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ORGANIZATIONAL BEHAVIOUR

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LESSON-1

INTRODUCTION TO ORGANIZATIONAL BEHAVIOUR

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STRUCTURE

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1.2 Introduction
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1.5. What do managers do?
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1.1 LEARNING OBJECTIVES

At the end of this lesson, the student should be able to:

- Define organizational behaviour.
- Explain the need for and importance of a manager in an organization.
- Develop an understanding of the functions of a manager and managerial roles in an organization.
- Explain the Major disciplines that contribute to the domain of organizational behaviour.
- Explain the level of analysis of the organization's behaviour.
- Understand various challenges and opportunities managers face in applying organisational behaviour concepts.

1.2 INTRODUCTION

Organizational behaviour (OB) is the domain that deals with understanding people's behaviour within an organization. The discipline deals with the individual behaviour of employees, group behaviour of employees, and behaviour of employees at the organizational level. In addition, the field investigates the impact of various cognitive, affective and behavioural aspects of human resources on the effectiveness of an organization (like what motivates employees, what makes a manager a good leader, how one can manage group dynamics, etc.). Organizational behaviour is crucial in facilitating present-day managers in dealing with various organisational challenges and opportunities.

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"*Organizational behaviour is a field of study that investigates the impact that individuals, groups, and structure have on behaviours within the organizations to apply such knowledge towards improving an organization's effectiveness*."- Stephen P Robbins.

Before exploring the various components of organizational behaviour or the three levels of analysis in organizational behaviour (namely, Individual, Group, and Organizational level), it is crucial to understand what we mean by these three levels of analysis. How has the domain of Organization behaviour formed? Furthermore, who are managers, and what functions and roles do they perform in an organization.? Finally, it is also essential to understand managers' present-day challenges and opportunities in organizational behaviour.

1.3 WHAT DO YOU MEAN ORGANIZATION?

A social unit that is structured and managed to pursue collective goals. All organizations have a management "***Structure***" that determines relationships between different activities and the members; assigns roles, responsibilities, and authority among members to carry out various tasks. Organizations are open systems--they affect and are affected by their environment. Organizations are formed to achieve some "***Purpose***". An organisation's purpose is stated through its vision, mission, goal, and specific objectives. To fulfil the underlying goals, organizations need "***People***". People form part of structures that allow them to collectively work and accomplish the set Purpose (Refer to the last lesson to learn more about various types of structures). The purpose or structure both differs from organization to organization.

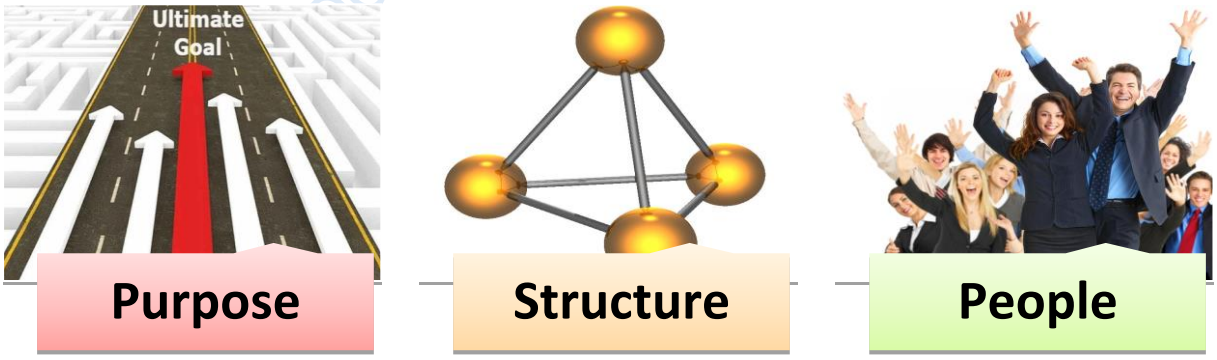

Figure 1.1 Features of an Organization

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1.4 MANAGER AND INTERPERSONAL SKILLS

Managers are the coordinators responsible for managing social units; these social units help the organization achieve its goals. For managing people, a manager needs technical, human, and conceptual skills (Refer to the 1.6. section of this lesson for more details). Earlier more focus was on technical skills and less on interpersonal skills, but eventually, interpersonal or people skills have become crucial; at times, they are preferred over technical skills. Interpersonal skills or soft skills help a manager connect with others at work. Managers are responsible for getting the job done through people. Their main task is not to complete the task directly. Therefore, it becomes essential for a manager to understand people's behaviour and connect with them. OB principles provide insights that help a manager develop their interpersonal skills, which could yield various organizational-level outcomes (like employee satisfaction with their respective jobs, employee commitment to an organization, employee engagement, stress levels, etc.).

Managers with high interpersonal skills can attract high-performing employees and are also able to improve employee retention. Recently, the organisations have been impacted by the "Great Resignation", a phenomenon that is used to describe situations in which huge numbers of employees have quit organisations towards the end of the Covid-19 pandemic. Also known as Big Quit or Great Reshuffle, it has made retaining employees critical to an organisation, as a process of hiring them is both costly and time consuming. Consequently, it has become essential to retain employees and control such trends.

1.5 WHAT DO MANAGERS DO?

Managers are the coordinators; they help an organization accomplish its objectives through people most effectively and efficiently. Here "Effectiveness" means completing a given task within the planned time frame. The manager should focus on "*Doing The Right Things*" to achieve goals on time. "*Efficiency*" means achieving goals with minimum resources. To achieve efficiency, managers should focus on "*Doing Things Right*" to minimize wastage as much as possible. Both Effectiveness and Efficiency are essential to accomplish organizational goals. Managers strive to achieve goals with minimum wastage.

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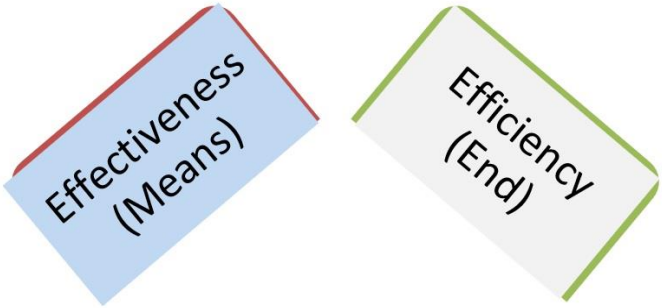

Figure 1.2 Efficiency and effectiveness

Henry Fayol and Henry Mintzberg gave a detailed description of various functions and roles performed by a manager. Functions of management are part of the classical approach provided by Henry Fayol (French Industrialist). Later in the 1960s, Henry Mintzberg divided the diverse responsibilities of a manager into ten roles performed by the manager.

1.5.1. Management Functions

Henri Fayol identified five management functions: planning, organizing, commanding, coordinating, and controlling. The manager performs various tasks of similar nature within each function. The detailed description of all five Functions of Management are as follows-

Planning: The primary purpose of any organization is to achieve specific goals. The manager needs to define these goals in line with the primary purpose and vision of the organization. It is a complete process where the manager explores various alternatives, builds a strategy for the whole organization, and sets employee objectives. Later these goals become a yardstick against which outcomes are measured. Fayol summed up this role under a broad category known as "*Planning*".

Organizing: The manager is also responsible for building the structures in the organization. The organizing function includes identifying various organisational tasks, grouping, and classifying similar-nature tasks and designing reporting relationships.

Commanding: The manager is responsible for communicating planned strategies, goals, or targets. In line with organizational goals and practices, a manager should direct and lead subordinates. It is associated with communicating clear instructions to employees in line with the company's mission and vision. In addition, a manager should be able to inspire and motivate employees to achieve the company's goals.

Coordination*:* Coordination is one of the crucial functions of management. Setting goals, creating structures, and giving instructions to employees will fail if all activities are not appropriately coordinated. It is equally important to harmonize all activities in an

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organization. Managers should ensure that various activities complement each other. Effective coordination will also reduce conflicts and stimulate employees' motivation.

***Controlling**:* The manager sets standards/objectives at the planning stage. However, the planning stage will remain incomplete unless the manager compares the standards with actual performance. Therefore, a manager should periodically compare the targets with the actual performance and take corrective actions in case of any gap.

The five functions identified by Henry Fayol provide an overview of the main functions of management; it may not cover all the complexities that a manager is expected to deal with in their day-to-day functioning.

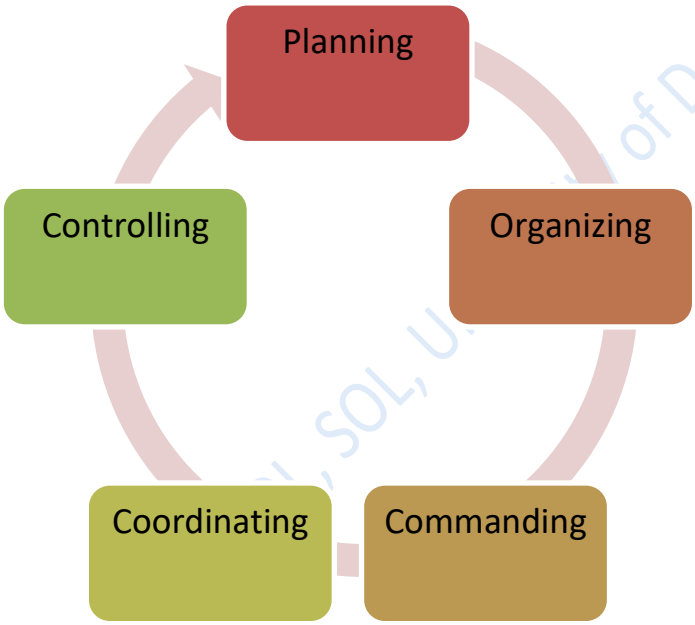

Figure 1.3. Five Management Functions by Henry Fayol

1.5.2. Managerial Roles

The role of managers in an organization is multifold. Henry Mintzberg defined Managerial Roles in 1960. Based on observation, Mintzberg segregated all the roles of a manager into three broad categories, namely, Interpersonal, Informational, and Decisional. He stated that these roles are highly interrelated and reflect a set of behaviours followed by managers in an organization. The detailed description of all three categories of Managerial Roles is as follows-

Interpersonal role of a manager: Interpersonal role of a manager includes three subsets within it. First is "*Figurehead*", a symbolic role where the manager works on routine level

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work of social and legal nature. This role inspires others in the organization. Secondly, the manager acts as a "*leader*" responsible for hiring, motivating, and directing employees. The third managerial role within interpersonal is called "*Liaison";* under this role; he builds his network. He can gather the required information through networking with people internal or external to the organization. Such contacts also provide a manager with favours.

Informational Role of a manager: The informational role of a manager is associated with a process where the manager gathers required information, transfers it into the organization, and transmits it to the outside organization. This role includes three subsets. The first subset is known as "*Monitor*"; under this role; the manager collects information through various sources and analyses the internal and external environment. Later the manager transmits relevant information to other members of the organization; this role also defines the second subset known as "*Disseminator"*. Finally, under the third subset, the manager as a "spokesperson" transmits the information outside the organisation.

***Decisional Role of a Manager*:** The manager is not only a symbolic head who manages information or directs employees but also a decision-maker. As an "*Entrepreneur*" manager searches for new opportunities and brings new assignments/ projects to the organization, a manager also initiates change. The manager is responsible for "*handling disturbance*" in the organization. For example, suppose there is some roadblock in the organization's functioning; the manager is responsible for handling it. The manager also acts as a "Negotiator", where he represents the organization in all the major negotiations. Lastly, as a "resource allocator," he is responsible for procuring and allocating *resources*.

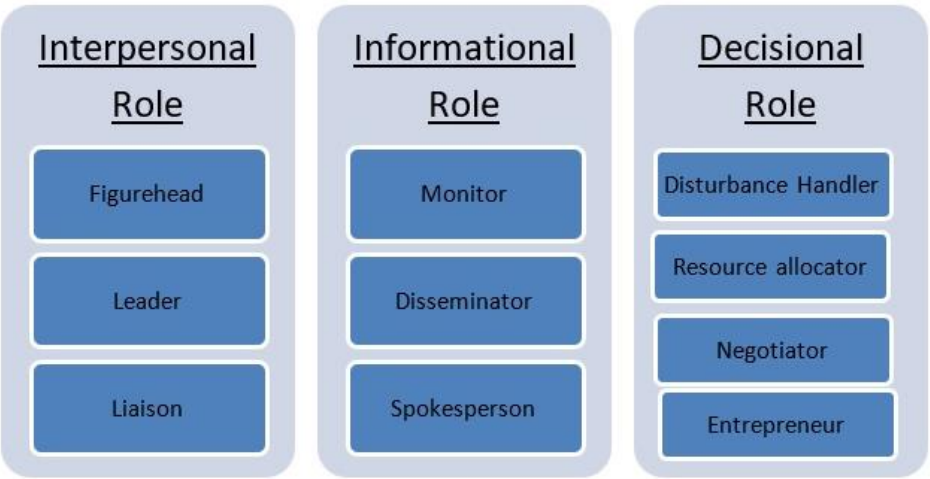

Figure 1.4 Mintzberg's Managerial Roles

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Emerging Managerial Roles

What do managers do? Or what a successful manager is supposed to do? If asked by a management student, the answer will be either associated with five basic functions (namely, planning, organizing, staffing, and controlling) as defined by French industrialist Henri Fayol or will be associated with ten managerial roles as defined by Henry Mintzberg.

But in the current scenario, in addition to these functions and roles, a manager should change and get away with the traditional approach while dealing with the employees. With growing competition and technological advancement, a manager must change some commonly followed practices like limiting his role to problem-solver, micromanagement, giving direction to employees, etc. To meet the contemporary challenges in the workplace the manager must shift from-

1. ***Directive to Instructive***: The role of the supervisor has considerably changed with the advent of technology. Robots driven by AI (Artificial Intelligence) have already replaced manual & repetitive work in the majority of industries. AI could impact the present roles of the employees, but it won't be able to exclude the need for human resources. New roles are emerging and are replacing the old ones. The present-day manager needs to explore best practices to shape the impact of AI on the industry.

2. ***Restrictive to Expansive***: Present-day competitive business environment needs employees to think and learn quick decision-making. Centralization and micromanagement by managers could restrict employees in the way they think. Therefore, it is important for managers to delegate and motivate their employees to analyze the market, think about a solution, and take decisions based on their analysis.

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3. ***Exclusive and Inclusive***- Managers should include employees in the decision-making process especially while dealing with some new situation (Like- WFH (Work from Home); Virtual organizations, etc. during Covid-19), this brainstorming process adds diversity and helps in identifying various perspectives around the problem. It also makes the "process of change" easier in the organization.

4. ***Repetitive to Innovation***- There is no best time for innovation, rather it is an ongoing process. Innovation makes an organization successful, and a successful organization needs innovation to remain competitive.

5. ***Problem solver to Challenger***- The role of the present-day manager is not limited to problem solver, today manager needs to be proactive in understanding, analyzing, and solving upcoming challenges in the industry.

6. ***Employer to Entrepreneur***- Present-day manager needs to think like an entrepreneur. An entrepreneur facilitates development and helps others in growth.

For more details on how roles of managers are changing Read *Pistrui, J., & Dimov, D. (2018). The role of a manager has to change in 5 key ways. Harvard Business Review.*

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IN-TEXT QUESTIONS

1. Efficiency means achieving goals with _____.

2. Functions of management are part of the classical approach, given by_____

3. _____means completion of given task within planned time frame.

4. According to Mintzberg, manager transmits the information outside the organisation, and this role is termed as _____

5. _____is a symbolic role, under this role manager inspires the employees.

6. The _____stage will remain incomplete unless manager will compare the standards formed at ____stage with actual performance.

1.6 MANAGERIAL SKILLS

Robert L. Katz has identified various skills necessary for a successful manager. According to him, a manager needs the following skills to accomplish their goals-

1.6.1 Technical Skills*:* Technical skills refer to the "*Employees' ability to apply specialized knowledge or expertise while performing the given task*"; in other words, technical skills mean knowledge and the ability to accomplish the given task.

For example, for a manager at ABC Ltd. (an audit firm), technical skills could include knowledge about the fundamentals of accounting, Indian Accounting Standard rules, and procedure for conducting an audit. Education/ and qualification are essential for technical skills (like a chartered accountant degree), along with knowledge gained through schooling/ college and / or on the job experience.

1.6.2 Human skills: The primary responsibility of managers is to communicate with employees and coordinate the work between employees. A manager should be able motivate and lead employees to accomplish the organisation's purpose. In addition, a manager should be able to resolve conflicts in the organisation.

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For example, an audit manager with a chartered accountant degree might possess sound technical knowledge about the audit process. Still, he won't be able to manage a team or accomplish goals unless he has good human skills (like- the ability to communicate, listen, and motivate; the ability to create good coordination between team and client to achieve the set targets; etc.)

1.6.3. Conceptual skills: The organisational environment today is highly Volatile, Uncertain, Complex, and Ambiguous (VUCA). In such an environment, making a decision based on only past knowledge is not possible. Therefore, to work in a present-day environment, a manager should have the mental ability to deal with complex problems. The ability to analyse a complex problem "*Conceptual skill"*. Furthermore, for decision-making in the VUCA environment, a manager should have good conceptual skills.

For example, To handle diverse client-specific queries or any challenge posed by the external environment (like the pandemic), a manager needs to analyze the problem, generate various alternatives and choose the best alternative.

1.7 MANAGERIAL ACTIVITIES: EFFECTIVE VERSUS SUCCESSFUL MANAGER

Fred Luthans and his associate found that all managers could be engaged in four activities, namely-

- ***Traditional Management**:* This includes planning, organizing, making decisions, etc.
- ***Communication*** includes communicating information, handling paperwork, and exchanging information.
- ***Human resource management**:* This includes managing people using human skills (like motivation, training, handling conflicts, etc.).
- ***Networking**:* Building a social network and interacting with external publics.

Luthans and his associates conducted an empirical study based on a sample of 450 employees. Their study found that a successful manager spends 48% of their time networking and hardly 13% of their time in traditional management. In contrast, an effective manager spends 44% of their time communicating and barely 11% of their time is spent on networking. An average manager spends 19%-32% of their time in all activities. In a nutshell, networking is an important activity that makes a manager successful.

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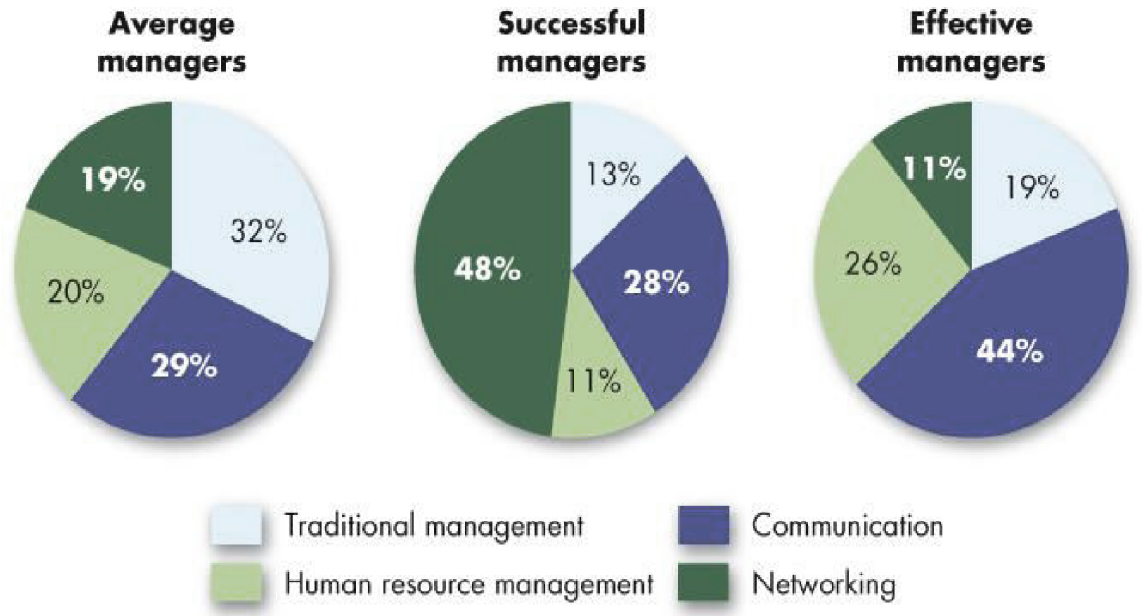

Figure 1.5 Allocation of Activities by Time

Source: Based on F. Luthans, R. M. Hodgetts, and S. A. Rosenkrantz, Real Managers (Cambridge, MA: Ballinger, 1988).

1.8 ORGANIZATIONAL BEHAVIOR

The definition of OB suggests that it is a *"field of study*, " meaning it is a distinct area with a common body of knowledge. Further, the field of study investigates individuals or groups to apply this knowledge to increase organizational effectiveness. The study focuses on the behaviour of employees at the group, individual or organizational levels that impact the performance of an organization. The study also focuses on various interpersonal skills that could help to deal with employees effectively. Following are some critical areas in OB-

- Motivation
- Leadership
- Stress management
- Group Dynamics
- Conflict Management

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- Personality
- Change process
- Interpersonal communication

1.9 MAJOR DISCIPLINES THAT CONTRIBUTE TO THE DOMAIN OF ORGANIZATIONAL BEHAVIOR

OB is an applied behavioural science. It integrates knowledge from various disciplines like psychology, social psychology, anthropology, sociology, etc.

Psychology: Psychology provides knowledge about factors that determine human behaviour. It includes various sub-disciplines like clinical psychology, industrial psychology, etc. Psychology has contributed to understanding the individual behaviour of employees in an organization. Some key areas in the domain of OB that are influenced by the knowledge of psychology are motivation, perception, personality, work stress, employee happiness, attitude, etc.

Sociology: Psychology deals with an individual's behaviour whereas sociology deals with the behaviour of a group. The domain of sociology includes status, society, social groups, prestige, social behaviour, etc. Some key areas in the domain of OB that are influenced by the knowledge of sociology are formal and informal organization, group dynamics, etc.

Social Psychology: The bent of psychology and sociology is termed Social Psychology. In simple words, it means the influence of group members on individual members of the group. Some key areas in the domain of OB that are influenced by the knowledge of social psychology are group decision-making, change in attitude, behaviour, communication, etc.

Anthropology: Anthropology deals with the study of human culture. It includes knowledge of various cultures and the impact of multiple cultures on human behaviour. With globalization, workforce diversity is inevitable, and employees from different cultures come together to accomplish organizational goals. Therefore, it is essential to understand the influence of culture on human behaviour. Some key areas in the domain of OB that are influenced by the knowledge of anthropology are cross-culture influences, values, etc.

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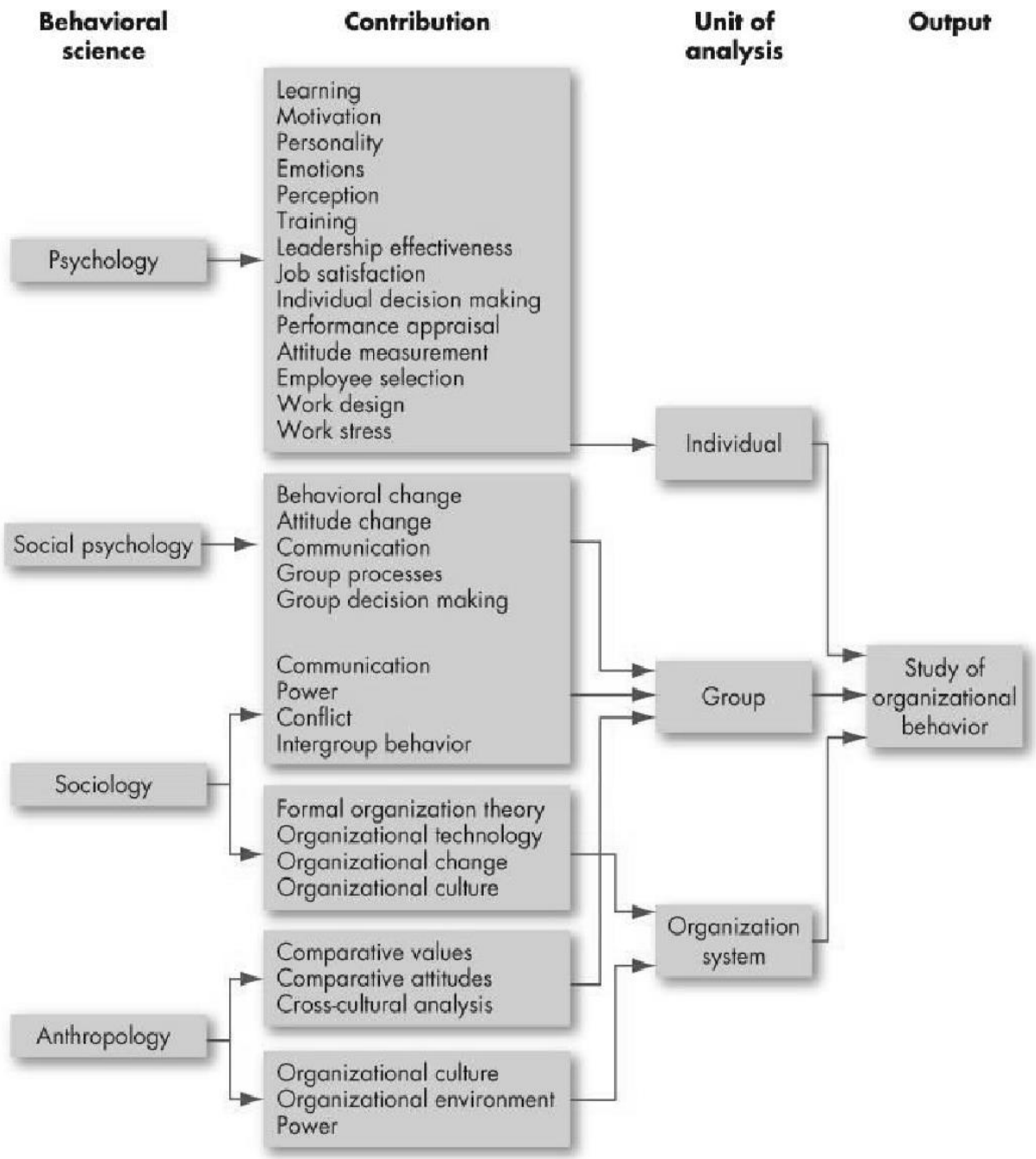

Figure 1.6 Major disciplines that contribute to the domain of organizational behaviour

Source: Robbins, S. P., Judge, T. A., & Vohra, N. (2019). *Organizational behaviour by Pearson 18e*. Pearson Education India.

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1.10 LEVEL OF ANALYSIS IN ORGANIZATIONAL BEHAVIOR

There are three levels of analysis in organizational behaviour employee behaviour can be analysed at three levels individual, group, and organizational. The individual-level analysis is a micro-level analysis, whereas the organizational-level analysis is a macro-level analysis. This difference in the analysis is required because it has been observed that the behaviour of employees is different when they work in groups compared to when they work individually.

1.10.1 Individual level analysis-

Unlike static resources, humans as a resource differ from one another. Organizations are made up of people, and every employee in an organization is central to the study of OB. Individual-level analysis or micro-level analysis helps in understanding individual differences. Integrating these individual factors provides insights to a manager and facilitates an understanding of human behaviour. Some factors that fall under this category could be an input (like- personality, values, attitude, etc.) or a process (like perception, learning, motivation of individual employees, etc.)

1.10.2. Group level analysis:

Employees are expected to work in a group. Working in teams is essential for surviving in a competitive environment. Individual employees perform differently when they work in groups. The group-level analysis, also known as meso-level analysis, helps understand group dynamics. Areas of interest in this category include group cohesiveness, teamwork, power, politics, group dynamics, etc.

Figure 1.7 Level of analysis in Organizational behaviour

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1.10.3. Organization-level analysis: It is also known as macro-level analysis. Several groups/teams operate within an organizational structure. They together form the culture. The organizational level analysis consists of a study of culture, climate, cross-culture analysis, etc., For example, it has been observed that employees often resist change, and change is an inevitable process. OB helps deal with resistance to change and facilitates a smooth change process.

IN-TEXT QUESTIONS

7. Level of organization could be broadly classified into _____categories.

8. Individual level analysis is also known as micro level analysis. True / False

9. Following title could not related to individual level analysis-

a) Personality b) Attitude
c) Values d) Culture

10. _____ is also known as meso level analysis.

11. Organization represents a set of arrangement by group of people to accomplish some underline _____.

1.11 CHALLENGES AND OPPORTUNITIES IN ORGANIZATIONAL BEHAVIOR

Organizational behaviour has grown in importance as the work environment has become more challenging, and the understanding of organisational behavior is being looked upon to provide solutions to the challenges. The diversity in the workplace has increased, and now organizations need more flexible employees. With technological advancement and globalization, new employment opportunities have emerged, and managing the workforce has become more challenging. The emerging gig economy and use of artificial intelligence in all spheres of business are presenting fresh challenges for managers. Following are emerging challenges where the understanding of OB could provide a solution to the manager.

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Enabling Leaders to lead in a VUCA world: Leading in today's VUCA world (Volatile, Uncertain, Complex & Ambiguous) creates unprecedented challenges that traditional leadership development fails to address. Leaders need to regain control of what they pay attention to and be capable of maintaining focus whilst experiencing feelings of fear, self-protection and, uncertainty. By practising mindfulness, leaders can equip themselves with the ability to feel calmer, be more present and develop clearer thinking amidst these challenging external conditions.

Agility and the Game of Teams: With the increasing need for organisations to become more agile, teams are becoming the foundation of organisational structure. Cisco, for example, already has more than 20,000 teams, with people sitting on many teams simultaneously. Agile teaming as a work practice requires agile minds, focusing more on "we and our priorities" and less on "me and my priorities". The pace of forming-to-performing and team disbanding has now become a strategic advantage. As we practice mindfulness, our default "all about me" thinking patterns become less automatic and habitual, and we open up to more inclusive thinking. Mindfulness also increases our cognitive flexibility, enabling us to think about things in new ways, be that the new ways of working, new team members, or a new project.

Responding to Globalization: Globalization refers to the integration of various economies. Today businesses are no longer restricted to a particular region. Today companies have presence in multiple countries; for example, Samsung a South Korean company has worldwide operations and so does the Burger King Brazilian company. Companies hire employees from other countries due to the cost of labour; like Apple Inc is an American company, but most Apple employees are not from the US. Even the production process is undertaken in a foreign land by some companies like Honda cars are built in Ohio. The world has become a "Global village". Therefore, a manager needs to focus on global issues. An expatriate manager must understand the cultural difference among employees. Something that fits the culture of the homeland might not work in other countries.

Managing Workforce Diversity: Workforce diversity means differences and similarities between employees in terms of gender, ethnicity, race, sexual orientation, age, value, etc. organizations operating globally have to deal with a diverse workforce. The heterogeneous workforce is essential because it helps the organization understand the customer needs, it helps in bringing new innovative ideas to the organization and increases the morale of other employees. But the diversified workforce is also a challenge for management. It is difficult to resolve conflicts as people tend to stick to their viewpoints which often centre around their values, belief, religion, or ethnicity.

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Improving customer service: Employees in front roles (directly dealing with customers) play an essential role in ensuring customer satisfaction. In addition, customer satisfaction plays a vital role in a competitive environment. Therefore, there is a need for a "customer-responsive" culture in an organization. Organizational behaviour could help managers bring such a culture into the organization by working on employees' attitudes and behaviour.

Working in Networked Organization: Network organizations allow employees to work together even when they are far away from each other in terms of distance. Worldwide lockdown around 2020 due to the pandemic (Covid-19), forced most organizations to move to the virtual platform. Even today in 2022, many businesses are still working through virtual platforms or have permanently adopted a hybrid mode. Managing such an organization needs different set of skills virtually collaborating and coordinating with employees is an emerging challenge for managers.

Helping employees in Work-life balance: Employees today find it challenging to create a balance between their work and life. Long working hours are one of the main reasons for work-life conflict. Today, employees from all over the world are virtually connecting through online platforms. It may be a daytime for one employee and a night for another employee. So, the world never sleeps. Work is endless, and there is no specific working time. Such conditions of present-day work lead to work-life conflict. Work-life conflict could increase burnout and stress among employees and, as a result, could drop the employee's productivity.

Creating a positive work environment: The new wave of positivity within the organization led to the growth of a new concept of positive organizational behaviour (POB), a study that focuses on the strength of employees. The earlier focus of managers was to work on the weakness of the employees or correct what is wrong, but the field of POB suggests that the focus needs to be deviation from what is wrong to what is right. Therefore, a manager today needs to learn how to get the best from the strengths of the employees.

Improving ethical behaviour: It is not that employees always want to do something considered wrong on moral grounds for their benefit or that they are not aware of what is right or ethical. It is just that people at work face Moral Distress, i.e., they mostly know what is right, but due to the limitations and fear of adverse outcomes, they fail to do the right thing. There is no clear line between what is right and wrong. Still, a manager needs to create an "ethically- healthy climate", which could minimize the vagueness between right and wrong behaviours. Further, it is important to promote integrity in the organization at all levels.

Economic Pressure: Managing employees in bad times, like during Covid-19, is more challenging than managing employees in good times. The Covid-19 pandemic besides

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impacting health conditions pushed organizations to cost-cut. Therefore, COVID -19 brought about a suddenly change in the business environment and presented unprecedented challenges to most businesses and their management. Under good economic conditions, managers work on employee motivation through rewards, but under bad economic conditions, managers need to deal with the growing stress conditions at the workplace.

The above challenges could also provide various opportunities to present-day managers. For instance, workforce diversity brings new ideas to the organization but could also lead to increased conflicts. Therefore, a manager must learn how to convert these challenges into opportunities**.**

IN-TEXT QUESTIONS

12. To coordinate with employee's manager needs _____ skills.

13. Role of manager is changing and becoming more challenging due to the technological advancements. (True/False)

14. _____suggests that the focus needs to be a deviation from what is wrong to what is right.

15. A manager needs _____ to analyse complex nature problem.

1.12 MANAGERIAL IMPLICATION

The following are the implications for the managers-

1. Human behaviour is complex, and it is challenging to generalize human behaviour. Though some provide insights for understanding and generalizing human behaviour, most of them are erroneous.

2. Managers often try to use intuition/idea/ or feeling while explaining cause-and-effect relationships. But sometimes feelings lead to incorrect decisions. Therefore, it is important to use metrics and rely on facts.

3. Managers should learn interpersonal skills. In a managerial role, soft skills like empathy, communication, leadership skills, etc., are way more important than technical skills.

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4. Work environment is changing continuously. Hence a manager needs to upgrade their technical and conceptual skills. In addition, managers must also update themselves with the new OB trends like Big Data.

5. Concepts of OB could provide various insights that could help a manager resolve conflicts, improve work-life balance, reduce stress, etc.

1.13 SUMMARY

The lesson aims to highlight the meaning of organizational behaviour, the need for interpersonal skills, and managerial functions and roles. The present-day managerial roles have changed with technological advancement, globalization, organizational structures, and changing employee lifestyles. A manager needs to learn how to convert these challenges into opportunities. Additionally, with increasing complexity in an organization, the skills required by a manager could also vary. The domain of organizational behaviour integrates the knowledge drawn from various disciplines like psychology, social psychology, anthropology, and sociology. It helps in understanding people's behaviour at an individual, group, and organisational level. It applies knowledge that enhances organizational effectiveness.

1.14 ANSWERS TO IN-TEXT QUESTIONS

1. Minimum Resources 2. Henry Fayol 3. Effectiveness 4. Spokesperson (or Informational role of manager 5. Figurehead 6. Planning Stage 7. Three 8. True	9. Culture 10. Group-level analysis 11. Purpose/ goal (Both are correct) 12. Human skills 13. True 14. Positive Organisation Behaviour 15. Conceptual Skills

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1.15 SELF-ASSESSMENT QUESTIONS

1. Assume you become a bank manager. As per Mintzberg's theory, what roles do you think you will be required to play as a manager? *(BMS; Open book exam)*
2. An effective manager may not be an efficient manager. Comment. explain the various skills required by a manager to become successful
3. Explain the difference between various levels of management, along with a suitable example.
4. Write short note on the functions of a manager. State how functions of management are different from managerial roles.
5. Explain the various challenges faced by present-day managers. Elaborate on how the role of manager is changing with time.
6. "Management is a universal concept". Do you agree? Comment.

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LESSON-2

PERSONALITY

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STRUCTURE

2.1 Learning Objectives
2.2 Introduction
2.3 Concept of Personality
2.4 Determinants of Personality
2.5 Types of Personality
2.6 Theories of Personality
2.7 How personality develops?
2.8 How personality influences organizational behavior?
2.9 How to Measure Personality?
2.10 Summary
2.11 Glossary
2.12 Answers to In-text Questions
2.13 Self-Assessment Questions
2.14 References
2.15 Suggested Readings

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2.1 LEARNING OBJECTIVES

After this lesson, you will be able:

1) To **understand** the concept of personality and various factors that determine personality.
2) To **identify** various types and theories of personality.
3) To **comprehend** the development and assessment of personality.
4) To **examine** how personality influences organizational behavior.

2.2 INTRODUCTION

Personality is a key psychological component that influences an individual's behavior. Personality is the role that an individual performs in public. The personality of an individual is distinct, personal and a major determinant of his behavior. Hence, it is important to understand the concept of personality in shaping individual behavior.

This lesson provides an overview of personality. It discusses various factors that determine personality. The next part of the lesson briefly explains the types and theories of personality. The lesson also explores the development of personality. Later on, this lesson also examines how personality influences organizational behavior.

This lesson will help the learners to understand various traits of personality and how it has a significant impact on organizational behavior. It will assist them in shaping their behavior in real-life situations.

2.3 CONCEPT OF PERSONALITY

The term "personality" originates from the Latin word "persona," which means "to speak through." This Latin term refers to the masks used by the actors. As a result, personality is the role that an individual performs in public. Personality does not just refer to a person's charm, appearance, smiling face, and attitude toward life. However, it is a dynamic notion that represents the evolution and development of an individual's entire psychological system. Traditionally, the idea of personality pertains to how individuals affect others through their outer appearances and conduct. Personality is a reasonably consistent set of characteristics that impact an individual's behavior and may be defined as the sum total of an individual's reactions and interactions with others.

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Personality was interpreted differently by different psychologists. The following definitions will help you better understand the notion of personality:

According to Gordon Allport, personality is defined as "*the dynamic organization within the individual of those psychological systems that determine his unique adjustment to his environment".*

In the words of Floyd L. Ruch, "*Personality includes external appearance and behavior, inner awareness of self as a permanent organizing force and the particular pattern or organization of measurable traits, both inner and outer*".

Fred Luthans defined personality as *"how a person affects others and how he understands and views himself as well as pattern of inner and outer measurable traits and the person-situation interaction."*

The definitions of personality provided above clearly demonstrate that the meaning of personality is considerably more than just the part that an individual performs in public. Integrating all of these definitions, one may say that personality is the sum of various characteristics that are evident in an individual and define his behavior pattern.

2.4 DETERMINANTS OF PERSONALITY

Now that you have understood the meaning of personality, the next question arises about how an individual's personality is developed.

Personality is an intangible idea. It is complicated since it is linked to cognitive and psychological processes. It is said that an individual is born with certain mental and physical characteristics, but personality gets shaped depending on the environment in which a person has been raised. A variety of factors influence an individual's personality, including biological factors, family and social factors, situational factors, and environmental factors. Let us discuss them one by one.

Biological Factors

Biological factors are those factors that are related to the human body. Three factors are considered to be relevant namely:

- **Heredity:** It refers to the characteristics of a person's personality that are passed down from parents to their children. These parameters are decided at the time of conception. Temperament, sex, energy level, reflexes, etc. are often inherited totally or partially from the parents. This viewpoint contends that the molecular structure of genes is the foundation of human personality.

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- **Physical Attributes:** Personality is influenced by physical attributes and maturation pace. The pace of maturation is linked to physical stature. It is considered that an individual's physical appearance has a significant impact on their personality. For example, height, color, facial attractiveness, physical strength, etc., all have an impact on one's self-concept.
- **Brain:** Biological factors have an impact on the brain. The composition and structure of the brain have a significant impact on one's personality. Few scientific studies show the brain impacts personality.

Family and Social Factors

Family and social factors have a vital role in developing an individual's personality. The personality is influenced by three key factors namely:

- **Socialization**: It is the process by which a new-born acquires a wide variety of behavior from an extremely vast range of behavioral potentialities that are available at birth. Those patterns of behavior are considered acceptable and normal by the family and social groups. Family members force the infant to adhere to particular acceptable behaviors.
- **Identification**: The process of shaping one's personality begins with the identification process. The identification process happens when a person attempts to identify oneself with someone in the family who is considered ideal. Normally, children emulate their father or mother.
- **Birth order**: Another important factor determining an individual's personality is birth order. For example, firstborn children are more likely to be reliant, logical, ambitious, cooperative, diligent and less aggressive, as well as more prone to anxiety and guilt.

Situational Factors

The impact of situational factors on personality has become more widely recognized in recent years. In general, an individual's personality is constant and stable, yet it fluctuates depending on the situation. Life is typically described as a series of experiences. Every person goes through many situations in his life that have a significant impact on his personality development. It sometimes exercises restrictions and sometimes boosts an individual's behavior. For example, a coward and a physically frail person might occasionally act bravely to save the life of a close one.

Environmental Factors

Environmental factors are the ones that exist within and around an individual. They are cultural considerations. Culture influences human decision-making, independence,

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dependency, attitudes, soberness, violence, competitiveness, cooperation and shyness. Culture comprises two essential components – individual conformity and approval by the wider group. Culture creates rules, attitudes and values that are imposed by various social groups. Individuals are obliged to adapt to the culture that society has built. Every culture has its sub-cultures further specifying success criteria, moral standards, appropriate style of dress, and cleaning standards. These cultural subgroups have a large influence on an individual's personality development. For example, a girl born and raised in a rich family in an urban region will act differently than a girl born and raised in a poor family in a slum area. Thus, culture has a stronger impact on an individual's personality.

Thus, it is evident from the above discussion that a variety of factors determine an individual's personality. As a result, one must consider personality as a comprehensive system.

IN-TEXT QUESTIONS

1. _____refers to the characteristics of a person's personality that are passed down from parents to their children.
   a) Heredity b) Physical Attributes
   c) Brain d) Socialization
2. Which of the following are the factors that determine personality?
   a) Biological b) Environmental
   c) Situational d) All of these
3. _____ is the process by which a newborn acquires a wide variety of behavior from the extremely vast range of behavioral potentialities that are available to him at birth.
   a) Identification b) Physical Attributes
   c) Birth order d) Socialization
4. A coward and a physically frail person might occasionally act bravely to save the life of his close one is an example of which factor of personality?
   a) Biological b) Situational
   c) Environmental d) All of these
5. When a person attempts to identify himself with someone in the family who he considers ideal it is known as:
   a) Birth order b) Physical Attributes
   c) Identification d) Socialization

2.5 TYPES OF PERSONALITY

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Personality qualities help people understand their personality types. The personality types have been discussed below:

The Myers-Briggs Type Indicator (MBTI)

The MBTI is a personality assessment instrument that is widely used across the world. This instrument consists of 100 statements on human personality. It asks individuals how they generally feel in specific scenarios. Based on the responses provided by the individuals, they are categorized as:

- **Extraverted vs. Introverted (E or I):** Extraverted individuals are outgoing, friendly, and self-assured, whereas introverted people are calm and reserved.
- **Thinking vs. Feeling (T or F):** Feeling types of individuals often base their decisions on their own morals and feelings, whereas thinking individuals are more logical and sensible in general.
- **Sensing vs. Intuitive (S or I):** Sensing individuals are highly practical and tend to stick to routines and orders. In contrast, intuitive individuals are not practical and typically rely on unconscious processes.
- **Judging vs. Perceiving (J or P):** Judging personalities appreciate order and organization in their surroundings and seek control, whereas perceiving personalities are more adaptable and impulsive.

Higher and lower scores in each of these characteristics aid in categorizing individuals into 16 different personality types. For instance, Extraverted/Sensing/Thinking/Judging (ESTJ) people are effective organizers and decision-makers because they are logical, reasonable, and analytical. Introverted/ Intuitive/ Thinking/ Judging (IITJ) persons are self-sufficient, driven, excellent creative thinkers, and have a strong desire to pursue their own ideas. As a result, it can be stated that MBTI is a highly effective instrument that is frequently used for employee selection, enhancing self-awareness, and offering career direction.

The Big Five Personality Model

The Big Five Personality Model is a paradigm that identifies five essential personality dimensions namely conscientiousness, emotional stability, extraversion, agreeableness, and openness to experience. These five characteristics are fundamental and accurately reflect the majority of the substantial differences in personality. These factors are discussed below:

- **Conscientiousness:** This factor measures an individual's reliability. Individuals that are very conscientious are more trustworthy, reliable, systematic and organized. An

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individual with poor conscientiousness, on the other hand, is reckless, less trustworthy, negligent, and unorganized.

- **Agreeableness:** This factor relates to a person's capacity to collaborate with others. Highly agreeable individuals are compassionate and cooperative. Individuals that score low on this dimension, on the other hand, are likely to be non-cooperative, disagreeable, and self-centered.
- **Extraversion:** This factor defines an individual's level of ease in interpersonal connections. Extroverts are more talkative, friendly, social and self-assured. Introverts, on the other hand, are more calm, more reserved and less social.
- **Emotional Stability:** This factor demonstrates a person's capacity to cope with stress. Individuals that are emotionally stable are usually calm, secure and self-assured. Emotionally weak individuals, on the other hand, are likely to be depressed, apprehensive, and insecure.
- **Openness to Experience:** This factor assesses a person's creativity and interests. Extremely open individuals are incredibly creative and are constantly open to new ideas. On the other hand, individuals that score low on this factor are less interested and do not respond to new ideas. They normally follow conventional methods of doing things.

Type A and Type B Personalities

Individuals are termed as Type A personalities who are impatient, highly competitive and aggressive whereas Type B personality individuals are easy-going, non-competitive and laid-back. Type A individuals are likely to be very productive as they work really hard, however, they are more irritable, not good team players, impatient and have poor judgment, whereas Type B individuals perform better on complex tasks involving accuracy and judgment rather than hard work and speed.

Introversion and Extroversion

These terms are usually associated with the sociability and interpersonal orientation of an individual. While extroverts are more gregarious; introverts are more self-assured and driven by their own distinct thoughts. Extroverts are reality-oriented, sociable individuals and are performers whereas introverts, on the other hand, are less risk-taking and more directive. They need strong encouragement and clear instructions. While extroverts think in terms of interactive and objective interactions; introverts think in terms of their own philosophy and belief.

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2.6 THEORIES OF PERSONALITY

In the preceding section, you have learned about types of personality. Now, the next question arises about theories that shape personality. Personality theories have been established to give insight into an individual's personality. They aid in comprehending the factors that form personalities. There are four main theories of personality. Let us discuss them one by one.

Psychoanalytic Theory

The psychoanalytic theory is a personality theory that holds that an individual is more driven by unseen forces that are influenced by conscious and logical thinking. The psychoanalytic theory is directly associated with Sigmund Freud. He contends that the interaction of the three components of the mind shapes human behavior namely:

- **Id:** The primitive aspect of the mind that desires instant fulfilment of biological or instinctive needs is known as the id. Biological needs are the fundamental physical requirements, whereas instinctive needs are the unlearned or natural demands, such as hunger, thirst, sex, and so on. Id is indeed the unconscious component of the mind that acts instantly and without giving any consideration to what is right and what is wrong. Id is, therefore, the source of psychic energy and the driving factor underlying all mental forces.
- **Super-Ego**: The Super-Ego is associated with the social or moral norms that an individual instils as s/he gets older. It serves as an ethical restriction on action and aids in the development of an individual's conscience. As an individual matures in society, cultural values and social conventions leading towards distinguishing right and wrong get acquired.
- **Ego:** The ego is the rational and conscious aspect of the mind that is linked to the reality principle. This implies that it balances the needs of the Id and the super-ego in real-life situations. While the Id is an unconscious part, the ego is conscious of the realities of the external world, hence, the ego keeps the id in control through intellect and reason.

Self-Concept Theory

The self-concept theory focuses on an individual's set of perceptions about oneself, as well as the perceptions of his/her interactions with others and other areas of life. Carl Rogers made substantial contributions to the self-theory. He defined self-concept theory as "*an organized,*

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*consistent, conceptual gestalt composed of perceptions of **I** or **Me***". There are four factors that comprise self-concept theory namely:

- **Self-Image**: Self-image refers to "*what an individual perceives about himself*". Everyone has specific views about themselves, for example, who or what they are; these beliefs shape an individual's self-image and identity. According to Erikson, an identity is created through a lifetime development that is typically unconscious to the individual and his society. In other words, an individual builds perceptions about himself unknowingly, based on social conditions.
- **Ideal-Self:** The term "ideal-self" refers to the "*way an individual would like to be*". It differs from the self-image as it depicts the ideal position that is perceived by an individual, whereas the self-image represents the reality that an individual experiences. The difference between these two factors may thus exist. The ideal-self acts as a stimulus to drive an individual to engage in activities that are consistent with the features of his ideal self.
- **Looking-Glass-Self:** The looking-glass self refers to "*an individual's impression of how others see his attributes or feel about him*". In other words, it is the perception of other's perception that is perceiving what others perceive about oneself rather than seeing who you truly are.
- **Real-Self:** The real-self is "*what others show you in terms of your self-image*". An individual's self-image is verified when others respond to him and express their beliefs or perceptions about how they genuinely feel about him. This is seen as an input from the environment, which allows an individual to modify the self-image in accordance with the information received.

Socio-Psychological Theory

According to the belief of socio-psychological theory, person and society are found to be closely linked. This indicates that an individual seeks to satisfy the demands of society and society assists him/her in accomplishing the goals. An individual's personality is formed as a result of this interaction. Adler, Horney, Forman, and Sullivan contributed to the socio-psychological theory. This theory (also known as Neo-Freudian Theory) varies from Freud's psychoanalytic theory in the following ways:

1. This theory contends that social variables rather than biological instincts play an essential role in forming an individual's personality.

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2. In this, motivation is conscious, which means that the individual is aware of his or her own needs and desires, as well as the kind of behavior necessary to achieve those requirements.

Thus, the theorists think that socio-psychological factors are a mix of social (family, religion, society, money) and psychological (ideas, feelings, beliefs) factors that are regarded to have a significant impact in determining an individual's personality.

Trait Theory

According to trait theory, an individual is made up of a set of defined predisposition characteristics known as traits. These characteristics are identifiable and often long-lasting qualities of an individual that set him apart from others. There are two main trait theories namely:

- **Allport Trait Theory:** This theory was proposed by Gordon Allport. According to him, an individual's personality may be examined by distinguishing between common traits and personal dispositions. The common traits are used to compare people based on six values, i.e., religious, economic, social, political, theoretical and aesthetic. Apart from common traits, there are personal dispositions that are distinct and are categorized as follows:
    - **Cardinal Traits:** The cardinal traits are strong and few people have personalities that are dominated by a single trait such as Mother Teressa's selflessness.
    - **Central Traits:** These are the general features that numerous individuals share in varying degrees such as friendliness, loyalty, kindness, agreeableness, etc.
    - **Secondary Trait:** Secondary traits explain why an individual acts differently than his/her usual behavior at times. For example, a cheerful individual may become irritated when others taunt him.
- **Cattell's Trait Theory:** Raymond Cattell developed this trait theory. According to him, a vast number of factors should be investigated to have a good comprehension of an individual's personality. He gathered life data (individuals' daily life behaviors), experimental data (standardizing experiments by evaluating actions), questionnaire data (responses gained through introspection of an individual's behavior), and performed factor analysis to find traits that are connected to one another. He identified 16 key personality factors by performing factor analysis techniques (Table 2.1).

Table 2.1: Cattell's 16 Key Personality Traits

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Traits	
Abstractedness	Imaginative Vs. Practical
Apprehension	Worried Vs. Confident
Dominance	Forceful Vs. Submissive
Emotional Stability	Calm Vs. anxious
Liveliness	Spontaneous Vs. Restrained
Openness to Change	Flexible Vs. Stubborn
Perfectionism	Controlled Vs. Undisciplined
Privateness	Discreet Vs. Open
Reasoning	Abstract Vs. Concrete
Rule-Consciousness	Conforming Vs. Non-Conforming
Self-Reliance	Self-sufficient Vs. Dependent
Sensitivity	Tender Vs. Tough
Social Boldness	Uninhibited Vs. Shy
Tension	Impatient Vs. Relaxed
Vigilance	Suspicious Vs. Trusting
Warmth	Outgoing Vs. Reserved

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The trait theory is based on the premise that traits are shared by many individuals and fluctuate in absolute amounts. Furthermore, the traits remain constant over time and may thus be assessed using behavioral indicators.

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IN-TEXT QUESTIONS

6. _____individuals are outgoing, friendly, and self-assured.
   a) Extraverted b) Introverted
   c) Thinking d) Feeling
7. _____ measures an individual's reliability.
   a) Conscientiousness b) Emotional stability
   c) Extraversion d) Sensing
8. Which is not a factor that belongs to Big Five personality traits:
   a) Sensing b) Extraversion
   c) Conscientiousness d) Sensing
9. The _____is a personality theory that holds that an individual is more driven by unseen forces that are influenced by conscious and logical thinking.
   a) Psychoanalytic Theory b) Self-Concept Theory
   c) Socio-Psychological Theory d) Trait Theory
10. Which theory is also known as Neo-Freudian Theory?
   a) Trait Theory b) Psychoanalytic Theory
   c) Socio-Psychological Theory d) Self-Concept Theory

ACTIVITY

Observe persons you know very closely and note down the various attributes of Id, Super Ego and Ego they possess.

2.7 HOW PERSONALITY DEVELOPS?

There are two main prominent psychologists namely Sigmund Freud and Erikson that described the development of personality. Let us discuss them one by one.

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Sigmund Freud's Stages of Personality Development

Sigmund Freud proposed that there are five universal stages of personality development namely oral, anal, phallic, latency and genital. These stages are explained below:

- **The Oral Stage:** This stage extends throughout the first year of life. During this time, the child's mouth is the most sensitive area of the body and the primary source of pleasure and joy. For instance, an infant's thumb sucking or biting when teeth erupt. The way the mother cares for the child influences whether the infant trusts or distrusts the environment (represented by the mother) around him. If his desires are frequently fulfilled, he develops trust and assumes that the world will look after him.
- **The Anal Stage:** This stage expands from one to three years in which the center of libidinal energy transfers from the mouth to the anal area. In other words, the anal zone of the body becomes the source of sexual satisfaction. Young children take great enjoyment in both the retention and ejection of feces. Toilet training provided by the parents to the child has an impact on the child's adulthood. If the mother is overly strict and controlling, the child will withhold feces and if this happens frequently enough, the child will become anal-retentive. When a child grows up, such a personality will show traits of stubbornness, frugalness, punctuality, excessive cleanliness or extreme messiness.
- **The Phallic Stage:** Around the age of three to six years, the focus on sexual enjoyment moves to another erogenous bodily zone, the sex organs. During this time, children might be seen gratifying themselves by inspecting and fondling their genitalia, masturbating, and exhibiting excitement in the matter of birth and sex.
- **The Latency Stage:** The latency stage is the fourth stage lasting six years until puberty. The libido is dormant at this stage, and no more psychosexual development occurs. During this time, the child lacks interest in sexual things and seeks libido gratification from the outside world, such as interest, knowledge, and so on. It is a stage of social development during which the child gains information and abilities for interacting with the outside world.
- **The Genital Stage:** The genital stage lasts from puberty to adulthood. There is a resurgence of sexual and violent impulses, as well as an enhanced awareness of a desire for the opposite sex. The individual finds satisfaction via heterosexual love. Libido discharge through mature sexual encounters with an opposite sex partner opens the door to true compassion for one's fellow. Freud believes that if an

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individual wants to attain ideal genital attributes then they should learn to work, delay gratification, become responsible, and, most importantly, take a more active part in dealing with life's issues.

Erikson's Stages of Personality Development

Erikson criticized Freud's emphasis on biological and social factors in the development of personality. He believed that social concerns should be given more consideration. Erikson established eight stages of life that reflect a person's continuous development. He described each stage as a specific conflict that must be successfully resolved before moving on to the next. These eight stages are explained below:

- **Infancy:** During the first year of life, a child resolves the fundamental problem of ***trust vs. mistrust***. An infant who receives love and care develops a sense of trust for other people whereas mistrust develops from a lack of love and care. This period has a significant impact on a child's future events.
- **Early Childhood:** A child's independence begins to develop in the second and third years of life. A sense of autonomy will emerge if the child is permitted to govern those parts of life that the child is capable of controlling. If the child often faces rejection from adults, a sense of ***self-doubt and humiliation*** is likely to emerge.
- **Play Age:** The four and five-year-olds are curious about their abilities. A child will acquire a feeling of initiative if he is encouraged to try and attain appropriate goals. If the child is controlled and made to feel incompetent, he will develop remorse and a lack of **self-*confidence***.
- **School Age:** A child learns numerous new skills and develops social talents between the age of 6 and 12 years. A child will acquire a ***sense of enterprise*** if he sees actual progress at a rate that is appropriate for his abilities, whereas, in the opposite scenario, a child will acquire a ***sense of inferiority***.
- **Adolescence:** The problem of adolescence is gaining a ***sense of identity*** rather than being confused about who you are. While enduring rapid biological changes, the adolescent is simultaneously attempting to distinguish himself or herself as socially distinct from the parents. The autonomy, enterprise and initiative established in earlier stages are critical in assisting the teenager to effectively resolve this issue and prepare for adulthood.
- **Early adulthood:** The young adult in his or her twenties faces the ***conflict of intimacy*** against isolation. The feeling of identity acquired throughout the adolescent

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years permits the young adult to begin building meaningful and enduring relationships.

- **Adulthood:** During this stage, adults must choose between ***generativity and self-absorption***. A self-absorbed individual never learns to see beyond themselves. They become preoccupied with maintaining and advancing their careers, and they never learn to care about the well-being of future generations, the organizations to which they belong, or the welfare of society at large. A generative individual perceives the world as much larger than themselves. Workplace productivity and societal growth become vital to them. They start to exert influence that is advantageous to their organizations through innovation and creativity.

- **Mature Adulthood:** In this stage, an individual is developed as a very mature individual. He has gained a sense of **wisdom or despair** and has earned insight and perspective that can truly lead future generations.

2.8 HOW PERSONALITY INFLUENCES ORGANIZATIONAL BEHAVIOR?

The personality traits of employees are used to analyze their behavior and to build appropriate tactics to cope with their behavior. The following are some of the attributes that impact organizational behavior:

- **Authoritarianism:** Authoritarianism is a term used to characterize people who have negative perceptions of their jobs and workers. Authoritarian persons often see obedience to authority as vital, have a negative attitude about people, adhere to traditional value systems regarding people and work, are highly inflexible, and are opposed to making decisions based on feelings and emotions. Such individuals want a well-organized and structured job environment guided by rules and regulations. They prefer autocratic or directive leadership, respect those who are in higher positions in the organizational hierarchy and also want respect from those who work for them.

- **Locus of control**: The belief about the results of their actions is termed the locus of control. Some people feel that their talents and abilities have an impact on the result of an activity. Others think that external factors such as fate or chance impact their outcome. Individuals who feel they have control over what happens to them are termed *internals*, whereas those who believe it is governed by other forces such as luck or chance are called *externals*. Internals are typically more satisfied with their

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jobs and are more active in seeking out information to make decisions than externals. Externals are more likely to be absent from their work, less satisfied and less committed to their jobs than internals.

- **Machiavellianism**: The term Machiavellianism is named after the works of Nicolo Machiavelli. Machiavellianism refers to an individual's tendency to manipulate others in order to gain and achieve power. Such people are more inclined to be active in organizational politics. Those individuals who exhibit this attribute with greater intensity are known as high Machs. High Machs are more realistic, emotionally stable, and willing to use any means to attain their goals. They manipulate more and generally win more. They are more likely to succeed in an environment with few rules and restrictions and are more self-assured and have higher self-esteem. They perform well in jobs that are more rewarding or that demands bargaining skills.
- **Achievement orientation**: It is a personality attribute that is used to predict an individual's behavior at work. An individual having a strong desire to succeed will make continuous attempts to do things better. Such individuals are convinced that their failure or success is the result of their own talents and flaws, as well as their own actions. These individuals dislike performing easy jobs because they do not appear to be challenging, nor do they enjoy performing tough tasks since the odds of failure are significant. As a result, they favor tasks with a moderate level of difficulty. High achievers often work better when they receive continuous performance feedback and the job has a direct link between efforts and rewards.
- **Self-Esteem:** A sense of liking or disliking oneself is referred to as self-esteem. A person with a strong drive for achievement is said to have high self-esteem. Such individuals feel that they have the necessary skills to succeed in work. People who have high self-esteem are risk-takers. They like dangerous and difficult tasks. They have an internal locus of control. They value pride, flair, recognition, achievement, and independence and are fulfilled with higher-order requirements over simple monetary motivation. People with low self-esteem, on the other hand, are impacted by external factors. They value and appreciate other individuals' perspectives more. They do not wish to be in an uncomfortable situation. As a result, they strive to please.
- **Risk Taking:** People's attitudes toward taking risks vary. The willingness to accept risks impacts decision-making. The risk-takers are more inclined to make quick decisions. Taking risks is also linked to job demands. High risk-taking is more prevalent in some castes, nationalities, religions and gender groups. Risk-taking

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behavior in organizations is connected to employees' capacity to take up difficult jobs and possess a high level of achievement motivation.

- **Self-Monitoring**: Self-monitoring is the capacity to adjust to the demands of the situation. Individuals with a high self-monitoring score closely examine the behavior of others to change their own behavior. They value professional mobility. They are more effective at performing opposing roles. These individuals can wear a mask that is more appropriate to the situation. As a result, highly self-monitoring persons exhibit a high degree of behavioral inconsistency. Therefore, the self-monitoring attribute assists managers in understanding their subordinates' personalities and behaviors to guide, motivate, communicate and control them on the job.

2.9 HOW TO MEASURE PERSONALITY?

There are several reasons for assessing an individual's personality. Understanding personality impacts numerous decisions, including recruiting personnel, developing relationships, designing motivational packages, and so on. A variety of metrics and procedures must be employed to comprehend an individual's personality. This, in turn, emphasizes the need of developing appropriate methodologies for assessing personality. Depending on the goal of the personality assessment, the usage of assessment methods for understanding personality may change from time to time and from circumstance to circumstance. There are three ways that are extensively utilized among the different methods of analyzing personality i.e.

- Personality Inventories (Objective Tests)
- Projective Tests
- Assessment Center

Personality Inventories (Objective Tests)

Personality inventories (often known as objective tests) are the most widely used method of measuring personality. They are standardized and can be administered to a large group of people at the same time. As the name implies, this approach consists of a series of statements referring to a specific aspect of the individual's personality. These statements are collectively known as *'Personality Inventories*,' and they serve as the foundation for prediction, or perhaps more accurately, understanding of personality. It is a questionnaire-based way of assessing personality that asks an individual to express reactions or feelings in certain scenarios. Individuals are asked to indicate their level of agreement or disagreement with each statement. Sometimes even a simple yes or no answer pattern is required.

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However, these replies are considered to have drawbacks such as faking a positive reaction. This highlights the importance of taking corrective actions to avoid and manage these drawbacks in order to generate a more and more trustworthy personal inventory. One method is to ask both positive and negative statements about the same aspects of personality, as well as to reverse the degree of agreement or disagreement values. The most popular personality inventories is the 'Locus of Control' developed by J.B. Rotter. As per Rotter, locus of control is a method of personality assessment that examines an individual's internal and external orientation, as well as his or her attitude toward control. On the basis of this, individuals are usually categorized into two extremes i.e., internal and external locus of control. People with an "internal locus of control" are those who think they have total control over their destiny and luck, whereas, people with an “external locus of control” are those who feel that what occurs to them is completely at the mercy of forces outside their control. The locus of control influences the individual’s behavior and performance.

Projective Tests

Projective tests, as opposed to the inventory method of personality measurement, are primarily used to determine the more subtle characteristics of personality. As a result, these tests are predicated on the underlying fundamental beliefs that an individual’s personality may be judged by assessing some of his or her dormant feelings, ambitions, aspirations, and hopes. Numerous projective tests for assessing personality have been developed over time.

Projective tests include the Inkblot Test, Sentence Completion Test, Thematic Appreciation Test (TAT), Picture Frustration Test and World Association Test. Among them, the most extensively used projective test to measure personality is the Inkblot test, popularly known as the Rorschach test, devised by the Swiss psychiatrist named Herman Rorschach. In the Inkblot test, Rorschach employed ten ambiguous and unstructured images termed inkblots, with one-half identical to the other. The individuals are then shown these inkblots/images and asked to describe what they perceive in the inkblots/images. The interpretations of these inkblots/images represent their sentiments or feelings, which serve as the foundation for their personality assessment. Whereas, Morgan and Murrary devised the Thematic Appreciation Test (TAT) projective test, which is also used to measure an individual's personality. It is made up of twenty images that depict various societal situations. Unlike the Rorschach test, these images depict a more precise picture of a situation. Individuals are then asked to compose a story about what may be happening in such a social context.

Assessment Centre

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In the 1930s, the notion of an assessment center was first applied to military situations in the German army. The primary goal of this approach was to evaluate applicants in a social setting. During the 1960s, this paradigm spread from the army to the business world. An assessment center is a tool that is used to examine personality. Situational tests, management difficulties, business plan presentations, in-basket exercises, scenario-based decision-making exercises and other simulated activities are used to evaluate personality. Individuals are required to take part in these activities. Multiple trained assessors, who might be from inside or outside the business, monitor the applicants' behavior and grade them based on specified aspects considered significant in their job. A job analysis is used to discover the critical aspects of a job. Each assessor creates an evaluation report for each applicant in the assessment exercises. Finally, all of the reports are combined to create the employee's profile.

IN-TEXT QUESTIONS

11. Which is a term used to characterize people who have negative perceptions toward their jobs and workers?
    a) Authoritarianism b) Locus of Control
    c) Machiavellianism d) Achievement Orientation
12. A person with a strong drive for achievement is said to have _____self-esteem.
    a) Low b) Medium
    c) High d) None of the above
13. _____is the capacity to adjust to the demands of the situation.
    a) Machiavellianism b) Locus of Control
    c) Achievement Orientation d) Self-Monitoring
14. Which approach is a questionnaire-based way of assessing personality that asks an individual to express reactions or feelings in certain scenarios?
    a) Personality Inventories b) Projective Tests
    c) Assessment Center d) Regressive Tests
15. Sentence completion test is an example of_____.
    a) Projective Tests b) Personality Inventories
    c) Assessment Center d) Regressive Tests

The assessment center approach to personality evaluation is beneficial for both the organization as well as employees. Organizations gather enough information about their employees to determine their strengths and weaknesses. This data assists the organizations in planning the selection, training, career paths and promotions of their employees. On the other hand, employees, gather favorable impressions about their jobs, chances of promotions and

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long-term loyalty to the organization. Many Indian companies, including Hindustan Lever, Modi Xerox, Crompton Greaves, Eicher, etc., have embraced this approach of assessment. This strategy, however, is not without limitations. One is that many stimulating approaches could not accurately represent the circumstance, and as a result, the applicant might not act genuinely. Second, even if the employee will be evaluated by many assessors, the halo effect in terms of personal abilities may affect the assessment.

2.10 SUMMARY

- Personality is the role that an individual performs in public.
- A variety of factors influence an individual's personality, including biological factors, family and social factors, situational factors and environmental factors.
- Personality qualities help people understand their personality types. The following personality types have been classified as The Myers-Briggs Type Indicator (MBTI), The Big Five Personality Model, Type A and Type B Personalities and Introversion and Extroversion.
- The MBTI is a personality assessment instrument that is widely used across the world and includes various personality types such as extraverted vs. introverted, thinking vs. feeling sensing vs. intuitive and judging vs. perceiving.
- The Big five Personality Model is a paradigm that identifies five essential personality dimensions namely conscientiousness, emotional stability, extraversion, agreeableness, and openness to experience.
- Personality theories have been established to give insight into an individual's personality.
- There are four main theories of personality namely psychoanalytic theory, self-concept theory, socio-psychological theory and trait theory.
- The psychoanalytic theory is a personality theory that holds that an individual is more driven by unseen forces that are influenced by conscious and logical thinking.
- The self-concept theory focuses on an individual's set of perceptions about himself, as well as the perceptions of his interactions with others and other areas of life.

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- Socio-psychological theory indicates that an individual seeks to satisfy the demands of society and society assists him in accomplishing his goals.
- According to trait theory, an individual is made up of a set of defined predisposition characteristics known as traits.
- Freud proposed that there are five universal stages of personality development namely oral, anal, phallic, latency and genital.
- Erikson established eight stages of life that reflect a person's continuous development namely infancy, early childhood, play age, school age, adolescence, early adulthood, adulthood and mature adulthood.
- The personality traits of employees are used to analyze their behavior and to build appropriate tactics to cope with their behavior. The following are some of the attributes that impact organizational behavior: authoritarianism, locus of control, Machiavellianism, achievement orientation, self-esteem, risk-taking and self-monitoring.
- The three ways of measuring personality are personality inventories (objective tests), projective tests and assessment centers.

2.11 GLOSSARY

Agreeableness: A person's capacity to collaborate with others.

Authoritarianism: People who have negative perceptions toward their jobs and workers.

Conscientiousness: A measure of an individual's reliability.

Emotional Stability: A person's capacity to cope with stress.

Extraversion: An individual's level of ease in interpersonal connections.

Extrovert: Individuals who are reality-oriented, sociable individuals and performers.

Heredity: Characteristics of a person's personality that are passed down from parents to their children.

Ideal-Self: "Way an individual would like to be".

Introvert: Individuals who are self-assured and driven by their own distinct thoughts.

Locus of Control: Belief about the results of an action.

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Looking-Glass-Self: "An individual's impression of how others see his attributes or feel about him".

Machiavellianism: An individual's tendency to manipulate others to gain and achieve power.

Openness to Experience: A person's creativity and interests.

Real-Self: "What others show you in terms of your self-image".

Risk Taking: Willingness to accept risks.

Self-Esteem: A sense of liking or disliking oneself.

Self-Image: "What an individual perceives about himself".

Self-Monitoring: Capacity to adjust to the demands of the situation.

Socialization: Process by which a newborn acquires a wide variety of behavior from the extremely vast range of behavioral potentialities that are available to him at birth.

2.12 ANSWERS TO IN-TEXT QUESTIONS

1. Heredity	9. Psychoanalytic Theory
2. All of these	10. Socio-Psychological Theory
3. Socialization	11. Authoritarianism
4. Situational	12. High
5. Identification	13. Self-Monitoring
6. Extraverted	14. Personality Inventories
7. Conscientiousness	15. Projective Tests
8. Sensing	

2.13 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of personality. Discuss the various factors that determine personality.
2. Briefly explain various theories of personality. According to you, which theory is more comprehensive? Give reasons.

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3. Discuss how personality influences organizational behavior.
4. Write a note on:
    a) Self-Concept Theory
    b) Freud's Stages of Personality Development
    c) Locus of Control
    d) Introversion and Extroversion

5. CASE STUDY

Rahul is the CEO of ABC Ltd. He is very particular about his work and is very obedient toward his authorities. He is self-centered and is not in favor of making decisions based on feelings and emotions. He has a negative attitude toward other people who are not like him. He does not like changes and follows traditional ways of meeting challenges, hence, he is very stubborn. On the other hand, Dhruv is an employee of ABC Ltd. He is opposite to Rahul. He makes a decision based on his feelings and emotions and is open to new challenges and experiences, hence flexible. But, Rahul wants his employees to work like him.

Based on this study, answer the following questions:

a) Which personality trait(s) does Rahul possess? Discuss.
b) Does this trait(s) influence organizational behavior?
c) Enumerate the differences between the personality traits of Rahul and Dhruv.
d) Which theory of personality does apply in this case?

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LESSON-3

PERCEPTION AND INDIVIDUAL DECISION MAKING

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STRUCTURE

3.1 Learning Objectives
3.2 Introduction
3.3 Perception
  3.3.1 Perception: Definition
  3.3.2 Perception: The Three Stages
3.4 The Attribution Process
  3.4.1 Three Types of Information in Attribution
  3.4.2 Behaviour & Attribution
3.5 Biases in Perception (Perceptual Biases)
3.6 Applications of Perceptual Biases (or Shortcuts) in Organizations
3.7 Individual Differences & Organizational Constraints
3.8 Ethics in Decision Making
3.9 Summary
3.10 Glossary
3.11 Answers to In-text Questions
3.12 Self-Assessment Questions
3.13 References
3.14 Suggested Readings

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3.1 LEARNING OBJECTIVES

The primary goal of this lecture is to comprehend perception and attribution theory in depth. After going through this lesson, the learner will be able to comprehend the following:

- Perception and its process, biases in perception, and three stage perception process
- The theory of attribution and its consequential determinants
- How to apply the rational framework of decision making
- Identify the shortcuts individuals use in making judgments about others

OPENING CASE STUDY

BUZZ09'S ALGORITHM FOR SOCIAL MEDIA POSTING

Data Analysts differ from ordinary people in clear ways. They frequently have particularly strong mathematical orientations and don't find it distressing to consider losing hundreds or even millions of dollars on a poor wager. Depending on variables they have little control over, their careers may advance or decline.

Ankit Kashyap stands out even with this unique group. He is the CEO and co-chair of an agency based out in Delhi, and he is just 27 years old. Mr. Kumar launched *Buzz09-The Digital Ecosystem* after earning his MBA from Ambedkar University Delhi together with two other recent college grads (Kushal Gupta and Ambuj Agarwal) and a third partner (Veenu Kashyap), who was still a student. Of course, Kumar and his fellow partners are too young to be running a Delhi based social media agency. The method they're using is much more intriguing. Analytics are a skill that all social media managers possess. Buzz09 stands out because of how far the company has gone with them. To really make buy, sell, or hold choices and to learn from its errors, the company has handed over computers to each of its employee as well as access to Hootsuite, which automatically posts creative on social media just by linking a client's social media accounts to it. According to Mr. Kumar, *"it's quite obvious that humans aren't becoming any better."* But technology and social media algorithms are becoming more reliable.

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OPENING CASE STUDY

BUZZ09'S ALGORITHM FOR SOCIAL MEDIA POSTING (CONTD.)

Due of the profits Buzz09 was able to provide, other businesses like RepDelhi's and ABC Company's Advisors decided to follow suit. According to proponents, computers outperform people because they can process schedules more rapidly, "learn" what functions, and change more easily and objectively. To assess social media content, Buzz09's software examines more than ten years' worth of social media data as well as the most recent market trends. When the algorithm shows that the number of impressions is declining, it automatically adjusts the schedules of online posting. Also, based on the library of images fed to the system, it automatically creates design for its client's social media accounts. Leaders of the Buzz09 have confidence in their artificial intelligence (AI) strategy. Mr. Kashyap believes in challenging AI as it purveys tech-innovative strategies to the company and its clients.

Not just social media posting decision is being replaced by machines. Computers are progressively replacing and even replacing human judgement in a variety of tasks, including operating nuclear power plants, hedge funds decision, piloting aeroplanes, and making medical judgments.

Not everyone believes AI always outperforms human reasoning and decision-making. Some claim that the use of computers makes complicated systems more prone to mistakes since no computer can foresee every circumstance, and people perform worse as the passive observers that AI transforms them into (Robbins & Judge, 2013). "When the human has no participation in the activity, there is a far larger risk of complacency," observes the pilot of one complicated system.

3.2 INTRODUCTION

The opening case study (*Buzz09's Algorithm for Social Media Posting*- mentioned above) demonstrates a few of the issues that people encounter while seeking for strategies to improve their **decision-making abilities**. One of the reasons why some individuals favour rational decision making is the possibility that **human decision makers may be biased** or wrong in

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many ways. This chapter examines some of these biases in human decision-making as well as the possibility that people may outperform computers, particularly in terms of innovation.

3.3 PERCEPTION

Through the process of **perception**, people organize and interpret their **sensory experiences** to give their surroundings meaning. However, there could be a significant **discrepancy** between what we perceive and what is real. For example, the whole employees of a company may agree that it's a great place to work because of the friendly office atmosphere, fascinating job assignments, competitive pay, first-rate benefits, and considerate management. However, as most of us are aware, it is **rare to see such unanimity**. *Why is perception important in OB research so much*? As opposed to reality, behavior is dependent on one's perspective of reality.

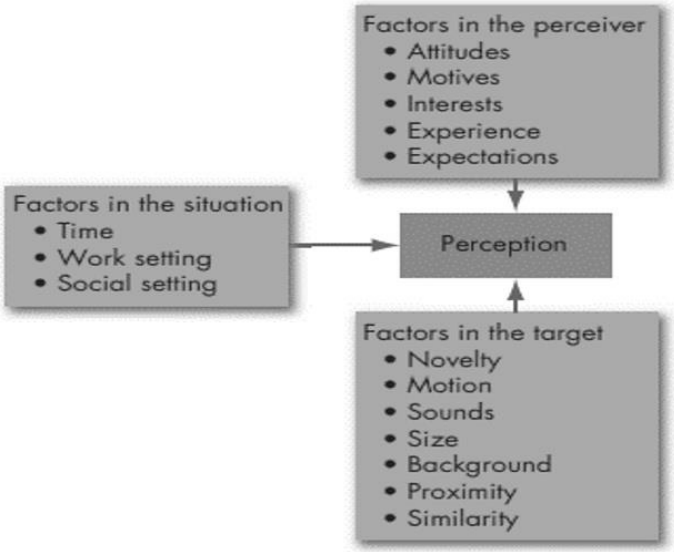

Fig 3.1. Factors That Influence Perception
Source: (Robbins & Judge, 2013)

How can we explain the fact that various people may observe the same thing and form quite different opinions about it? Many factors affect perception, sometimes skew it as well. The **perceiver, the object, target being perceived**, or **the context** in which the perception is produced may all have these components (or a few of them) (see Figure 3.1).

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Your **attitudes, personality, aspirations, interests, prior experiences, and expectations** all have a significant impact on how you interpret what you see while trying to understand a target. Regardless of their real features, you can see someone as authoritarian if you consider police officers to be that way or as slow if you assume young people to be that way.

The **target's characteristics** also influence how we see it. Silent individuals are less likely to stand out in a crowd than loud individuals. The link between a target and its backdrop, as well as our tendency to group nearby items and those with similar characteristics together, all influence perception since humans do not examine targets in isolation. Male and female, as well as members of any other group that can be quickly classified in other, unrelated ways, frequently have something in common. **How attentive we are can vary depending on the environment**, including the time of day, location, light, temperature, and several other variables.

SATURDAY VERSUS MONDAY

On a Saturday night in a club, a young client "dressed to the nines" might not be there. But if that individual were dressed that way, you would see them in your management class on Monday morning (and that of the rest of the class). The perceiver (the person about whom we are projecting our perceptions) and the target are unaffected.

On the other hand, Saturday night and Monday morning are two separate times.

3.3.1 Perception: Meaning

The **core elements** of the perception process are the *choice, interpretation, and usage of inputs and signals*. The high error rate of the process used to create perceptions is a serious drawback of perception. Think over the photos for a while (Figures 3.2 and 3.3). Figure 3.2 shows the standard physical perception assessments. ***Did you make the same mistakes that most people do?*** We are unable to see pictures appropriately even when we are aware of our error and can evaluate them objectively. Brand logos in figure 3.3 have a hidden message that once understood, is difficult to forget.

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"Perception alters what we perceive. It is subject to error"

Another example that highlights the **power of perception** is shown in Figure 3.3. The figure reflects **"Closure".** It focuses on the gaps that people fill in to comprehend a stimulus. Even though we know the lines in forms like rectangles and triangles are crooked, we nonetheless fill them in. Therefore, closure is essential to how perception works. Most of the time, we don't know all the facts, so we fill in the blanks with assumptions. Closure enables us **to analyse a blur (or faded) situation** by completing that incomplete picture with the help of our experiences. Figures 3.2, 3.3, and 3.4 show the progression of perception. Social perception does use similar techniques. **We draw conclusions based on our presumptions even when we cannot see everything.**

Fig 3.2. Common Perception Illusion

Source: Suggested Readings

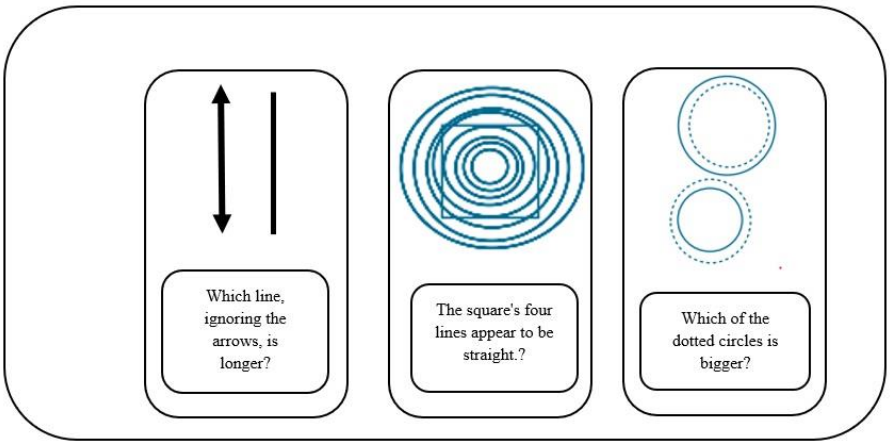

Fig 3.3. What do you perceive of these brands?

Source: Suggested Readings

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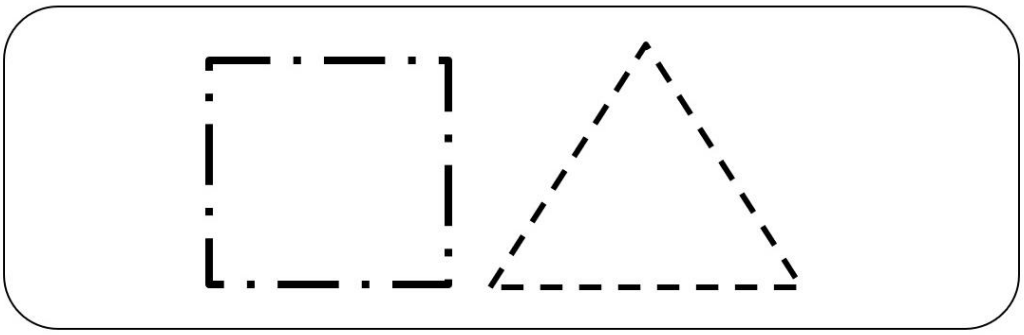

Fig. 3.4. Closure
Source: Suggested Readings

WHAT WOULD YOU DO?

Situation 1

You're considering working for a company with extensive operations in India and Japan. Understanding that having a strong command of Japanese will benefit you. You are currently enrolled in Japanese-language course that will improve your fundamental communication abilities. You are thinking whether to list this as one of your abilities because you anticipate being somewhat adept by the time you land the job. Would you include it in your resume?

WHAT WOULD YOU DO?

Situation 2

You are proficient in data science and analysis. One of your new colleagues, who really wants to learn this skill, has shown an interest of finessing this skill from you. You think that the new joinee is not a quick learner and unable to grasp technical things. Considering this as one your perceptions about him/her, what would you do?

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THINK ABOUT HOW CLOSURE COULD IMPACT A MANAGER'S PERCEPTION OF A WORKER!

A boss who oversees 25 employees seldom interacts with any of them. The manager, however, personally witnessed a contentious conversation between the employee and from a separate management department during the preceding six months after one client complained about a certain employee. However, during the previous six months, one client has voiced a complaint on a certain employee, and the manager has personally overheard a heated exchange between that employee and a management from a different department. Based on these two instances and the limited time available to gather further information, the manager may use closure to round out the picture and infer that the employee has a **short attention span.**

CASE STUDY
INDIA VERSUS AMERICA

Consider the situation of American citizen Ms. Thompson, who starts working for a major corporation in India. She meets with Mr. Roy, her boss, on the first day. Mr. Roy greets everyone and then begins to collect information about Ms. Thompson's mother's relatives, siblings, father, and grandfather's jobs. He devotes a lot of his time to family discussions that Ms. Thompson deems inappropriate and unimportant.

Ms. Thompson is an expert at conducting interviews and avoiding personal questions, so she carefully avoids all these intrusive questions. During the hour-long meeting, she doesn't learn much about her duties or Mr. Roy's expectations. She is quite perplexed. Mr. Roy is unhappy and concerned that Ms. Thompson is vague about her background and won't talk about her family from his perspective. How can she expect to connect with others if they don't know anything about her or her family? Before knowing someone's personal background, he cannot trust them.

In this scenario, both sides evaluate the situation from their own cultural vantage points. The Spanish social structure and ties to family and friends hold the key.

Roy, on the other side, Ms. Thompson is used to working in an American environment where private things are inappropriate and unimportant. Given her cultural background, Ms. Thompson is appropriately avoiding these personal challenges, but Mr. Roy is only striving to show that his new employee has the necessary and core family background to be trustworthy.

The cultural misconceptions in this scenario appear to be based on a variety of cultural conventions and assumptions.

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3.3.2 Perception: The Three Stages

The three stages of perception are presented in Figure 3.5

Perception is a multidimensional process, as seen in Figure 3.5. In this section, we examine each of the three stages and consider the factors that affect them.

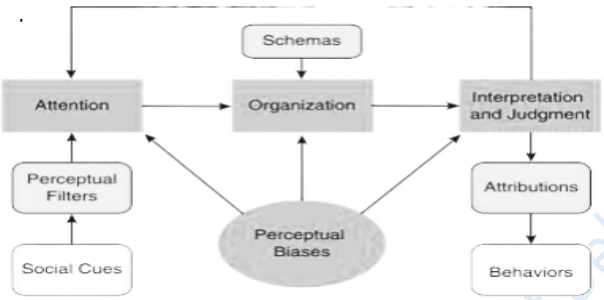

Fig. 3.5. The Three Stages of Perception
Source: (Robbins & Judge, 2013)

1. Attention Stage

Paying **attention** to the surroundings is a necessary initial step in the perception process. Understanding **environmental cues** is a crucial stage in the process of perception. During the attentional phase of perception, we select which stimuli, cues, and signals to focus on. What do we notice? What grabs our attention? For instance, while your professor takes a brief break from class to look over his notes, you could catch a glimpse of his keys jingling in his pocket. You could then notice his unusually baggy pants because of the noise that came out of his keys. In each of these cases, an uncommon event draws attention and may cause individuals to divert their focus from what they are doing.

In the attention stage of perception, we may choose **consciously or unconsciously** what to focus on. The **perceptual filter** is a technique for allowing certain information to pass while excluding others. **Selective attention**, or the fact that we pay attention to some social and physical cues but not others, is the core element of the perceptual filter. During the attention stage, a multitude of factors determine what information passes through our perceptual filter. In addition to culture, salience is another factor. Salient cues are those that stand out in some way. Salient elements and signals have a greater part in our perception process than other signals do since we use them. In the samples, the jingling keys, baggy clothing, Southern accent, tattoos, and body piercings all stuck out.

The **stimulus's intensity** is another factor that affects salience. You're likely to pay greater attention to someone who speaks loudly, wears a striking apparel, or applies a strong

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perfume. For instance, people who wear bright colours when they dress, are more likely to be remembered after a meeting—though not always favourably. Aside from that, **cultural differences** may play a role in why some events remain in our recollections. For instance, standing close to someone while speaking is normal in Middle Eastern and Mediterranean cultures. These acts are not observed in other cultures. In contrast, the same gesture is typically unheard of in the United States, where people become uneasy if a co-worker speaks to them too near or touches their arm or shoulder. That co-worker's actions are obvious, which increases the likelihood that you'll see them and recall them.

The people in each of these cases stand out, prompting us to remember them and form opinions about them. They impede our **perceptual filter due to their prominence**. This is not to argue that you must try to stand out to be better remembered. People could recall you more vividly, but they can also hold your harsher behaviour against you. We **must organize** the cues and the material that draws our attention into sets that make sense and that we may use later.

CASE STUDY

AN INDO-AMERICAN WOMAN CEO IN INDIA

When Malti, a 1975 passed out from Harvard Business School, who spent her entire life in the United States since her childhood, joined ABS in 1977, she questioned long-held views on both sides of the Indian thinking (mostly bureaucratic and paternalistic society back then), which was her ultimate glass ceiling-cracking moment. ABS, an enterprise that owns the several educational institutions worldwide was being operated by Malti, who also served as its first female CEO. Around 17,000 individuals were employed at ABS at the time. Malti's credentials were out of the ordinary for a top executive of an Indian corporation. Having no prior experience in control of a large, multi-billion-dollar global organization while being a Texas native born in India, a former attorney, and a former journalist.

Following Malti's arrival, ABS's equity returns significantly lagged those of its competitors. The successes of Malti's predecessor, who held the position for 15 years until retiring in 1977, included increasing ABS's workforce, doubling its profitability, experiencing a more than 80% increase in share prices, and converting a struggling company into a global powerhouse.

How did this implausible "outsider" from another continent work for a very conservative company in India and become one of the most respected CEOs there?

Upon finishing business school in 1975, Malti relocated to West Virginia and started working for the Associated Press. She then created a Pulitzer-winning newspaper in Georgia with her husband. The two relocated to India in 1977 when the newspaper went out of business, becoming CEO of ABS, where she grew sales by 130 percent in just four years. Malti admits that she faced scepticism when working at ABC: "I had analysts in on the first day, and I could hear them asking, 'Who is this person? Then I started to wonder, "Who is this person?"

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AN INDO-AMERICAN WOMAN CEO IN INDIA (CONTD.)

But she moved quickly to establish her reputation and grow the company. During her first week on the job, she issued an introductory email to all 17,000 employees. I function best in a workplace that is upbeat, enthusiastic, and full of comedy. *"I do not want to be linked with a firm that is not reputable and fair,"* the employee said after just seven months on the job.

When she stated that she wanted to double ABS' market worth, the company's shares surged. She promised that more changes will be made. However, for the time being, our objective is to enhance overall corporate performance.

Malti usually wore khadi clothing to meetings and used Indian slangs. It was clear that she had no reservations about grabbing attention. She was referred to the ABS chairperson as "an enthusiast and exuberant" because of her egalitarian viewpoint, which contrasted with the traditional Indian thinking.

In her words, "I don't even use that phrase because, first of all, that's what old people do, and second of all, it's what you do after dinner." she expresses that she is not ready to retire at age 66. Through her blunders, she discovered that "you may fail, but you don't die."

Malti's issues and career serve as an illustration of how perceptions affect businesses. To carry out her responsibilities as the leader of a big company, she has had to contend with gender, cultural, and social stereotypes as well as public perceptions. Her success has been greatly influenced by her capacity to understand herself, other people, and her environment. Malti had to observe people and events, gather knowledge, assess that knowledge, and generate opinions based on a range of subjective interpretations as well as factual facts. All leaders must act in this manner. To be effective, she needed to manage how other people perceived her. **That is significant.**

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IN-TEXT QUESTIONS

1. Perception is a _____

a. Scientific process c. Mental process

b. Both A and C d. None

2. Which process' fundamental components are stimulus selection, interpretation, and use?

a. Perception c. Organizational development

b. Locus of Control d. Ethics

3. _____ permits us to assess a fading circumstance by filling that partial image based on our experiences.

a. Closure c. Creativity

b. Communication d. Connotation

2. Organization Stage

The second step of the perceptual process is **organization**. *The data that our filters have permitted through must now be organized.* We **group information** into sets that make sense, are practical, and are organized. We create new sets, build new links between the various parts, classify newly found information into pre-existing, well-known categories, and combine things into bundles we can remember.

Schemas

At this level, the primary activity is the use of schemas. Schemas, which **are mental or cognitive models or patterns**, are used by people to understand and explain situations and events. They act as structures that enable us to fill in the gaps in social contexts. For instance, during the closure phase, people use schemas to help fill in gaps in incomplete visualizations. Although some of our schemas may be conscious to us, they usually operate subconsciously.

Schemas at work

Schemas are beneficial since they hasten the information processing. They help us remember details and close gaps in our perception. Schemas greatly facilitate the organization of knowledge, which enhances our capacity to recall specifics about people and events. Because

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we use closure to fill in information we don't know and make snap decisions, schemas might lead to mistakes.

Table 3.1

Advantages and Disadvantages of Schema

S.No.	Advantages	Disadvantages
1.	Help us in recalling	Hard to modify
2.	Provides information	Ignores information that does not fit
3.	Structure information	May lead to over-interpretation

Culture and Schemas

When interacting with people, we must be aware of the likelihood that our **preconceived notions will affect** how we see them. Since certain information fits into pre-existing schemas, it may be quickly sorted and saved. Additional information might not fit into a given structure. This might lead to the creation of a new schema or cause things that should not be remembered because they contradict our beliefs and may not fit into any pre-existing categories. For instance, many women have experienced having their male co-workers either forget their comments or blame them on their male co-workers when they made suggestions or comments during meetings. These assumptions were something Malti *(refer to the case study presented on page 12)* had to cope with.

3. Interpretation and Judgement Stage

In the interpretation and judgement stage of social perception, which is the third step, we **interpret and translate the ordered information to establish its meaning** (see Figure 3.5). Through interpretation, we create an opinion or judgement about the subject or circumstance and ascertain the motivation behind the behaviour. In firms where a manager's responsibilities include evaluating their team members, clients, vendors, and other business partners, this method is crucial. For instance, you see that your new employee is pleasant and courteous to everyone she meets and that she takes the time to get to know them. You ponder whether she is simply behaving in a typical manner. Whether they begin a new job or not, she is a very pleasant and sociable individual. **To decide, you must determine a justification for her actions, which is the process (Attribution) we'll explore next.** Also, look at Fig 3.6 for more specific information.

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IN-TEXT QUESTIONS

4. What comes last in the process of perception?
   a. Results
   b. Judgement and Interpretation
   c. Selection
   d. Consistency
5. Which element enhance the process of processing information?
   a. Filters
   b. Schema
   c. Perception
   d. Prejudice
6. Choose the wrong option.
   a. Distinctiveness
   b. Consensus
   c. Consistency
   d. Selective Filters

3.4 THE ATTRIBUTION PROCESS

The act of assuming a cause for a behaviour and presenting that cause is known as the attribution process. One of the initial steps in the attribution process is determining whether an action's cause is internal or external (see Figure 3.6). An **internal attribution** is when you suggest that the person's actions are the result of something "inside" the person. These are either more or less stable factors (such as personality, morality, or intrinsic skill) (such as effort or motivation). Internal attributions, which places a strong emphasis on the individual, are occasionally referred to as personal attributions.

When we think that factors "outside" of the person are the cause of behaviour, such as "Mary is late for work because she is lazy" or "Sergio did well on the test because he worked hard," we establish **external attributions**. These factors might include the surrounding natural environment, the difficulty of the job, the workplace culture, the presence, and behaviour of other people, or even luck. Since they link behaviour to its environment, external attributions are often referred to as situational attributions.

External attributions are mostly dependent on task difficulty and chance, but internal attributions are based on ability and effort.

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INTERNAL VERSUS EXTERNAL ATTRIBUTIONS AT WORK

Like us all, managers are prone to apply internal attributions excessively and external attributions insufficiently. For instance, supervisors who are evaluating employees are more prone to conclude that low performance is due to a lack of skill, effort, or motivation. They are much less inclined to attribute poor leadership to contextual factors, such as insufficient training, insufficient support from co-workers, insufficient tools, or even their own subpar performance.

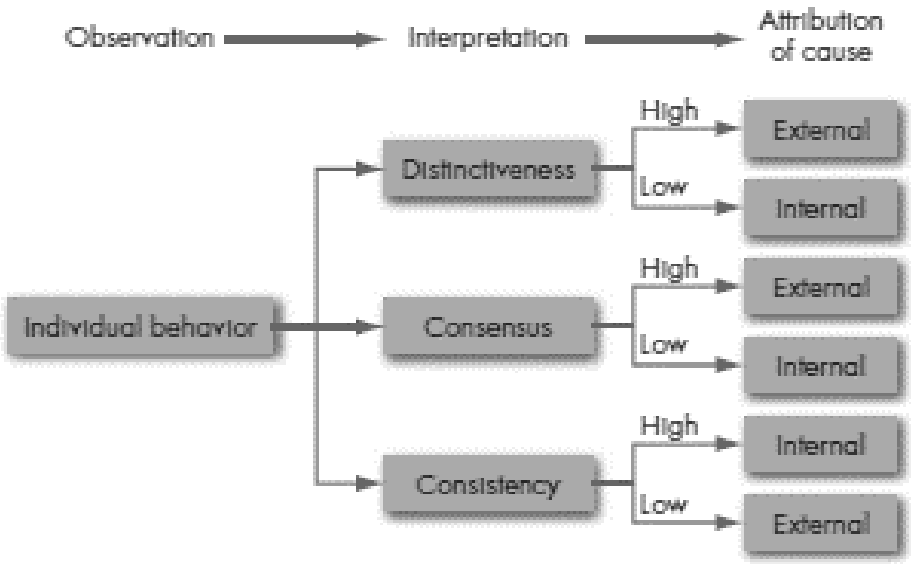

Fig. 3.6. The Interpretation and Judgement Stage: Attribution
Source: (Nahavandi, Denhardt, & Aristigueta, 2020)

3.4.1 Three Types of Information in Attribution

When determining internal or external attributions, we use **three types of information**: uniqueness, consensus, and consistency.

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1. *Distinctiveness*

   We initially consider if the behaviour is unique to a certain profession or situation. Does the individual always behave in this way? If the answer is yes, we'll probably hold that person accountable for their actions. If not, we can consider external influences. Consider how a manager appraising his employees may consider how distinct each employee's performance histories are to illustrate how this component functions in an organizational setting. Or are computer-related jobs the only ones where they perform well? Do they perform similarly across the board? If the performance is particular to one or a few tasks and is therefore specific to a scenario, an external attribution is more plausible.

2. *Consensus*

   Is this a typical behaviour or is this person acting strangely? Is the employee in question the sole member of the team that is having issues with the new method after the bad performance was addressed? If other individuals behave in a similar way, demonstrating that there is agreement, we are more likely to assign something to the outside world.

3. C*onsistency*

   Depending on what is constant, we can ascribe anything to either the internal or external reality. Without consistency, we find it difficult to make any kind of judgment; assigning responsibility calls for extreme consistency. It would be challenging for management to assign blame to a worker whose performance differs significantly from month to month and from task to task.

3.4.2 Attribution Through Behaviours

Researchers have shown that even though we have more information about ourselves than about others, we usually use the same approaches to identify the root causes of our difficulties. We consider our actions and behaviours and extrapolate our thoughts and aims from them to understand **why we operate in the manner that we do**. ***Self-perception theory is the name given to this theory***. According to self-perception theory, when asked to explain their own behaviour, people tend to search both inside and outside of themselves for answers.

The **self-perception theory of attribution has surprising findings**. Consider how we behave when we are recognized for our work and given a reward. For instance, how would a professional basketball player justify his performance if he received a significant bonus for playing well? Would he say he loved the game so much or would he say the big

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bonus was the reason he won? How would the worker who regularly lends a helping hand to other workers without getting paid for it defend her actions? It's noteworthy that when we receive large monetary compensation or positive public attention for our efforts, we are more likely to blame our actions on the outside reward. Over-justification refers to the tendency to **blame** our own behaviour on outside forces after getting an external benefit. **Over-justification** has several negative effects on managers. It suggests that giving people significant external incentives for finishing pleasant tasks may reduce their internal motivation to complete the task. If the reward is strong and meaningful enough, people are more likely to make an external attribution—that is, to place blame for their actions on something other than their own motivations. Because of this, employees may become less motivated to achieve internally and may perform less successfully unless they continue to get significant incentives. This practice may provide one explanation for why some professional athletes perform badly despite being paid well. Managers should emphasize internal features and make them obvious whenever possible to maintain employees' internal Motivation and **interests**. High amounts of praise and reward from the public may have an immediate effect, but they can have the **opposite effect** in the long run.

IN-TEXT QUESTIONS

7. Assuming an explanation for a behavior and advancing that reason is known as:

   a. Attribution Process c. Distinctiveness
   b. Consistency d. Consensus

8. Personal attributions are related to?

   a. External attributions c. Internal attribution
   b. Societal attributions d. Physical attributions

9. Situational attributions are

   a. External attributions c. Internal attribution
   b. Societal attributions d. Physical attributions

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IN-TEXT QUESTIONS

10. To understand why we behave in the way that we do, we consider our actions and behaviours and extrapolate our attitudes and aims from them. This concept is known as

    a. Self-evaluation c. Self-organized

    b. Self-role d. Self-parameters

11. After earning an external incentive, we tend to blame outside forces for our own conduct.

    a. Under-simplification c. Under-analysis

    b. Over-analysis d. Over-justification

12. _____ is the final element of the attribution process.

    a. Conscience c. Concordance

    b. Concept d. None of the above

13. *"We are inclined to attribute something externally if other people act similarly, indicating that there is agreement"*. This is related to:

    a. Distinctiveness c. Consistency

    b. Consensus d. All of the above

3.5 PERCEPTUAL BIASES (COMMON SHORTCUTS IN JUDGING OTHERS)

We discussed how people often attribute other people's behaviour by exaggerating their own personal traits and underestimating external factors. This tendency is known as the **Fundamental Attribution Error**. For instance, if your boss is unresponsive, you are more likely to blame his lack of people skills or propensity for being cold and distant than you are to blame the expectations placed on him or the amount of work he must do. In this way, you

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are more likely to attribute a co-worker's obstructionist behaviour to her personality than to a lack of communication. These accusations make us less likely to see others favorably.

Table 3.2

Perceptual Biases

S.No.	Perceptual Biases	Description
1.	Fundamental Attribution Error	Undervaluing situational factors and overvaluing personal factors while making attributions about others' actions
2.	Actor-Observer Differences	An inclination to rely more on third-party explanations for our own behaviour
3.	Stereotypes	"A generalization made about a person based on the group they belong to"
4.	Halo or Horn Effect	In multi attribute stimuli, use of a single attribute to influence the overall assessment -positive or negative of the stimuli
5.	Similar-to-Me Effect	A tendency to like someone who we think is like us and to dislike (or not like) someone who is different
6.	Primacy and Recency	A propensity to place an excessive emphasis on either the most recent information—in the case of recency—or the most recent information—in the case of primacy.
7.	Self-Serving Biases	The propensity to give success credit and deny failure blame

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CASE STUDY: TRAYVON MARTIN

"The Trayvon Martin case featured a significant amount of perception and prejudices in the Florida, United States. Martin was wearing a hoodie the night he was shot, demonstrating how even something so basic may affect how we perceive people."

There might be **negative consequences** from the Fundamental Attribution Error. Because of this propensity, we frequently internalize victims mistakenly and blame them for their suffering. For instance, in the well-publicized case of the Florida teenager who was shot by a self-appointed neighborhood watchman, the fact that **Trayvon Martin** was wearing a hoodie became the focus point, obscuring many of the crucial issues. When assessing people, we typically focus on internal factors.

The Fundamental Attribution Error, however, works in the **other direction** when we try to justify our own behaviour. We rely more on **external justifications** to support our own actions. This process is known as the **actor-observer difference**. In addition to making internal attributions about other people's behaviour, which is a common fundamental attribution error, we also commonly make external attributions about our own behaviour. This differentiation is brought about by the numerous perspectives that come from having access to different kinds of information. Contrary to how others may see us, we are aware of

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our own history and how we respond in different situations. As a result, we often have different perspectives than observers on how distinctive and consistent our own behaviour is. Because actors and observers have different perspectives, actors are more likely to **ascribe external causes because environmental impacts are more apparent to actors than to observers**.

Fig. 3.7. Women taking part in Marathon in Pakistan

Source: Authors' Research

"These young ladies ***(Figure 3.7)*** *are participating in a recruitment process for a police force in Peshawar, Pakistan. However, because the profession is widely seen as a vocation that is exclusively for men, women in America and European, Eastern European, Asian, and Latin American nations complain that gender stereotyping makes it difficult for them to enter the field. The stereotyped perception of women wrongly generalizes them as being unfitted to carry out police work, even in nations like the United States where the law demands employing police officers without regard to gender. Women who wish to work in*

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law enforcement, however, argue that they meet the physical standards and even offer unique attributes to the position, such as compassion and effective communication skills."

A **stereotype** is a generalization made about a person based on their membership in a certain group. Race, gender, sexual orientation, functional area, and other categories may be among these groupings. Because of their strength, stereotypes can make it difficult for us to recognize individual distinctions and achievements. Consider the challenges that Malti, a ABS employee, faced. Since her first day on the job, the British media has questioned her credentials and aptitude for the role. How a mother of three could run a big British firm was a concern for some. Her spouse was mocked by others, who called him the "househusband." Even more than Malti's creativity and strategic foresight, the company's male leaders were given credit for many of her excellent decisions. With her engaging humour and deft people skills, Malti debunked the clichés.

The **halo effect (also known as the horn effect)** occurs when a general opinion or assessment of one aspect of a person or circumstance results in either a halo, which is a favourable impression, or horns, which is an unfavourable impression, and which then serves as the focal point around which all additional information is selected, arranged, and interpreted. For instance, a study done in the United Kingdom discovered that a person's first name might have a big impact on how they are seen. Another example is when someone identifies themselves as a "Apple" or "Google" employee. Because of the reputation of these companies, we are likely to form an opinion of the person immediately away.

A strong element that might result in a halo or horn is **the "similar-to-me" effect**. The similar-to-me effect occurs when we like someone we believe to be similar to ourselves and dislike someone we believe to be distinct from us. In a multicultural environment Lack of likeness may be extremely problematic when the other person is likely to be different and as a result, perhaps unlikable.

Do you believe that first impressions are important? If you say that, you are correct! The importance of initial impressions is referred to as **the primacy effect**. It speaks about a tendency to exaggerate fresh knowledge. Early information is often recalled, and it frequently affects subsequent perceptions. In contrast to the primacy effect, the recency effect leads us to focus more on the latest information. **The recency effect** is most prevalent when there is a temporal gap between the earlier and later information.

The tendency to accept credit for our successes but reject accountability for our errors is known as the **self-serving bias**. On the one hand, when we do poorly on a test, fumble a

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presentation, lose a client, or fall short of our objectives, we frequently attribute external blame rather than internal attribution on our own lack of effort or skill. We blame the unfair professor, the disinterested audience, the finicky client, or the unachievable company goals.

The sum of all the prejudices makes the relationship between managers and their employees fascinating. Stereotypes, halos-horns, and primacy-recency may bias the data that managers gather. Additionally, managers usually blame employees' incompetence and lack of effort for poor performance, whereas employees blame managers' poor managing skills. However, since they are so confident in their own abilities and commitment to success, both sides frequently fail to recognize the contributions made by the opposing party. **Perceptual biases allow us to perceive social situations quickly and accurately, but they can also result in errors.**

3.6 APPLICATIONS OF PERCEPTUAL BIASES (OR SHORTCUTS) IN ORGANIZATIONS

People in companies are constantly evaluating one another. Managers are required to evaluate the work of their staff. We assess the level of effort each of our co-workers is putting out in their task. Members of the team assess a newcomer right away. Our decisions frequently have substantial ramifications for the organisation. Let's examine the most straightforward examples.

Employee Interview: Most hiring decisions involve an interview. However, interviewers frequently form false perceptions and form hasty impressions that stick with them. According to research, we establish opinions about people in less than a tenth of a second based on our initial impressions. If these initial thoughts are unfavourable, they frequently carry more weight in the interview than if they were revealed later. After the first 4 or 5 minutes of an interview, many interviewers' decisions don't vary all that much. Because of this, information gathered earlier in the interview is given more weight than information gathered later. A **"good candidate"** is therefore likely defined more by the absence of bad traits than by the existence of favourable ones.

Performance Expectations Even when their perceptions of reality are flawed, people nonetheless try to justify them. The concepts of self-fulfilling prophecy and the Pygmalion effect are used to illustrate how a person's conduct is influenced by the expectations of others. A manager won't likely be let down if she has high expectations for their staff. Like this, if

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she merely expects mediocre performance, they will probably live up to her low standards. Expectations are fulfilled. It has been discovered that the self-fulfilling prophecy has an impact on how well accountants, warriors, and even students perform.

Performance Evaluation Performance evaluations will be covered in more detail later, but for now it is important to realise that they heavily rely on the perceptual process. Promotion, wage increases, and continued employment are some of the most evident results that are directly related to an employee's future and are determined by the evaluation. Many tasks are evaluated subjectively, even though the assessment might be objective (for instance, a salesperson is evaluated based on how much revenue he earns in his region). Even though they are frequently important, subjective assessments are troublesome since they are affected by all the flaws we've covered so far, including selective perception, contrast effects, halo effects, and more. Ironically, performance reviews may reveal just as much about the assessor as they do about the employee.

IN-TEXT QUESTIONS

14. Which sort of bias is the tendency to accept credit for our successes but reject accountability for our failures?

    a. Self-error
    c. Self-serving
    b. Self-recency
    d. Self-primacy

15. A generalization about a person based on the group they are a part of is

    a. Prejudice
    c. Assumption
    b. Stereotype
    d. Observation

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3.7 INDIVIDUAL DIFFERENCES AND ORGANIZATIONAL CONSTRAINTS

Here, we focus on the variables that affect people's decision-making processes and their susceptibility to biases and mistakes. We talk about organisational and personal limitations.

1. Individual Differences

The use of intuition, frequent biases and mistakes, and bounded rationality are characteristics of decision-making in practice . Individual variations also lead to departures from the rational paradigm. We examine gender and personality differences in this area.

Personality plays a critical role in defining perceptions. For instance, people with high self-esteem tend to follow a self-serving bias. It means that they accept the credit for success but blame others if they fail. Therefore, personality allows individuals to perceive in some ways that are limited to their personal traits.

Gender is another individual characteristic that influences decision making. For instance, women ruminate more than men.

You may anticipate that those with greater levels of **mental capacity** would be less prone to frequent judgement mistakes given that we know they can process information more rapidly, solve problems more precisely, and learn quicker. However, it seems that only some of these may be avoided by persons with mental capacity.

Time orientation, the value placed on reason, the conviction that individuals can solve issues, and the propensity for group decision-making are all **cultural differences**. We may better understand why Indian managers make choices considerably more slowly and deliberately than American managers by examining differences in time orientation. In India, reason is respected, although this is not universally true.

2. Organizational Constraints

Employee Evaluation The standards by which employees are judged have a big impact on managers. We shouldn't be shocked to discover that a division manager's plant managers spend a significant portion of their time making sure that bad information doesn't reach him if he feels that the manufacturing facilities under his supervision operate best when he hears nothing unfavourable.

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All companies establish **rules and regulations** to guide choices and influence behaviour. They naturally restrict the options for making decisions as a result.

Fig. 3.8: McDonald's

Source: Authors' Research

Employee decisions at McDonald's locations across the world are influenced by formal restrictions. Employees at McDonald's restaurants, like the one in this photo who is making Mc-Cafe Mocha, are expected to behave in a certain way. To maintain the company's high standards for food quality and safety as well as dependable and welcoming service, McDonald's expects staff to abide by rules and regulations for food preparation and service. For instance, McDonald's mandates that every shop perform 72 safety-practices, as part of a daily monitoring schedule for restaurant managers.

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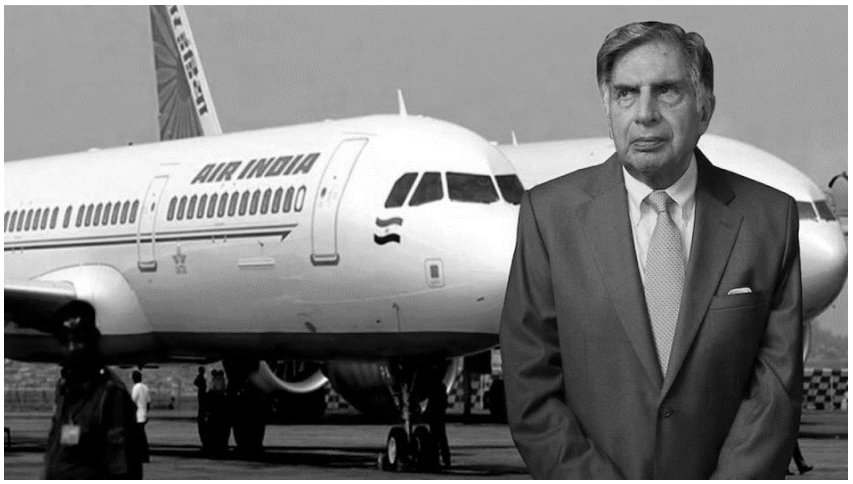
3.8 ETHICS IN DECISION MAKING

TATA BRINGS BACK AIR INDIA



Tatas have recently taken over Air India. Air India was founded by Dadabhoy Tata back in 1932**. "In 1953, the Government of India passed the Air Corporations Act to purchase a majority stake in the airline carrier from Tata Sons. Its founder JRD Tata continued as the chairman till 1977"**. However, from 2006 onwards, Air India started to incur heavy losses even after merging with Indian Airlines. The combined losses for Air India and Indian Airlines were rising exponentially every year. In January 2022, Tata bought back its one of the ventures that were started by its Stalwarts.

Questions:

1. Are the perception of this acquisition negative or positive? Explain why?
2. What type of individual and organizational constraints did Tata face?

Utilitarianism, which promotes making decisions only based on their outcomes in an effort to maximize the good for the greatest number of people, is the first ethical standard. This view dominates business decision-making. It is consistent with goals like great profitability, productivity, and effectiveness. Another ethical need is to make decisions in conformity with the basic freedoms and rights contained in documents like the Bill of Rights.

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The recognition and defence of essential liberties possessed by people, such as the right to due process, free expression, and privacy, are required when placing a focus on rights in decision-making. This standard protects **whistle-blowers** who make use of their freedom of speech to alert the public or the media to an organization's unethical behaviour.

A third need for laws to be justly or equitably distributed in terms of costs and benefits is that they be applied in a fair and unbiased manner (also known as **Justice**). Typically, this viewpoint is shared by union members. It advocates paying everyone the same wage for a given post regardless of differences in performance and relying heavily on seniority in layoff decisions. Each criterion has advantages and disadvantages. A utilitarian worldview may promote efficiency and production, but it also has the potential to diminish some people's rights, particularly those of people of colour. Rights are used to safeguard individuals from damage and are compatible with freedom and privacy, but they may also encourage a legalistic environment that lowers productivity and efficiency. An emphasis on justice protects the rights of the underrepresented and weaker, but it may also encourage a sense of entitlement that hinders innovation, risk-taking, and productivity.

3.9 SUMMARY

In this lesson, you have learned:

1. The process of perception is inherently flawed and skewed.
2. Because culture adds complexity and usually provides an unexpected scenario, cross-cultural interactions are particularly susceptible to perception errors.
3. Each person has predetermined ideas about a specific group. As a result, give your stereotypes some thought.
4. Relying solely on recollection may cause us to make judgments that are prejudiced in an organizational setting. To prevent biases and inaccuracies from clouding your judgment and causing mistakes, make notes on significant events and issues.
5. Role of perceptual biases are important to understand in managerial decision-making and many other administrative situations.

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3.10 GLOSSARY

Egalitarianism is a belief in human equality especially with respect to social, political, and economic affairs.

Perception filter is the process of letting some information in while keeping out the rest.

Selective attention is the "process of paying attention to some, but not all, physical and social cues".

Salient cues are those cues that are somehow so striking that they stand out.

Stereotypes vs Prejudice - Stereotypes are unfounded assumptions about a social group that lack any basis in fact. Stereotypes are assumptions made about a social group that can be either good or negative, conscious, or unconscious. **Prejudice** is a strong unreasonable feeling of not liking or trusting somebody/something, especially when it is based on his/her/its race, religion, or sex.

3.11 ANSWERS TO IN-TEXT QUESTIONS

1. C	**9.** B
2. A	**10.** B
3. C	**11.** C
4. B	**12.** B
5. D	**13.** C
6. A	**14.** B
7. C	**15.** A
8. A	

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3.12 SELF ASSESSMENT QUESTIONS

Discussion Question:

1. What are perceptions? Describe all seven biases in detail.
2. Describe the differences between primacy effect and recency effect with your real-life examples?
3. In the Trayvon Martin case, which perceptual bias became more relevant (and irrelevant) at the same time?

Individual and Group Activity:

For complete understanding, please read the following brief case and repeat it as many times as you feel necessary. As directed by your instructor, you won't be allowed to consult it until the end of the activity.

> "A well-liked college instructor had just completed the final exam and had turned off the lights in the office. Just then, a tall, dark, and broad figure appeared and demanded the exam. The professor opened the drawer. Everything in the drawer was picked up and the individual ran down the corridor. The dean was notified immediately"

The First Stage: Individual Scores

Answer the following questions about the case you have just read without referring to the case. Circle T if the statement is true or correct, F if it is false, and? if you are not sure or cannot tell.

1.	The thief was tall, dark, and broad.	T	F	?
2.	The professor turned off the light.	T	F	?
3.	A tall figure demanded the examination.	T	F	?
4.	The examination was picked up by someone.	T	F	?
5.	The examination was picked up by the instructor.	T	F	?
6.	A tall dark figure appeared after the professor turned off the light.	T	F	?

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7.	The man who opened the drawer was the professor.	T	F	?
8.	The professor ran down the corridor.	T	F	?
9.	The drawer was never actually opened.	T	F	?
10.	Three people are referred to in this case.	T	F	?

The Second Stage: Group Discussion (Next Page)

- Without turning back to the case or changing any of your answers, compare your answers with those of your group members. Discuss any discrepancies. The goal is not to come to an agreement and a common group answer, but to explore areas of differences and their causes.
- Now that you have discussed the case in your group, how many questions do you think you answered correctly?

The Last Stage: Scoring and Discussion

Your instructor will provide you with the scoring key for the questions. What explains your score? What processes are operating? What are the implications?

3.13 REFERENCES

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3.14 SUGGESTED READINGS

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LESSON-4

LEARNING, ATTITUDES, VALUES AND EMOTIONS

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STRUCTURE

4.1 Learning Objectives

4.2 Introduction

4.3 Learning

4.3.1 Nature of Learning

4.3.2 Types of Learning

4.3.3 Principles of Learning

4.4 Theories of Learning

4.4.1 Classical Conditioning

4.4.2 Operant Conditioning

4.4.3 Social Learning

4.4.4 Cognitive Learning

4.4.5. Reinforcement

4.5 Learning Organization

4.6 Attitude

4.6.1 Measurement of Attitude

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4.6.2 Formation of Attitude

4.6.3 Job-related Attitudes

4.6.4 Cognitive Dissonance

4.7 Values

4.7.1 Types of Values

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4.8. Values, Attitude and Behaviour

4.9 Emotions

4.9.1 Types of Emotions

4.9.2 Sources of Emotions

4.9.3 James-Lange Theory

4.10 Emotional Intelligence

4.11 Summary

4.12 Glossary

4.13 Answers to In-text Questions

4.14 Self-Assessment Questions

4.15 References

4.16 Suggested Readings

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4.1 LEARNING OBJECTIVES

After completing this lesson, you will be able to:

- Understand the concept of learning;
- Understand the theories of learning;
- Understand the concept of attitude;

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- Understand the concept of values;
- Understand the concept of emotions.

4.2 INTRODUCTION

Individual behaviour is very complex to understand and the application of tools of organizational behaviour to modify individual behavior is far more complex. Therefore, before students jump on to understand different tools and techniques of modifying individual and group behaviour at workplace, a student must have a clear understanding of dynamics impacting individual behaviour. This lesson illustrates different concepts that are related to the factors affecting individual behaviour. The concept of learning, attitudes, values and emotions establishes the foundation of human personality and thereby, impacting the behaviour. Learning signifies a change in one's internal state, which may lead to new permanent behaviours (for instance, learning a new skill like driving) or new comprehension and knowledge (for example, a new subject area such as evolution of management in modern era). When people learn specific behaviours, they may not always have a deeper comprehension of the reasons behind them (for example, using a mobile phone without an understanding the mechanics of technology used to build that mobile phone). By ascertaining the benefits of learning, organisations have started to actively promote a learning culture and reap on the benefits of advancement and change.

4.3 LEARNING

The concept of learning plays an important role for developing human nature. It helps an individual understand complex situations and respond logically and rationally. It is a concept that shapes an individual's skills, lifestyle and thoughts. Learning can have lasting change in individual's behaviour caused by direct and indirect events. Learning as a concept is quite often misunderstood as education and training. Whereas, education, training, practice and experiences are rather tools of learning that cause permanent changes. Temporary change does not truly reflect learning and eventually disappears. For instance, an employee out of the fear of pay cut may become punctual at workplace but in personal life where there is no fear of pay cut may not practice punctuality. This kind of temporary change requires practice and experiences to intensify individual learning process.

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The Cambridge Dictionary defines learning as "the process of getting knowledge or a new skill".

According to E.R. Hilgard, "Learning is a relatively permanent change in behaviour that occurs as a result of a prior experience".

Henry P. Smith defined learning as "…the acquisition of new behaviour or the strengthening or weakening of old behaviour as the result of experience".

4.3.1 Nature of Learning

Learning is basically the process of acquiring Knowledge, Skill, Ability (KSAs), etc. This gives a refreshing understanding to the process of learning having distinctive features:

- It is a universal concept which is experienced by all living beings.
- It is acquired through personal or impersonal experiences.
- It is a continuous practice for modifying behaviour.
- It may imply improving behaviour in humans but behaviour may also degrade.
- It involves individuals to modify and adapt to distinct nature that can be adjusted according to the situation.
- It brings relatively permanent change in individual behaviour.
- Change in behaviour is the result of experience, practice and/or training.
- Experience or practice must be reinforced for learning to occur.
- Learning may not be directly observable.
- It is a tool for growth and development.

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4.3.2 Types of Learning:

Motor Learning	Learning that require muscular coordination. Walking, running, driving, eating, etc.
Verbal Learning	Individuals learn different languages. Helps to communicate with others.
Concept Learning	Builds and develops mental framework in individuals. Thinking, reasoning, finding logic, etc.
Discrimination Learning	Helps in distinguishing stimuli and identifying suitable response to the stimuli. Distinguishing among various animal sounds.
Learning of Principles	Helps in building value system of individuals. Learning to be honest, helpful, etc.
Problem Solving	Application of concept learning in solving a problem. Finding shortest route to reach a destination.
Attitude Learning	Developing a predisposition for directing individual behaviour. It can be both positive or negative.

Fig 4.1: Types of Learning

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4.3.3 Principles of Learning:

The first three "Laws of learning" - readiness, exercise and effect were given by Edward Thorndike. Later, came the psychologists who recognized several other principles/laws of learning which are generally applicable to the learning process. These principles have been discovered, tested, and used in practical situations. They provide insight into what makes people learn most effectively. We discuss these principles in brief hereunder:

Readiness: An individual must be ready or capable of learning. Since learning is an active process, individuals must be adequately rested, healthy, and physically able to learn. For example, securing good grades in various subjects leads to mental and emotional readiness of students to do more hard work in acquiring knowledge.

Exercise: Learning continues as individuals practice more. Practice involves recall, review and summary, and manual drill and physical applications. All of these serve to create learning habits. For instance, to be a good doctor or lawyer, individuals have to practice their profession.

Effect: An individual's chance of success is definitely increased if the learning experience is a pleasant one. For instance, songs and movie stories are remembered for years by an individual as watching a movie is entertainment for the individual.

Primacy: Learning must be facilitated in a logical order, step by step, making sure the individuals have already learned the preceding step. For instance, an individual is first oriented and then trained on the job.

Recency: The principle of recency states that things learned recently will be remembered most at a particular time. Conversely, the far an individual is removed time-wise from a new fact or understanding, the more difficult it is to remember things. For instance, an individual will remember what he/she wore yesterday than what he/she wore a month or a year back.

Intensity: A sharp, dramatic, clear, vivid, or exciting learning experience creates an earning more than a routine or boring experience. The principle of intensity implies that an individual will learn more from the real-life experiences than from a substitute. For instance, a toddler learns to walk after falling many times.

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Freedom: The principle of freedom implies that learning should be self-motivated and not forced upon an individual. Individuals must have freedom of - choice, action, bear the results of action—imbibing personal responsibility. If no freedom is granted, individuals might have little interest in learning.

Requirements: The principle of requirement implies that "one must have something to obtain or do something". It can be an ability, skill, instrument or anything that may help individuals to learn or acquire knowledge. For instance, in order to learn piano, an individual must have availability of piano.

IN-TEXT QUESTIONS

1. Which of the following is not a type of learning:

   Attitude learning

   Concept learning

   Discrimination learning

   Regular Learning

2. Experience or practice must be _____ for learning to occur.

3. Learning requires pleasant experience. Which principle of learning suggests that?

4.4 THEORIES OF LEARNING

Over the years, academicians have been focusing on describing different patterns and/ or process through which learning occurs in an individual. The four popular theories that offer explanation of how individuals acquire patterns of behaviour are explained further.

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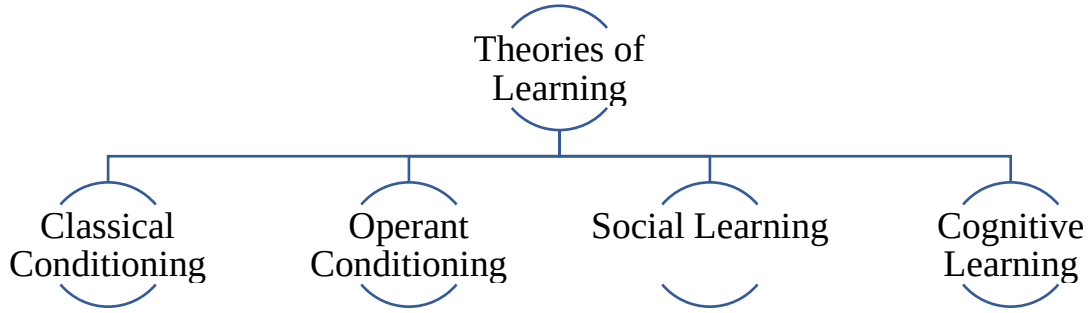

Fig 4.2: Theories of Learning

4.4.1 Classical Conditioning:

It is the process by which individuals learn reflex behaviour. A reflex is an involuntary response that is not under an individual's conscious control. Ivan Pavlov, is the brain behind the concept of classical conditioning. His famous experiment with dogs lays the foundation of how classical conditioning works to produce desired behaviour among the individuals.

While studying the digestion in dogs, Pavlov noted an interesting observation, i.e., his canine dogs were salivating whenever a lab assistant entered the room which dogs associated with food being served to them. Here, the salivating response to the serving of food is an unconditioned reflex while salivating to the expectation of food is a conditioned reflex. To dig deeper, Pavlov opted to use food as the unconditioned stimulus, or the stimulus that evokes a response naturally and involuntarily. The sound of a metronome was selected as the neutral stimulus. The dogs were first made to hear the sound of the ticking metronome, and then the food was immediately served. After several trials, dogs began to salivate after hearing the sound of metronome. "A stimulus which was neutral in and of itself had been superimposed upon the action of the inborn alimentary reflex," Pavlov wrote of the results, "We observed that, after several repetitions of the combined stimulation, the sounds of the metronome had acquired the property of stimulating salivary secretion." In other words, the previously neutral stimulus (the metronome) had become what is known as a conditioned stimulus that then provoked a conditioned response (salivation).

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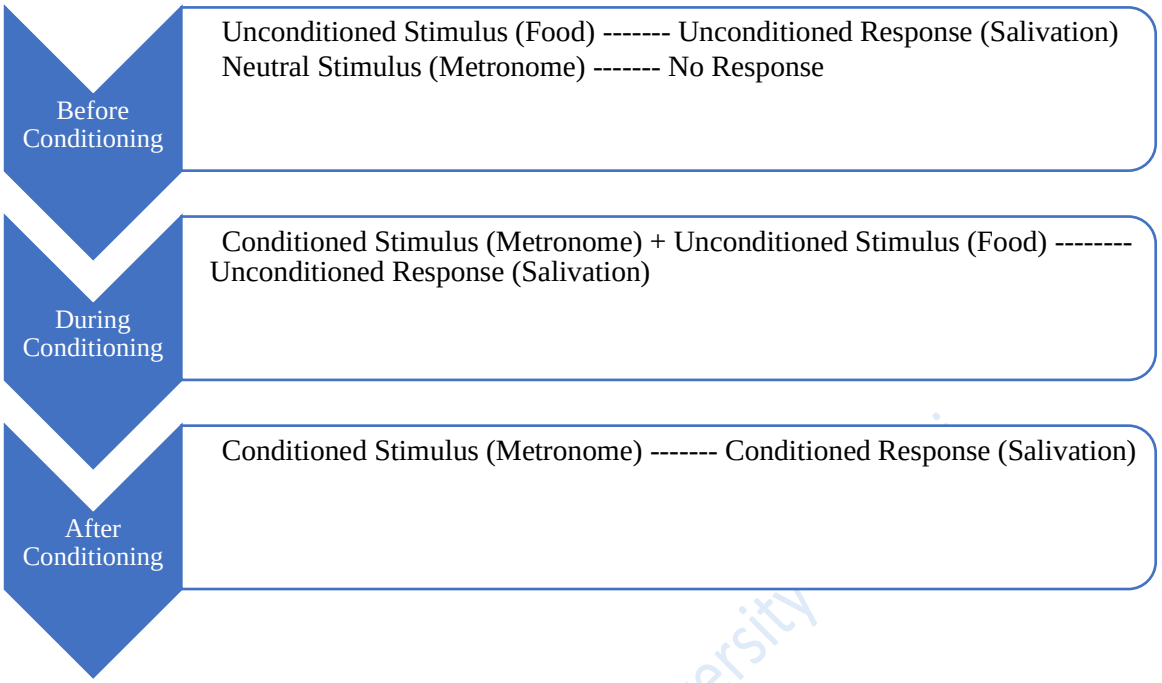

Fig 4.3: Process of Classical Conditioning

Thus, learning (conditioned response) can be induced under classical conditioning by building an association between conditioned stimulus and unconditioned stimulus. This happens quite often in real-life, for instance when a mock fire drill is organized at a school, students are taught to respond to the sound of a particular fire alarm. Thereby, students become ready for any fire emergency in future.

4.4.2 Operant Conditioning:

It refers to a process by which individuals learn voluntary behaviour. The theory argues that behaviour is a function of its consequences. Individuals learn to behave to get something or to avoid something. For instance, students reach to school on time to get attendance or to avoid missing on subject knowledge. B.F. Skinner, Harvard Psychologist is the brain behind the development of theory of operant conditioning. Skinner suggested the use of pleasant consequences to increase the frequency of good behaviour. The individuals are more likely to repeat their good behaviour if they are positively reinforced than not rewarded or worse, punished. For instance, students with highest attendance are if awarded in school are likely to impact students to be more regular than punishing them for their absence. In organizational setting, giving more work to employees who finished their tasks before deadline seems like a

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punishment for good behaviour. Next time, the employees may delay the completion of assigned tasks.

Classical Conditioning	
Stimulus	**Response**
Is stuck by a pin	Flinches
Is tapped below the kneecap	Flexes lower leg
Is shocked by an electric current	Screams
Operant Conditioning	
Response	**Stimulus**
Works	Is paid
Sit on a table in restaurant	Menu is presented
Increases productivity	Incentivize

Table 4.1: Examples of Classical and Operant Conditioning

4.4.3 Social Learning:

Albert Bandura and others have extended the works of Skinner by demonstrating that individuals can learn new behaviour by observing others in social situations and then adopting or modelling that behaviour after that of the others. This type of learning is coined as 'Social Learning', i.e., learning from society. Individuals tend to behave the way they see others behaving in their social circle. If the results of replicating someone's behaviour is positive, the behaviour is repeated; if the results are negative, the behaviour is not repeated. For instance, people indulge in smoking by watching others and then quit as it links to cancer. Our learning from parents, teachers, managers, celebrities, and similar such people influences our behavior.

The impact of models is fundamental to social learning. The following processes determine the intensity of models over others' behaviour:

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Attentional Process: Individuals learn from only those models whom they find attractive. For instance, celebrity's outfits are often duplicated by common people.

Retention Process: Individuals learn from only those models whose actions are remembered by the individuals. For instance, cricket lovers remember Sourav Ganguly's waving his jersey in the Lord's stadium.

Motor Reproduction Process: Individuals learn from only those models when they replicate models' behaviour immediately. For instance, while watching a cooking show, the recipe is learned if you immediately prepare it.

Reinforcement Process: Individuals exhibit model behaviour if they are presented with positive consequences. For instance, higher pay for higher productivity.

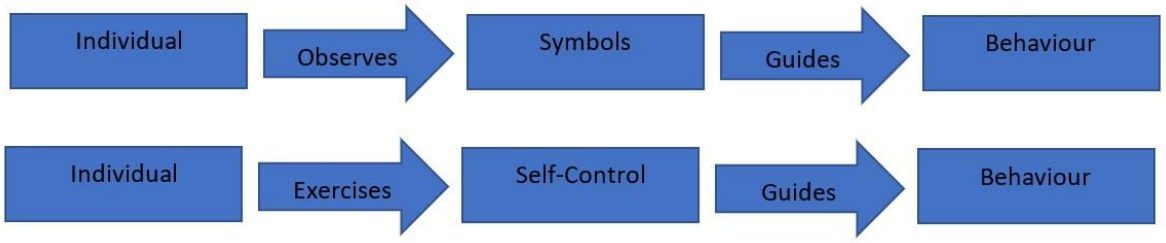

Fig 4.4: Model of Social Learning

4.4.4 Cognitive Learning:

The word "cognitive" is derived from the word "cognition," which refers to the capacity for thinking, perception, memory, and problem-solving. On the other side, cognitive learning theory emphasizes on how human mind functions during the learning process. It focuses on how the brain interprets information and investigates how learning takes place. "Cognitive learning" is thinking about the perceived relationship between events and individual's goals and expectations". It involves selective interpretation of perceived data organized into patterns of thoughts and relationships. For instance, the leadership theories explain how a manager is perceived as a leader. They become leaders by showing some traits for good role models. Cognitive theory of learning suggests that an individual creates a cognitive structure in memory which records and organizes information about various activities that occur in a learning situation.

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Types of Cognitive Learning	Meaning	Example
Intuition Learning	Focus on bigger picture and creativity	Application of acquired knowledge
Introversion Learning	Thought oriented, enjoys deep and meaningful conversations	Book reading clubs, Group Discussions
Extraversion Learning	Action oriented learning and enjoys socializing	Playing guitar, sports
Sensing Learning	Relies on historical data to evaluate a situation and develop solutions	Keeping umbrella handy in rainy season
Feeling Learning	Decision making based on personal values	Creating your own lifestyle

Table 4.2: Types of Cognitive Learning

4.4.5 Reinforcement:

The operant conditioning is based on the law of effect as given by Edward Thorndike. The law of effect states that the behaviour with rewarding consequences is likely to be repeated; while behaviour with negative consequences is not likely to be repeated. This law serves as the foundation of reinforcement theory. Reinforcement is the core of the learning process. Reinforcement can be defined as anything that strengthens a response and/or tends to increase its frequency. There are four types of reinforcement strategies.

Motive	Reinforcement	Meaning	Example

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	Strategy		
Encourage desirable behaviour	**Positive Reinforcement**	Pleasant consequence for desired behaviour	Incentive for higher productivity
	Negative Reinforcement	Removal of undesirable consequence	Supervisor stops criticizing when employees meet their standards.
Discourage undesirable behaviour	**Extinction**	Removal of desirable consequence	Isolating a disruptive employee from the team
	Punishment	Placing undesirable consequence	Pay cut for being late at work

Table 4.3: Strategies of Reinforcement

Reinforcement does not guarantee a particular response as individuals are dynamic. For instance, studying hard may not yield good grades. Many times, the presence or absence of reinforcers may bring in random responses. Thereby, they need to be governed by rules. These rules are known as schedules of reinforcement. These schedules how often a reinforcer must be present or absent to bring in desired responses.

Schedule	Nature	Effect on Behaviour	Example
Continuous	Reward after each desired behaviour	Fast learning but rapid extinction of behaviour	Compliments
Fixed-Interval	Reward after fixed time intervals	Irregular performance with rapid extinction	Weekly pay-out
Variable- Interval	Reward after variable intervals	Above average performance with slow extinction	Pop quizzes
Fixed Ratio	Reward at fixed	High performance	Piece-rate pay

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	amount of output	with rapid extinction	
Variable Ration	Reward at variable amount of output	Very high performance with slow extinction	Commission based sales

Table 4.4: Schedules of Reinforcement (Source: Robbins Stephen P and Judge T.A., Vohra, Organisational Behaviour, 16th Ed. Pearson.)

4.5 LEARNING ORGANIZATION

A learning organization is an organization that has developed the continuous capacity to adapt and change. As individual learns and so do organizations. Continuous learning is a fundamental requirement for ensuring sustainability of businesses. Chris Argyris and his associates, developed two types of learning organizations:

a) Single-loop learning involving measures to improve the organization's ability to achieve desired goals. It requires routine behavioral learning.

b) Double-loop learning involves re-working on the organizational goals, policies and strategies to adapt a new organizational culture.

The fundamentals of learning organization are –

- In a learning organization there is a shared vision that can emerge from many places but the top management is responsible for ensuring that the vision exists and is nurtured.
- Ideas are formulated and implemented at all levels of organizations.
- Employees understand their own jobs as well as the way in which their own work inter-relates with and influences that of other employees.
- Conflicts are resolved using collaborative learning and the integration of diverse opinions of employees throughout organization.
- The role of the leader is to empower employees, inspire commitment, and encourage effective decision making throughout the enterprise through the use of empowerment and charismatic leadership.

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An organization can be transformed into a learning organization by adopting to three-step process – **establishing a strategy for continuous improvement; redesigning organization structure; and reshaping organizational culture**.

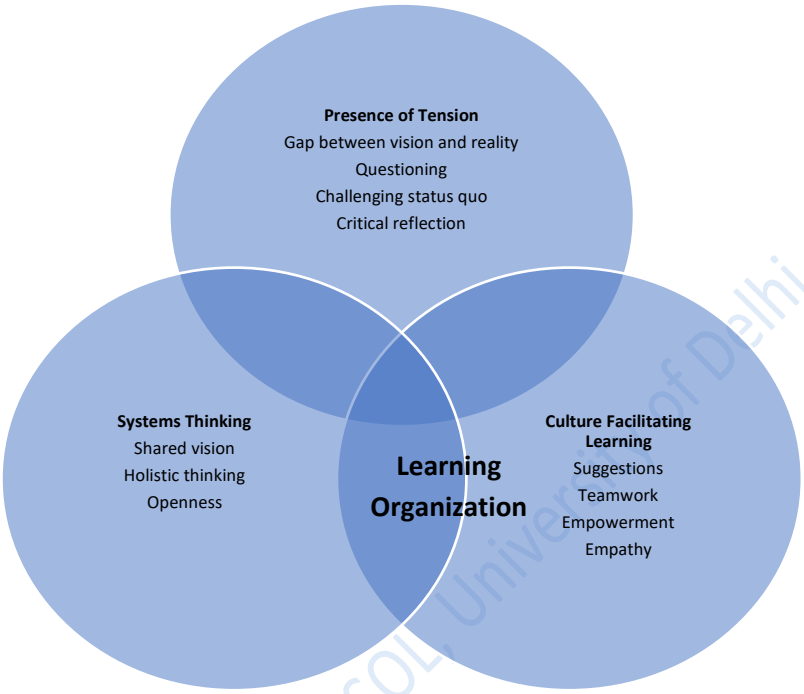

Fig 4.5: Characteristics of Learning Organization (Source: Luthans, F. (2011). Organizational Behavior: An Evidence – Based Approach, McGraw Hill Education)

IN-TEXT QUESTIONS

4. According to Skinnerian Operant conditioning theory, a negative reinforcement is:
   (a) Nothing but punishment
   (b) A biofeedback
   (c) A withdrawing or removal of a positive reinforcer
   (d) An instinctive drift
5. Which schedule of reinforcement is a ratio schedule stating a ratio of responses to rein-forcements?
   (a) Variable Ratio Schedule (b) Fixed Interval Schedule
   (c) Variable Interval Schedule (d) Fixed Ratio Schedule

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Case Study of a Learning Organization – Ford

Ford used the accounts payable as illustrated in the figure below prior to installation. The initial purchase order for raw materials is sent by Ford's purchasing department. Additionally, a copy of the purchase order is forwarded to the accounts payable division. The vendor raises an invoice for the accounts payable division after delivering the raw supplies. The accounts payable division totals the purchase order, the items that have been received, and the invoices before paying the supplier. While Mazda, a Japanese automaker competitor, managed the same procedure with 100 workers—a surprisingly low number of employees even when the magnitude of the operation is taken into account—Ford used roughly 500 individuals to handle the entire process.

Instead of tinkering with the company procedures just slightly. Ford made the decision to employ IT to drastically alter its accounts payable procedure. A mechanism without invoices has been put in place. The departments responsible for purchasing will create the purchase order and update the database. The payment will be made without waiting for the vendor to send an invoice as soon as the materials have been received and a warehouse worker updates the materials received.

4.6 ATTITUDE

Evaluative remarks regarding things, people, or events are called attitudes. It can be positive, neutral or negative. They are a reflection of one's feelings. If an individual says that "I like my job" that describes how the individual feel about his/her job. Attitudes are intricate. In order to comprehend, individuals must take into account the underlying components of attitude. There are three important components of attitude as - cognition, affect, and behavior which are closely related.

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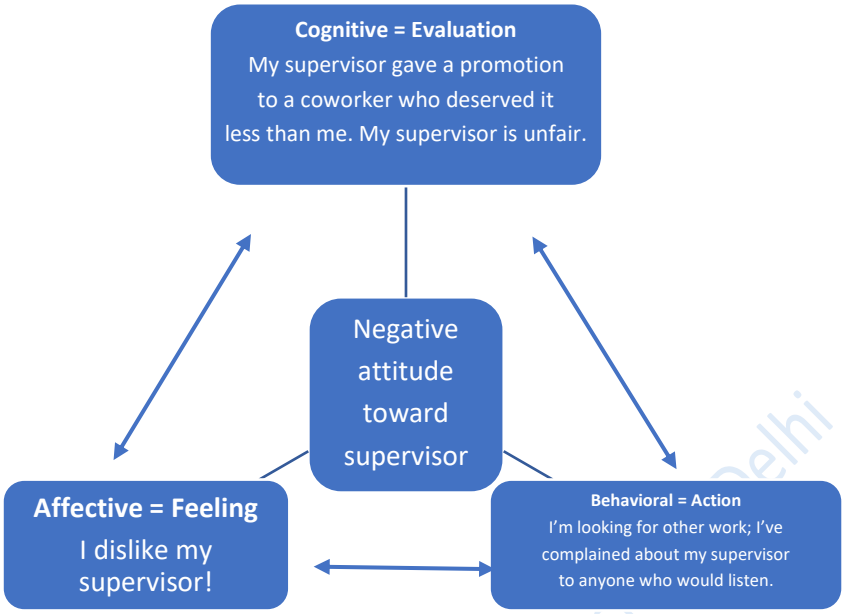

Fig 4.6: Components of Attitudes (Source: Robbins Stephen P and Judge T.A., Vohra, Organisational Behaviour, 16th Ed. Pearson.)

Characteristics of attitude:

- Attitude may be fluctuating. An individual may dislike something at first then like same thing later.
- Attitudes are intangible psychological phenomenon.
- Attitudes toward something are acquired over a period gradually.
- Attitudes are built in the process of socializing.
- Attitudes help in adjusting to a new environment. With positive attitude individuals can welcome changes instead of resisting.
- Individuals build attitudes to create their self-image. Attitudes help in expression of one's value system.
- An ambitious person will have a positive attitude for the job instead of complaining about it whole day.
- Knowledge can be substituted by the attitudes. For instance, people stereotype about others due to lack of personal information about them.

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4.6.1 Measurement of Attitude

The attitudes of individuals though stable in a shorter duration, might be modified over a period of time. Minor changes in individual's attitude is inevitable and normal which makes the behavior dynamic. For instance, an irregular student becomes regular and punctual realizing the positive aspects of getting early up in the morning. There are many ways of measuring such changes in individual's attitude. Few of them are presented hereunder:

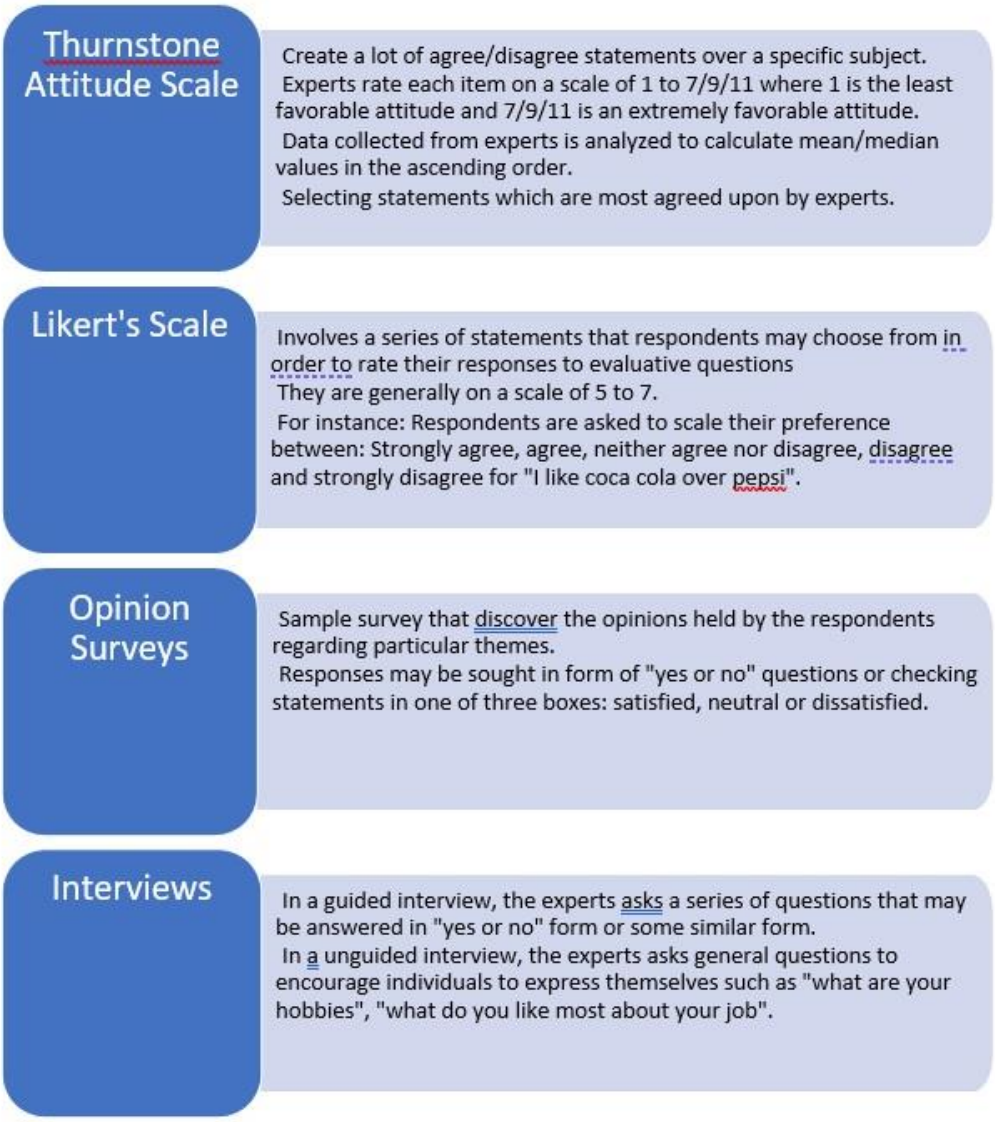

Fig 4.7: Tools for Measuring Attitude

4.6.2 Formation of Attitude:

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Individuals form positive, neutral and/or negative attitude towards something depending on various factors:

Psychological factors: It includes ideas, beliefs, perception, values, information, etc. For instance, an employee perceives hard work will yield rewards to him than the employee will have a positive attitude towards job.

Family: An individual is well influenced by the family as he/she spends the major time of childhood with the family instilling ready-made attitudes of the family members. Family is involved in decision-making towards education, job, religion, economic conditions, etc. For instance, an individual with low income family will develop a saving attitude towards money.

Society: Society creates the circle of tradition and culture around the individual, influencing the attitude. For instance, the attitude of Japanese people towards their job is critically different from that of Americans. Japanese employees are better adjusted to the notion of work as honourable.

Political factors: Ideologies of the political parties, and leaders greatly affect an individual's attitude. For instance, an individual from any communist party may oppose liberal democracy.

Organisational factors: During the adulthood, individuals spend most of their time in the organization they work for. They collectively, not just form the organizational culture but influence each other's attitude as well. For instance, a nurturing culture in the organization may influence their employees towards personal development by providing opportunities to learn new things and grow professionally. Such practices develop good attitude towards organization and job.

Economic factors: Economic conditions of an individual affect the spending capability of individuals that may develop negative attitude toward individual spending lavishly on leisure.

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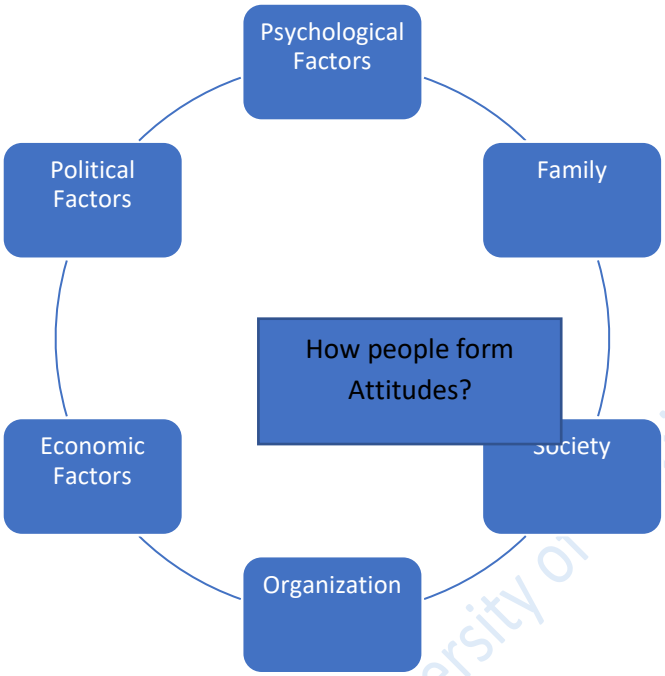

Fig 4.8: Formation of Attitudes

4.6.3 Job Related Attitudes:

In the study of Organization Behaviour (OB) people focus more on job-related attitudes. These are positive or negative evaluations that employees hold about aspects of their job environments. Most of the research in OB has looked at three job related attitudes: job satisfaction, job involvement, and organizational commitment. A few other important attitudes are perceived organizational support and employee engagement.

a) **Job Satisfaction:** A positive feeling about one's job resulting from an evaluation of its characteristics.

b) **Job Involvement:** The degree to which a person identifies with a job, actively participates in it, and considers performance important to self-worth.

c) **Psychological Empowerment:** Employees' belief in the degree to which they affect their work environment, their competence, the meaningfulness of their job, and their perceived autonomy in their work.

d) **Organizational Commitment:** The degree to which an employee identifies with a particular organization and its goals and wishes to maintain membership in the organization.

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e) **Perceived Organizational Support:** The degree to which employees believe an organization values their contribution and cares about their well-being.

f) **Employee Engagement:** An individual's involvement with, satisfaction with, and enthusiasm for the work he or she does.

There is some distinctiveness among attitudes, but they overlap greatly for various reasons, including the employee's personality. If a manager knows someone's level of job satisfaction, the manager knows most of what employees need to know about how that employee sees the organization. Researches suggests that managers tend to identify their employees as belonging to one of four distinct categories: enthusiastic stayers, reluctant stayers, enthusiastic leavers (planning to leave), and reluctant leavers (not planning to leave but should leave).

4.6.4 Cognitive Dissonance:

In the late 1960s, a review of the research challenged the assumed effect of attitudes on behavior. One researcher—Leon Festinger—argued that ***attitudes follow behavior***. He observed that individuals change what they say so that it doesn't contradict what they do. For instance, individuals criticize a political party and then praises the political party if any policy is released that is in favor of the individual. Festinger suggested that cases of attitude following behavior prove the effects of ***cognitive dissonance***. It is any incompatibility an individual might perceive between two or more attitudes or between behavior and attitudes. Festinger argued that any form of contradiction is uncomfortable and that individuals will therefore attempt to reduce it. They will pursue a stable state, which is of minimum dissonance. Research has suggested that individuals do seek consistency among their attitudes and between their attitudes and their behavior. They either change the attitudes or the behavior, or they develop a rationalization for the inconsistency. According to a study, for instance, that the attitudes of employees who had experienced difficult, emotionally challenging work events improved after they talked about their experiences with co-workers. Social sharing helped these workers adjust their attitudes to behavioral expectations. No individual, of course, can completely avoid dissonance. Individuals know evading income tax is wrong, but they fudge the numbers a bit every year and hope they are not audited. Festinger proposed that the desire to reduce dissonance depends on three factors, including the importance of the elements creating it and the degree of influence individuals believe they have over them. Individuals will be more motivated to reduce dissonance when the attitudes are important or when they believe the dissonance is due to something they can control. The third factor is the rewards of dissonance; high rewards accompanying high dissonance tend to

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reduce the tension inherent in the dissonance (the dissonance is less distressing if accompanied by something good, such as a higher pay raise than expected).

IN-TEXT QUESTIONS

6. The defining characteristic of_____ is that they express an evaluation of some object.

a. Beliefs
b. Attitudes
c. Interaction
d. Perception

7. Bob cooks for his girlfriend; it's his way of showing her he cares about her. His cooking is an example of

a. dissonance
b. a terminal value
c. a relational currency
d. self-promotion

4.7 VALUES

Values represent the fundamental convictions that "a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence." Values have a judgmental element because they carry people's ideas about right, good, or desirable. They have both content and intensity qualities. The content characteristic says a code of conduct or end-state of existence is vital. The intensity characteristic specifies the extent of importance of end-state of existence. When people rank values in terms of intensity, they obtain that person's value system. Everyone has a hierarchy of values according to the relative significance they assign to values such as freedom, honesty, obedience, pleasure, self-respect, and equality.

The basic characteristics of values are:

- They are relatively stable and enduring.

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- People starts establishing their value system in the early years—by parents, teachers, friends, and others.
- They reflect standards of human behaviour.

Organizational Values – Example of Tata

Business, as I have seen it, places one great demand on you: it needs you to self-impose a framework of ethics, values, fairness and objectivity on yourself at all times." - Ratan N Tata, 2006. Tata has always been a values-driven organisation. These values continue to direct the growth and business of Tata companies.

The five core Tata values underpinning the way we do business are:

Integrity: We will be fair, honest, transparent and ethical in our conduct; everything we do must stand the test of public scrutiny.

Responsibility: We will integrate environmental and social principles in our businesses, ensuring that what comes from the people goes back to the people many times over.

Excellence: We will be passionate about achieving the highest standards of quality, always promoting meritocracy.

Pioneering: We will be bold and agile, courageously taking on challenges, using deep customer insight to develop innovative solutions.

Unity: We will invest in our people and partners, enable continuous learning, and build caring and collaborative relationships based on trust and mutual respect.

Source: Organizational Values – Example of Tata (https://www.tata.com/about-us/tata-values-purpose)

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Cohort	Entered the Workforce	Dominant Work Values
Boomers	1965–1985	Success, achievement, ambition, dislike of authority; loyalty to career
Xers	1985–2000	Work/life balance, team-oriented, dislike of rules; loyalty to relationships
Millennials	2000 to present	Confident, financial success, self reliant but team-oriented; loyalty to both self and relationships

Table 4.7: Dominant Work Values in Today's Workforce (Source: Robbins Stephen P and Judge T.A., Vohra, Organisational Behaviour, 16th Ed. Pearson.)

4.7.1 Types of Values:

Broadly speaking, there are two types of values - Terminal and Instrumental Values.

Terminal Values	Instrumental Values
Desirable end-states of existence; the goals a person would like to achieve during his or her lifetime.	Preferable modes of behavior or means of achieving one's terminal values.
Comfortable life Sense of accomplishment Self-respect Wisdom	Ambition Courage Honesty Independence

Table 4.8: Types of Values (Source: Robbins Stephen P and Judge T.A., Vohra, Organisational Behaviour, 16th Ed. Pearson.)

Allport and his associates have identified six types of values –

Theoretical: Interests that develop reasoning and systematic thinking.

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Economic: Interests in accumulation of wealth.

Aesthetic: Interests in beauty and artistic harmony.

Social: Interest in people and relationships.

Political: Interest in acquiring power and leading others.

Religious: Interest in understanding the cosmos of whole.

4.7.2 Formation of Values:

A person sources his/her value system from the diverse components of their environment such as –

Family – Family is the prime and most important source of obtaining values. Children learn some values from his/her family since the childhood and retains those values in their mind throughout their life. The ways the parents nurture, educate and raise their children shape their personality and inculcate values in them.

Society – Society plays a major role in developing value system of people. Children learn basic manners and discipline from their teachers. Teachers play a pivotal role in developing value system in individuals. Besides schools and colleges, other groups of society such as religious groups, economic and political groups to which people belongs also affect their value system.

Personal factors – Personal characteristics like intelligence, ability, appearance and education level of a person determines his value system very strongly. For example, an intelligent and educated person will understand and learn the social and work-related values relatively faster than the uneducated person.

Culture – Cultural factors which influence value system of an individual include norms, beliefs and other behaviour patterns which are preferred and acceptable by the society. These values are often carried in rituals, customs or narratives that are often repeated and highly resistant to change because they are seen as absolute.

Religion – Religion is comprised of set of values and traditions which guide routine behaviour and decision making of an individual. Religious values help people determine what is good or what is based.

Life experiences –One learns most from own experiences and sometimes from experiences of others too. The values which an individual learns from own experiences of life are relatively long lasting and difficult to change.

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Role demands – Role demand refers to the behaviour which is associated with the particular position or role profile in an organisation. Every individual play multiple roles in life. The problem occurs when there is a role conflict. In such case, individuals quickly learn the value system prevailing in the organisation so that they may survive and progress in the same organisation.

Constitution – Almost, all the existing constitutions of various countries highlight the values of democracy, equality and world peace. The values enshrined in the Constitution of India are stated in its Preamble are Justice, Liberty, Equality of status and opportunity and Fraternity. Herein, justice occupies the first place, followed by liberty, equality.

4.8 VALUES, ATTITUDE AND BEHAVIOUR

The difference between values and attitudes is firstly that while values are always positive (i.e. expressing preferences), attitudes can be both positive and negative. Secondly, values are general, but attitudes are specific and can vary from object to object. It is also believed that attitudes are more apt to change than values. Behaviour depends on underlying attitudes, but is also affected by many other things like opportunities to act, norms, expected consequences etc. Therefore, the link between attitudes and behaviour is not direct. The characteristics and relationships between individual values, attitudes and behaviour are presented hereunder:

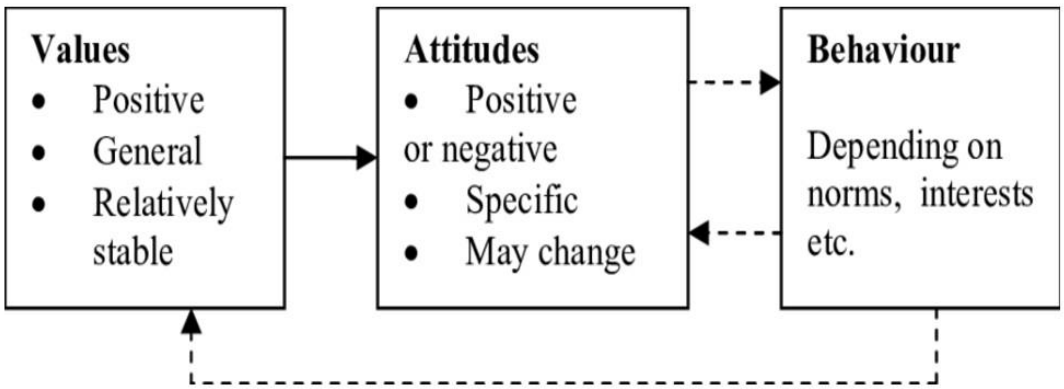

Fig 4.9: The relationship among Values, Attitudes and Behaviour (Source: Jaakson, K. (2022). Management by values: the analysis of influencing aspects and its theoretical and practical implications.)

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Although Collins and Porras (1994) are of the opinion that mere articulation of values increases the likelihood of values-based behaviour, there has to be support via organisational systems as well. Basically, there are two paths for organisational support of values-based behaviour. The first option is having the people with the "right" attitude who are naturally inclined to behave in the desired way. Stackman et al., (2000) maintain that values are key determinants of employee attitudes, which in turn affect work-related behaviour. This is to say that values do not affect behaviour directly, but via attitudes, which are defined as "dispositions to respond favourably or unfavourably to an object, person, institution or event" (Ajzen, 2005: 3).

4.9 EMOTIONS

The root of the word emotion comes from a French term meaning "to stir up." And that's a great place to begin our investigation of emotions at work. Emotions are intense feelings directed at someone or something. They are reactions to a person (seeing a friend at work may make you feel glad) or an event (dealing with a rude client may make you feel frustrated). They are also useful for creative tasks, because positive people tend to be more creative and open to new ideas. In addition to helping with employee creativity, companies such as Microsoft Corporation often want to understand which features of their products produce not just high ratings for usability but also high emotional ratings. Individuals with strong positive emotional reactions are more likely to use their product and recommend it to others (Weler, 2008). This is something Apple Inc. has been known for doing well, as their products tend to evoke strong positive emotions and loyalty from their users.

Characteristics of Emotions:

- Emotions accompany Instincts: For instance fear is associated with the instinct of escape, in a situation which is considered by an individual as dangerous.
- Emotions are primary or secondary: For instance resentment, indignation, sullenness, rage and fury are the variations of anger (primary).
- Emotions are subjective: These are, in reality, personal experiences.
- External situations produce emotions: An external situation like thunder engenders fear in the mind of the individual.
- Overt behaviour is the product of emotion as fear arouses crying.

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- Emotions are complex affective states: It includes cognition to the extent that the individual experiences emotion only after he recognises a particular situation.
- There is a wide range and wide degree of emotions.
- Reasoning and emotion: Reasoning provides a check on emotional upsurge. The emotional response is weakened by the application of intellect.

4.9.1 Types of Emotions:

There are few attributes more core and universal to the human experience than the emotions. Of course, the broad spectrum of emotions humans are capable of experiencing can be difficult to articulate.

Fig 4.9: Types of Emotions (Source: Adapted from H. M. Weiss and R. Cropanzano, "Affective Events Theory," in B. M. Staw and L. L. Cummings (Eds.), Research in Organizational Behavior, Vol. 18, JAI Press, Greenwich, Conn., 1996, pp. 20–22 and Daniel Goleman, Emotional Intelligence, Bantam Books, New York, 1995, pp. 289–290.)

The workplace contains a wide variety of emotions. Furthermore, it is probably not overstatement to say that many administrative and organisational decisions, as well as most personal ones, are based more on emotions than on rational cognitive processes. For instance, rather than what is logically best for one's profession, career decisions are frequently dependent on feelings of satisfaction, affection, or even fear. In reality, rather than being

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influenced by factors like marginal costs, return on investment, or other considerations that the classic rational economic/finance models would predict, management decisions are frequently motivated by unpleasant emotions like fear or rage.

4.9.2 Sources of Emotions:

Emotions emerge from a wide range of sources:

a) **Personality:** Every person has a natural tendency to experience some moods and feelings more frequently than others. We also differ in how strongly we feel the same emotion; people who are affectively intense feel both positive and negative emotions and moods more strongly.

b) **Day of the week or time of the day**: People are typically at their worst early in the week and at their best late in the week. As people tend to avoid delivering unpleasant news or request favours on a monday morning.

c) **Stress:** The emotions and moods can suffer from stress. The consequences accumulate over time, and ongoing stress can make our moods and emotions worse.

d) **Social activities:** For the majority of people, social activities boost emotions and have minimal impact on negative emotions. A positive emotion encourages social contact.

e) **Lifestyle Factors:** Sleep quality does affect emotions. People are more prone to experience tiredness, rage, and aggression when they are exhausted, which can affect decision-making and make it challenging to control emotions. Another factor be exercise that enhances our positive emotions. This is especially good for depressed people.

f) **Demographic Factors:** As people age, negative feelings tend to happen less frequently. Highly happy emotions linger longer in elderly persons, but negative emotions pass more swiftly in older people. With age, emotional experience gets better. Moreover, Men are less demonstrative in their emotions than women are. Compared to males, they feel them more strongly and hang onto them for longer. Except for rage, they express both pleasant and negative emotions more frequently. This is so because men are drilled to be courageous and tough. Women exhibit greater good moods because they are social and nurturing.

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IN-TEXT QUESTIONS

8. The link between attitudes and behaviour

a) direct b) not direct

c) neutral d) does not occur

9. Emotions are:

a) objective responses to experiences in our environment
b) subjective responses to experiences in our environment
c) physiological changes to experiences in our environment
d) behavioral changes to experiences in our environment

10. Which of these supports the James-Lange theory of emotion?

a) emotion is a visceral response producing a behavioural response
b) artificial induction of visceral changes does not necessarily produce emotion
c) the viscera are 'insensitive structures'
d) visceral changes are the same in many emotions

4.9.3 James-Lange Theory:

The James-Lange hypothesis of emotion, put out independently by psychologist William James and physiologist Carl Lange, postulated that feelings are the product of bodily responses to experiences. To put it another way, this theory contends that people's physiological reactions to environmental stimuli are interpreted by them to produce emotional experiences. This idea holds that seeing an external stimulus causes a physiological reaction. How people perceive those physical responses will determine your emotional response. Imagine an individual is out for a walk in the woods when the individual spots a grizzly bear. The individual's heart starts to beat quickly, and the individual start to quiver. According to the James-Lange theory, the individual will perceive his physical responses as signs of fear ("I am shaking. I'm afraid as a result ")

The conventional wisdom prior to the James-Lange theory held that people's initial response to perception was cognitive. Then, in response to that idea, physical responses took place. Instead, the James-Lange method proposed that these physiological reactions take place first and are crucial to the sense of emotion. The hypothesis had a significant impact on psychology and our understanding of emotions, even though it may appear like a minor distinction in the course of events. Though widely accepted, not everyone concurred that emotions were triggered by physical reactions.

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4.10 EMOTIONAL INTELLIGENCE

The capacity to recognize, use, and regulate your own emotions in order to reduce stress, communicate clearly, sympathizes with others, overcome obstacles, and diffuse conflict is known as Emotional Intelligence (EQ). You can develop stronger relationships, perform well at work and school, and reach your professional and personal objectives with the aid of emotional intelligence. Additionally, it can assist you in establishing a connection with your emotions, putting your intentions into practice, and choosing what is most important to you. Emotional intelligence is commonly defined by four attributes:

Self-management – Individuals control impulsive feelings and behaviors, manage your emotions in healthy ways, take initiative, follow through on commitments, and adapt to changing circumstances.

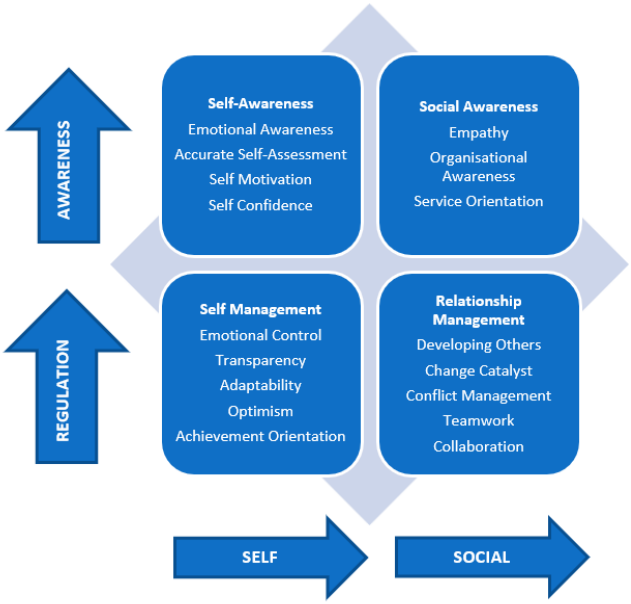

Fig 4.11: Attributes of Emotional Intelligence

Self-awareness – Individuals recognize their own emotions and how they affect your thoughts and behavior. They know their strengths and weaknesses and have self-confidence.

Social awareness – Individuals have empathy. They can understand the emotions, needs, and concerns of other people, pick up on emotional cues, feel comfortable socially, and recognize the power dynamics in a group or organization.

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Relationship management – Individuals know how to develop and maintain good relationships, communicate clearly, inspire and influence others, work well in a team, and manage conflict.

The fact that so many people still think that interacting with co-workers personally hinders efficiency means that the office is still the last refuge of IQ worship. Individuals don't have the same emotional connections at work that encourage them to get along with others the way they do at home. Individuals lack the advantage of a shared past to aid in their understanding of what motivates individuals around them. Because of this, it is even more crucial that individuals have a technique to recognize what their co-workers need right now. That ability is already present in them; it is called active awareness, and it results in empathy. Putting those aspects of their EQ to use will help them succeed and deal with issues at work

4.11 SUMMARY

Theory	Appraisal	Criticism
Classical Conditioning	Identifying causes of behaviour Emphasizes learning from the environment Supports nurture over nature Based on scientific, empirical evidence Improve or control undesirable behaviors	Does not allow for free will in individual Underestimates uniqueness of human beings May lack validity Limiting in describing behavior in terms of nature or nurture
Operant Conditioning	Effective for temporary behaviour modification Easy to implement	Does not address cognitive processes Behaviour ends with reinforcement

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		May hinder intrinsic motivation
Cognitive Learning	creative approach for solving tasks less time to solve tasks division of tasks which makes it possible for individuals to search for a quick solution	Limit the quantity of learning Use of repetition and therefore, encourages rote learning Ineffective for Bright Learners
Social Learning	Natural Way to Learn great for leverage in organisations Higher Learning Retention Bringing employees together to share subject matter expertise costs less	False setting Ignores the Role of nature Ignores Biological Factors Ignores life span changes
Thurstone scale	Allows as many statements as you want. Assured of survey reliability because the judges that will rate the scale are highly knowledgeable. Provides the average	Time-consuming. The scale is complex. There is no sure method of measuring attitude; scale only try to measure the expressed opinion and then draw inferences from it

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	score of the survey ranks. This assists the researcher when analyzing the results from the respondents because the researcher already knows what score to compare the result to. The scale also gives the researcher the monopoly to choose items that represent the desired range.	about people's actual feelings or attitudes. Limited answer options.
Likert's Scale	Ease of Implementation-Quantifiable Answer Options Makes question answering easier on the respondent Responses are very easy to code Likert surveys are also quick, efficient and inexpensive methods for data collection	On one side, two people can get the same value in the Likert scale by having chosen different options. Is difficult to treat neutral opinions as "Neither agree nor disagree". Respondents tend to agree to the statements showed. This phenomenon is called acquiescence bias.
Opinion Survey	To Get a Sense of the Majority Opinion	Influence Could Also Be Negative

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	For Potential Accuracy To Negate Thinking Errors Much more affordable	Chances of Inaccuracy Altering Answers
Interviews	Ability to find the right candidate Enables detailed assessment Great source of information Increase knowledge Understanding stakeholders better Extracting additional information	Highly time-consuming Unpredictable outcome Hard to verify the truth Can easily form stereotypes Risk of personal bias

4.12 GLOSSARY

Attitudes: Mental states of readiness for need arousal.

Classical conditioning: It is a behavioural procedure in which a biologically potent stimulus is paired with a previously neutral stimulus.

Emotional intelligence: The ability to accurately perceive, evaluate, express, and regulate emotions and feelings.

Extinction: In a learning situation, the decline in the response rate because of nonreinforcement.

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Learning: The process by which a relatively enduring change in behavior occurs as a result of practice.

Negative reinforcement: Reinforcement that strengthens a response because the response removes some painful or unpleasant stimulus or enables the organism to avoid it.

Operant conditioning: Learning that occurs as a consequence of behavior.

Positive reinforcement: Action that increases the likelihood of a particular behavior.

Punishment: An uncomfortable consequence for a particular behaviour response or the removal of a desirable reinforcer because of a particular behaviour response.

Values: The conscious, affective desires of wants of people that guide their behaviour. Basic guidelines and beliefs that a decision maker uses when confronted with a situation requiring choice.

1.13 ANSWERS TO IN-TEXT QUESTIONS

1. d) Regular Learning 2. Reinforced 3. Principle of Effect 4. (c) A withdrawing or removal of a positive reinforcer 5. (c) Variable Interval Schedule 6. b) Attitudes	7. c) a relational currency 8. b) not direct 9. b) subjective responses to experiences in our environment 10. a) emotion is a visceral response producing a behavioural response

4.14 SELF-ASSESSMENT QUESTIONS

1. What is meant by learning in the organization? What are the different ways in which employees may learn at work? Cite suitable examples.
2. How important is attitude in making people attached to a company and making employees satisfied?
3. Values have become secondary for achieving success in the organization. Discuss.

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4. How do you apply concepts about emotions to specific Organizational Behaviour issues?

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LESSON-5

INTERPERSONAL RELATIONSHIP

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STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 Transactional Analysis
5.4 Ego States
    5.4.1 The Parent Ego State
    5.4.2 The Adult Ego State
    5.4.3 The Child Ego State
5.5 Types of Transactions
    5.5.1 Complementary Transactions
    5.5.2 Non-Complementary Transaction
    5.5.3 Ulterior Transactions
    5.5.4 Gallows Transaction
5.6 Need of Understanding Transactional Analysis

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5.7 Life Positions

5.8 Stroke Analysis

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5.10.1 Application of Johari Window in Business

5.11 Summary

5.12 Answers to In-Text Questions

5.13 Self-Assessment Questions

5.14 References

5.15 Suggested Readings

5.1 LEARNING OBJECTIVES

At the end of this lesson, the student should be able to:

- Explain the concept of transactional analysis and the need to maintain a healthy interpersonal relationship in an organisation.
- Differentiate between complementary and non-complementary transactions.
- Understand the concept of life positions and their importance in the organisation.
- Understand the importance of stroke and the concept of psychological games.
- Understand the importance of the Johari window as a tool for improving interpersonal relationships.

5.2 INTRODUCTION

Organisations accomplish their objectives through their employees. It takes collective efforts, which requires smooth interpersonal interactions among employees. Globalization and technology improvements have made it more critical for employees to interact with one

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another and ensure smooth interpersonal communication to enhance organizational effectiveness.

As Aristotle said, “Man is a social animal” by extension, employees interact with one another and work in close associations. Employees working together share a special bond that makes them feel connected with one another and the organisation itself. A healthy interpersonal relationship makes employees more productive and positive and renders the entire working environment more salubrious. An interpersonal relationship is a dyadic relationship that is interactive, now this interaction can be on a one-to-one basis, one-to-group basis, group-to-one basis or group-to-group basis. Besides, these transactions can be cooperative or conflicting. The cooperative transaction is a win-win scenario for both, the organization and the members partaking in it.

Some skills that can help navigate an individual to these significant transactions without a hitch are: - mutual trust, positive thinking, empathy and courtesy.

Accomplishing successful interpersonal relations in the context of organizational goals is a challenging and slow process. It requires a deep psychological understanding of oneself as well as of others. Every manager is responsible for managing interpersonal relations in his department in such a way that everybody cooperates willingly in accomplishing the organizational goals. Without good interpersonal relations, there will be an atmosphere of misunderstanding and conflicts in the organization. After a long time of research, several behavioural scientists recommended the use of various tools for analysing and managing interpersonal behaviour in an organization for the betterment of the organization and its people. The present lesson explores some of these tools, like ego states, life positions, psychological games, strokes, and the Johari window.

5.3 TRANSACTINAL ANALYSIS

Transaction refers to communication and exchange of dialogue between two individuals. Transactions consists of two components -"Transaction stimulus" (It is given by a person who starts communication) and "Transaction response" (It is provided by a person who receives transaction stimulus).

When two individuals interact, one responds to the other; this is called a social transaction. The study of these transactions is known as transactional analysis (TA). Based on the ideas of Sigmund Freud's Psychometric theory of childhood experiences in the late 1950s, Eric Berne developed transactional analysis theory. It is a psychoanalytic theory and a therapy method

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that helps understand interpersonal behaviour and analyse social interaction between people. Transactional Analysis is a theory to improve interpersonal communication. Transactional analysis was initially thought to be a simple model and was criticized. But eventually, the understanding of transactional analysis increased, and many acknowledged it. Transactional Analysis has wide applications in clinical, therapeutic, organizational and personal development, encompassing communications, management, personality, relationships and behaviour.

Today TA is used in organizations as psychotherapy. Eric Berne said that verbal communication, particularly face-to-face communication, is at the centre of human social relationships and psychoanalysis. His starting point was that when two people encounter each other, one of them will speak to the other, which he called the Transaction Stimulus. The reaction from the other person he called the Transaction Response. The present lesson includes the concept of ego states, life positions, psychological games, strokes, and the Johari window that could help understand how interpersonal relationships could become smooth.

5.4 EGO STATES

Humans are teeming with whims and fancies. Accordingly, when employees interact, their conduct varies as per the situation. An employee is cooperative at one time and grumpy at the other. He is cordial to one colleague and gives a cold-shoulder to another. Such different actions occur because of varying ego states.

At the core of transactional analysis are the Ego states. Paul Federn coined the term Ego states. According to this, human personality comprises three "ego states". Ego states refer to a “pattern of behaviour”. As one grows up, one develops a certain behaviour pattern known as the Ego State. According to Dr Eric Berne, there are three ego states: parent ego, adult ego, and child ego. Each ego state consists of some common behavioural pattern an individual follows in various situations. Usually, their present-day reactions are based on their past experiences and feelings. Following is a brief detail on each ego state-

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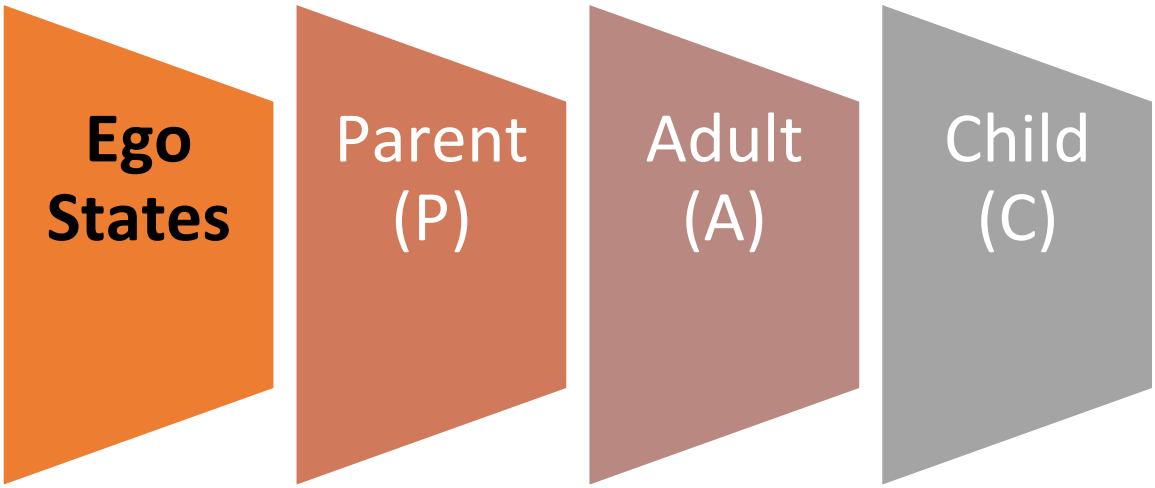

Fig5.1: Ego States

5.4.1 **The Parent Ego State:** Parent Ego refers to the personality attributes of values, attitudes, and behaviour of parents like people, inherited by a person when he was a child. An individual assimilates such behaviour from parent figures like a teacher, father, mother, brother, or any other person who is elderly and displays an advisory behaviour, which is copied by a child and subsequently displayed in his life when such situations arise. Either someone makes decisions for you, or they show protection and care. Both types of behaviour represent the "Parent ego". Parent ego can be of the following two types-

i. **Nurturing Parent Ego**: The nurturing parent ego state has attributes like empathy, comfort, and protection towards others. In this state, an individual tries to understand others and emanates empathy towards them. Actions taken from this state instil confidence and encourage others to go on and are full of appreciation for people and their positive behaviours. For instance, a person in this ego state will say, "*What can I do to help you*?

ii**. Critical Parent Ego:** The critical parent ego state is about blaming others and giving unconstructive criticism. It includes actions like – attacking other people, being extremely judgmental, not listening, and not being interested in an explanation. The critical parent will write you off as a person rather than deal with your behaviour. However, they are always ready to respond with a 'should or ought to almost anything that people tell them. For instance, an individual in his critical parent ego state will say, "*You must submit your assignment by evening*."

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Activity

Name that one friend in your friend circle-

a) Who normally suggests place, fix time, and decides do's and don'ts for the whole group.

b) Who says, "don't worry, I am with you", or "I'll help you in best possible manner" or shows care and concern.

5.4.2 **The Adult Ego State:** An adult's ego state refers to a pattern of behaviour where an individual behaves more logically. Past experiences do not influence such individuals and they believe in seeking facts and tend to reflect problem-solving behaviour. Their behaviour is inclined toward rational decision-making. They analyze the situation after going through the available facts and behave rationally. Logical thinking, thoughtful conversation and factual discussion are the cornerstones of an adult ego state. The adult ego state is stored by facts, not feelings and emotions.

5.4.3 **The Child Ego state:** The child ego state refers to a pattern of behaviour that could be characterized by spontaneous, impulsive, creative, and emotional components of personality. A child's Ego state could take two types, one is a happy child (no harm to anyone), and the second is a destructive child (behaviour might harm others or themselves).

People operating in this state usually act as they did when they were a child. The Child Ego State is primarily concerned with feelings though that does not mean that when in the 'here and now' experience, the person does not have access to attitudes and thinking, but it simply means that when activated, feelings are usually the executive energy force. People operating in this state act emotionally and make impulsive decisions. Immature behaviour characterizes this state. Anxiety, dependence, fear, hate, and conformity are other characteristics of a Child Ego State. Physical and verbal cues such as giggling, compliance, seeking attraction and coyness indicate the Child Ego State.

PARENT EGO	**ADULT EGO**	**CHILD EGO**
Teaching	Rationality	Spontaneous
Demonstrating	Objective	Impulsive

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Rules & Laws	Figuring out	Fantasizing
Dos and Don'ts	Estimating	Creativity
Truths	Evaluating	Experiencing joy/frustration

Conclusion: There is no general rule regarding the effectiveness of any ego state in any given situation. Each type of ego state may lead to positive or negative behaviour. It is not only about words but also tone, body postures, expressions, and gestures that reflect the ego state during the communication exchange. From an organizational perspective, learning and reflecting on the positive side of each ego state is essential.

IN-TEXT QUESTIONS

1. Fill in the blanks-
   a) There are three types of Ego states, namely, _____, _____, and _____.
   b) The transactional analysis (TA) theory is coined by _____.
   c) _____ coined the term Ego state.
2. MCQs

a) Child Ego state is the pattern of behaviour that could be characterized by-
   i) Impulsive
   ii) Creative
   iii) Spontaneous
   iv) All the Above

b) Adult Ego state is the pattern of behaviour that could be characterized by-
   I) Logical
   ii) Protective
   iii) Spontaneous
   iv) Controlling

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5.5 TYPES OF TRANSACTIONS

A transaction is a unit of social interaction consisting of an initiating message called the stimulus(S), and a reply called the response(R). The stimulus and response might be verbal or nonverbal, but they must be received and acted upon by both parties. In other words, a transaction is a relationship between two people in which one says or does something, and the other reacts. A transaction may involve any combination of ego states.

Transactions are forms of interactions that develop early in life, such as Parent-Child, Child-Child, or Adult-adult. For instance, young children, when ordered, become frightened or grumpy. Many years later, as grown-ups, they may get into a rut and reply to the same transaction.

Following diagrammatic representations elucidate the exchange of transactions between two people-

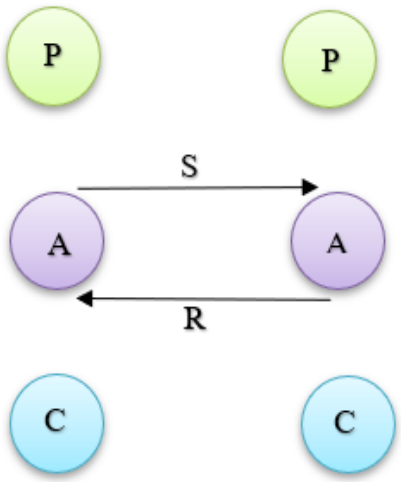

Fig.5.2: Transaction

An arrow passes from the ego state from which the stimulus(S) originates to the ego state which receives the message. The arrow represented by "R" shows the corresponding response(R).

Depending on the ego states of the persons involved in transactions, there may be four types of transactions: Complementary, Non-Complementary, Ulterior and Gallows.

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5.5.1 Complementary Transactions

A stimulus invites a response; this response becomes a stimulus for further response, and so on. Appropriate and Expected Transactions indicate healthy human relationships. Successful communication takes place when transactions are complementary.

Complementary Transaction = effective + complete communication

A transaction is complementary when a stimulus from one person gets the predicted response from the other. The transaction is complementary because both the interacting individuals act in the perceived and expected ego state. In such a transaction, both persons are satisfied, and communication is complete. A complementary transaction occurs when the lines between the sender's and receiver's ego states are parallel. Complementary transactions are of the following types:

i. **Adult-to-Adult transactions**: this is the most satisfactory transaction and leads to healthy communication. The individuals involved are rational, logical, and objective. Therefore, it is an ideal transaction within an organisation. It is the best type of communication, as it is respectful and reduces conflicts. The key to recognizing the Adult-to-Adult transaction is an unemotional exchange between the individuals.

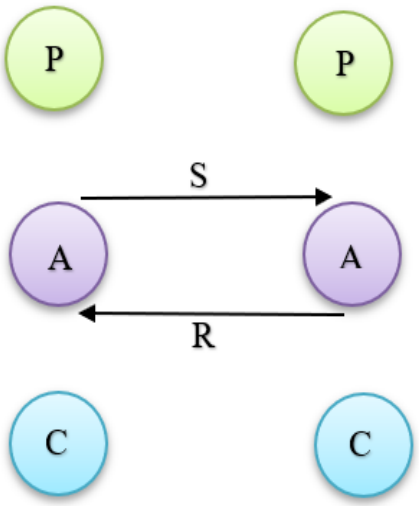

Fig.5.3: Adult-Adult Transaction

Supervisor: Have you finished your job? (A-A)

Employee: Yes. Sir, I finished it long back, and it has already been delivered to the assembly section. (A-A).

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The supervisor wanted to take stock of the work assigned to the employee. The employee responded from his adult ego state. As a result, both individuals had effective and complete communication.

ii. **Adult-to-Parent Transaction:** In this transaction, an individual sends a transactional stimulus as an adult to another individual. If the other individual responds from the nurturing parent's ego state, the communication will be smooth. On the other hand, if the response comes from a critical parent ego state, it could give rise to a conflict.

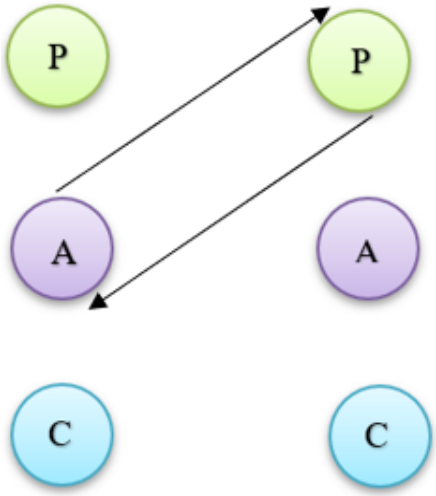

Fig.5.4: Adult-Parent Transaction

Employee X: Have you seen my file? (A-P)

Employee Y: No, but I can help you find it. (P-A)

An employee X enquired about his missing file. Employee Y responded from his nurturing parent ego state. As a result, both individuals had effective and complete communication.

iii. **Adult-to-Child Transaction:** In this transaction, an individual may send a transactional stimulus as an adult to another individual and gets a response from a child's ego state. Such a transaction is generally not seen on work premises.

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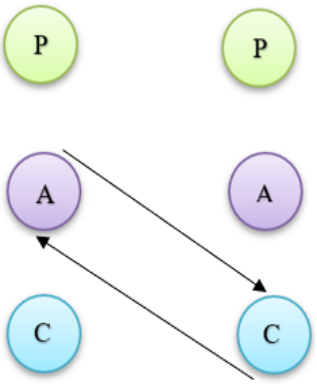

Fig.5.5: Adult-Child Transaction

Employee X: how are you? (A-C)

Employee Y: Aww, thanks for asking. I am doing great. (C-A)

Employee X wanted a normal howdy do with employee Y. Employee Y overwhelmed with emotions and responded from his Child ego state. Since employee X expected such a response from employee Y, the communication was successful.

iv. **Parent-to-Parent Transaction:** In this transaction, the manager uses rewards, criticism, rules, and admonitions. The transaction can be beneficial if the employee supports him. Otherwise, the two may be needless competition as the employees will try to push their ideas.

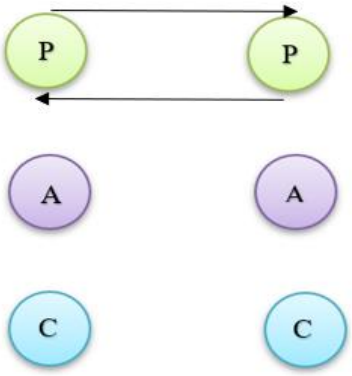

Fig.5.6: Parent-Parent Transaction

Superior: You must not unnecessarily experiment with things. (P-P)

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Subordinate: Great things don't happen without experiments. (P-P)

v. **Parent-to-Adult Transaction:** In this transaction, an individual sends a transactional stimulus as a parent to another individual and gets a response from an adult ego state. The stimulus uses dogmatic and overbearing language but gets countered with a logical reply. Therefore, conflicts over trivial matters are staved off.

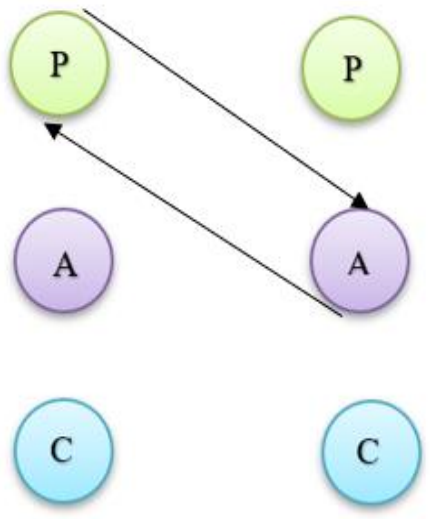

Fig.5.7: Parent-Adult Transaction

Employee X: you should sit straight. (P-A)

Employee Y: I have a backache. (P-A)

Employee X called employee Y on his sitting posture. Instead of snapping at him, Employee Y chose to reason with him and precluded a conflict.

vi. **Child-to-Child transactions:** In this transaction, an individual sends a transactional stimulus as a child to another individual and gets a response from a Child ego state only. Such a type of transaction is not suitable for a workplace. Both individuals act on whims, fancies, and emotions in this transaction. Therefore, the organization suffers badly, and the situation cannot last long.

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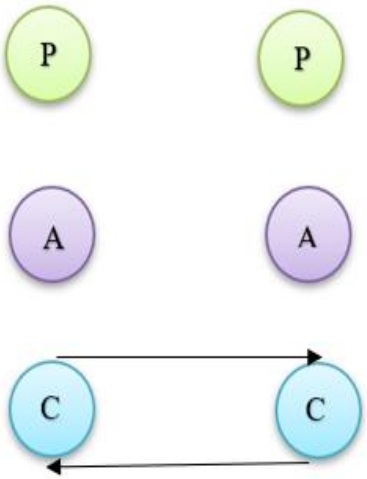

Fig.5.8: Child-Child Transaction

Employee X: Management should always think in favour of their employees. (C-C)

Employee Y: If management does not think in our favour, we will do the same towards them. (C-C)

Both employees are verklempt with emotion . In the short run, such a transaction is smooth for the individuals involved, but in the long run, it is not good for the organization.

vii. Child-to-Parent transaction:

Employee: To whom should I submit the file after completing it? (C-P)

Manager: You must always follow the chain of command for any official work. (P-C)

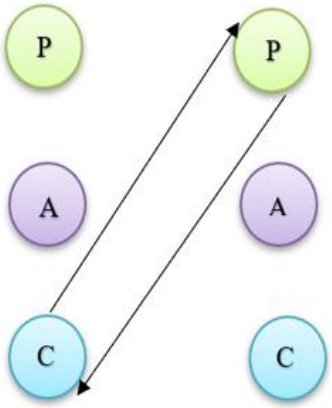

Fig.5.9: Child-Parent Transaction

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viii. **Parent-to-Child transaction:** when the manager interacts from the Parent Ego and the employee responds with the Child ego; this can be satisfying for both in the short run. Conflict and pressure are eliminated. But in the long run, the personality of the employee may remain underdeveloped, which may create a feeling of frustration.

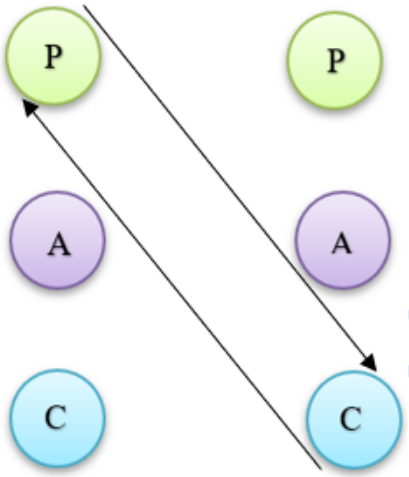

Fig.5.10: Parent-Child Transaction

Employee X: I am feeling under the weather today. I must go and see the doctor. (P-C)

Employee Y: Aww, I'll take care of you! (C-P)

Employee X acted from a parent ego state and received a response from Employee Y through a child ego state. The resultant transaction is complete communication. Nevertheless, such transactions are not preferred in a workplace since they may lead to the underdevelopment of employee Y.

5.5.2 Non-complementary transaction

A Non-complementary or cross-transaction occurs when the person who initiates the transaction does not get the response from the expected ego state. In such transactions the stimulus-response lines are not parallel.

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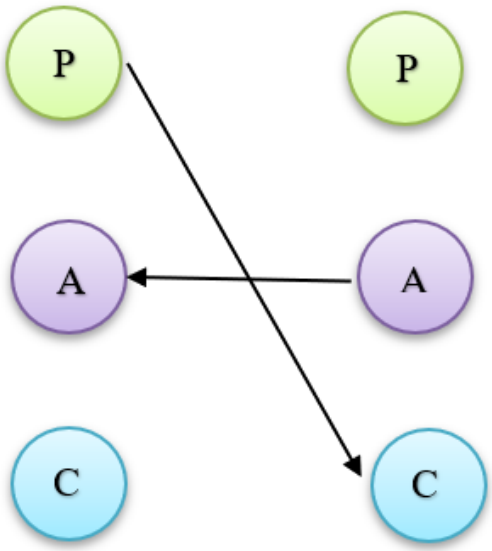

Fig.5.11: Cross Transaction

Supervisor: How many units have you made till now? (A-A)

Operator: Do not enquire frequently. I will inform you after completing it. (P-C)

The supervisor expected a rational response; instead, the operator got worked up and replied from a parent ego state. As a result, the communication was not successful.

Such a transaction will ultimately result in a dispute. Once the transaction is crossed, it results in unrest and dissatisfaction, leading to arguments and conflicts between the interacting parties.

5.5.3 Ulterior Transactions

We all have been in a conversation where it is all about the 'unsaid'. The real message is hiding behind the veil of social interaction. There is an overt and a covert message in such conversations. In transaction analysis, we call these interactions ulterior transactions.

In ulterior transactions**,** two messages are conveyed simultaneously — a social message on top and a psychological one at the bottom. So, it appears like the person is saying one thing, but there is something else he is trying to convey (left to the intelligence of the receiver).

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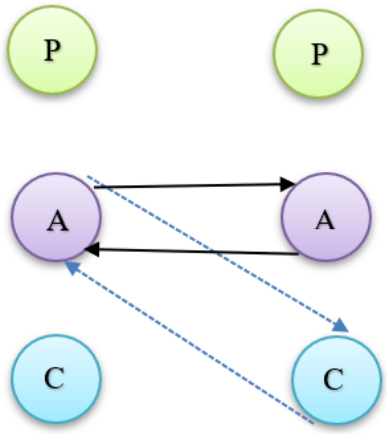

Fig.5.12: Ulterior Transaction

Now, these can be both enthralling and excruciating. Flirtatious games are a classic example of an exhilarating and enjoyable ulterior transaction. Whereas, on other occasions, the existence of a sub-text is downright unpleasant. Salespersons are usually adept at deploying ulterior transactions. Following is an example of an ulterior transaction at play in an organisation:

Supervisor: What time is it, Kunal? (Kunal reached late to the office, to which the manager asked him this question. On the surface, he is confirming the time, but he intends to highlight that Kunal is late to the office.)

Ulterior transactions occur when three or more ego-states interact at the same time. The interaction is at two levels — what the person says (the social message) and what he means (the psychological message).

Example:

Social Message (overtly spoken words):	**Psychological Message (covert message):**
Salesperson (S): This is the top-of-the-range model. (A-A) **Customer (R):** I'll take a look at it, please. (A-A)	**Salesperson (S):** I don't think you can afford this. (A-C) **Customer (R):** How dare you! I can buy this. (C-A)

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5.5.4 Gallows Transaction

Gallows transactions include laughs or smiles on the heels of a statement which is painful to the individual. The distinguishing mark of humour in the gallows transaction is that it isn't funny. Instead, the laugh serves as tightening the noose, and the destructive behaviour gets reinforced. **Example**: a teacher getting amused at the stupid behaviour of her student.

Conclusion: The adult-to-adult transaction is most effective in the organization because it is problem-solving, treats people as equals and improves understanding. Though the A-A transactions are the most desirable yet, other complementary or parallel transactions are also workable depending upon situations and the willingness of both superiors and subordinates to develop a workable relationship.

IN-TEXT QUESTIONS –

MCQs

3. In _____two messages are conveyed at the same time — a social message on top and the psychological message at the bottom.
   i) Ulterior transactions
   ii) Cross Transaction
   iii) Complimentary Transaction
   iv)Gallows Transaction
4.) When manager speaks to a subordinate as Parent to Child and Subordinate respond as Child to parent; then it is an example of –
   i) Ulterior transactions
   ii) Cross Transaction
   iii) Complimentary Transaction
   iv)Gallows Transaction
5.) When stimulus and response lines are not parallel it is known as –
   i) Ulterior transactions
   ii) Cross Transaction
   iii) Complimentary Transaction
   iv)Gallows Transaction
6.) "A mother smiling at a stupid behavior of her son" - Following is an example of:
   i) Ulterior transactions
   ii) Cross Transaction
   iii) Complimentary Transaction
   iv)Gallows Transaction

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5.6 NEED OF UNDERSTANDING TRANSACTIONAL ANALYSIS

Transaction Analysis is a prominent tool for positive change and growth. It is the study of how individuals introject certain behaviours, either by accident or from their early caretakers or authority figures and then continue to acquit themselves in that same behaviour pattern.

TA is a model for people to work towards 'autonomy', where they can choose to live the way they want to and not act as if they are controlled by past events or messages. Determination of one's ego state through TA helps them to be in the driver's seat of their way of life. An understanding of the TA can help the person change their life's script and choose to rewrite it without being hooked on to the inappropriate behaviours of the past.

Before moving ahead, let us understand some commonly used jargon in transactional analysis.

a. **Script:** A story we have learned and internalized about ourselves. Negative stories about us or others tend to result in dysfunctional social outcomes. The script itself tends to be out of our conscious awareness.

b. **Games:** We all have our scripts and engage in various "games" that generally involve winners and losers. Games in Transactional Analysis have been defined as: "a series of duplex transactions which leads to a 'switch' and a well-defined, predictable 'payoff' that justifies a not-OK, or discounted (less-than) position." In a transactional game, we act out our internalized script and things go well for a while. Then, we receive the "strokes" we expect to get from acting out our script instead of being vulnerable and authentic until things inevitably go south – the "switch" – and then we get the "payoff."

c. **Strokes:** The pleasant or familiar thoughts and feelings we receive from playing social games with our internalized scripts.

d. **Switch:** The moment when our internalized script's utility breaks down. This is usually when the script prevents us from expressing our authentic identity at that moment. We begin to feel sad, confused, and angry.

e. **Payoff:** The usual, expected result of our game, wherein we end up feeling a loser or less-than.

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5.7 LIFE POSITIONS

A child is like a clean slate. However, in the process of growing up, he wades through a lot of experiences and emotions. These experiences lay the groundwork for making assumptions about their self-worth and the worth of significant people in the environment.

Thomas Harris has called these assumptions life positions, which tend to be firmer than the ego states. During our formative years, we make decisions about ourselves, our world, and the people around us. These decisions get built upon the pattern of strokes we receive from our parents and primary caregivers. These decisions lead us to accept one of our four basic psychological life positions. Once a life position gets decided, it drives our patterns of thought, emotion, and behaviour. The positions are acquired very early, i.e., in childhood, and stay throughout our life. Life positions develop an individual's perception, which may be positive or negative. In this way, four "Life Positions" may be generated as shown in the following figure-

- **I am OK-You are OK: T**his is the ideal life position. People with this life position have healthy relationships and a positive outlook. They are cordial, forthcoming and accepting of themselves and others. Managers working from this life position feel comfortable delegating authority as they have confidence in themselves and their subordinates. This life position is based upon the adult ego state.

- **I am OK-You are not OK:** is occupied by those who project their difficulties onto others. They are blaming and critical. Transactional games that reinforce this position involve a self-styled superior (the "I am OK") who projects anger, disgust, or disdain onto a designated inferior or scapegoat (the "You are not OK"). This position requires someone to be 'worse than' to maintain the sense of self as OK. Managers in this life position consider delegation of authority a threat because they do not trust others. These are the individual who possesses the rebellious child ego.

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YOU ARE OK

I am OK **You are OK** (The Healthy Position)	**I am not OK** **You are OK** (The One-down Position)
I am OK **You are not OK** (The One-up Position)	**I am not OK** **You are not OK** (The Hopeless Position)

I AM OK

I AM NOT OK

YOU ARE NOT OK

Fig.12: Life Positions

- **I am not OK-You are OK:** People with this life position feel powerless and keep grumbling. They think others are more competent and have fewer problems. Managers working in this life position are unpredictable and erratic in behaviour. They use their bad feelings as an excuse to act out against others.
- **I am not OK-You are not OK:** is a position of hopelessness, futility, and frustration. From this position, life seems uninteresting and hopeless. It may result in self-destructive or violent behaviour. Managers in this life position neither take decisions on time nor properly delegate authority.

Out of these positions mentioned above, the ideal one is **"I am OK – You are Ok",** This is because:

- It indicates healthy acceptance of self
- It demonstrates respect for others.

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- It is likely to result in better communication.
- It is expected to result in better performance behaviours.

The other three life positions are less mature and less effective. Thus, the life positions talk about the individual developing his identity, sense of worth and perception of others during childhood. Once a person has decided on a life position, that will often remain fixed unless considerable effort is made to change the underlying beliefs and decisions about life. Transactional analysis psychotherapy aims to bring awareness, explore, challenge, and change an ineffective life script. It is based on the belief that because we were the original creators of our script, we have the power to change it.

IN-TEXT QUESTIONS –

MCQs

7. _____ are more permanent than _____

i) Life Positions; Ego States

ii) Ego States; Life Positions

iii) Ego States; Psychological Games

iv) Psychological Games; Life Positions

8) _____ is an ideal life position-

i) I am Ok; you're not OK

ii) I am Ok; you're OK

iii) I am not Ok; you're not OK

iv) I am not Ok; you're OK

9) _____ -people tend to feel that whole world is miserable

i) I am Ok; you're not OK

ii) I am Ok; you're OK

iii) I am not Ok; you're not OK

iv) I am not Ok; you're OK

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5.8 STROKE ANALYSIS

From our earliest beginnings, in utero, we depend on another person. We are born needing and seeking contact, with an innate sense that we can't survive without it. Throughout our lives, we receive this contact through various types of verbal and nonverbal communication:

- a smile
- a hug
- praise for something we do or who we are
- a challenge to something we do or who we are.

In transactional analysis, these modes of contact are called strokes. Eric Berne described strokes as a unit of recognition, one person acknowledging another by way of act or speech.

5.8.1 Types of strokes:

- positive and negative
- verbal and nonverbal
- conditional and unconditional.

Telling someone that we love them is an unconditional positive stroke (the ultimate one) whereas telling someone that we love their cooking is a conditional positive stroke. The former strokes the person's entire being, whilst the latter strokes one aspect of their being. Conversely, telling someone, you don't like their cooking is a conditional negative stroke and telling someone you hate them is the ultimate unconditional negative stroke.

Throughout life, this communication develops our personality, informs our sense of self-worth, and defines our beliefs in ourselves, the world, and others. Depending on the type of strokes we receive before adulthood, we end up in one of four life positions, as defined in TA.

If the strokes we receive through childhood are appropriate to our age and stage of development and are a balanced mix of positive and negative, as needed, then we are likely to grow up with a sense of "I am OK-You are OK". In TA, this life position describes a balanced emotional and cognitive outlook on life.

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However, if the balance of strokes has veered far to the positive, contained too many negatives or been an inappropriate mix, then we are likely to struggle with a fair sense of self and the world.

Those brought up with too many positive strokes might hold the life position of I am OK-You are not OK and struggle to see the others' point of view, having developed an over-inflated sense of self-worth.

On the other hand, children who receive too many negative strokes (or not enough positive ones) can grow into adulthood believing others to be more important than themselves; this life position is called I am not OK- You are OK. Alternatively, they might hold the life position of "I am not OK. You are not OK" with little hope for themselves and seeing little good in the world.

5.9 PSYCHOLOGICAL GAMES

Games in Transactional Analysis are "a series of duplex transactions which leads to a switch and a well-defined, predictable payoff which justifies a not-OK, or discounted, position".

Let us have a look at what that means. Firstly, what is a duplex transaction? A duplex transaction is where we say one thing and mean another. Only about 8% of our communication is through words; the rest is through tone, body language and facial expressions. Berne observed that whenever we say one thing (the social message) and mean another (the psychological massage), it is always the psychological message that gets heard.

We tend to open games with duplex transactions, not saying what we really mean. Then, the game will deliver positive strokes until the "switch" clicks in. The switch is the point at which things suddenly feel like they are going wrong. It is the point at which we may feel confused, scared, angry, or whatever our racket feeling usually is. This leads quickly to us taking a "payoff". It confirms that whatever negative (untrue) thoughts we have held onto about life are true.

Let us give an **example** of a game and take it apart using the language introduced above. Let us take the game "*Yes, But*". In this, one person has a problem, and another is invited to solve it. Everything the other person suggests is rejected with a "*Yes, I could do that, but... (insert reason for not doing that)*". We all know people who play this. We may even play it ourselves.

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Whilst it may appear the player is asking for help on the social level, what they are really doing on the psychological level is proving that they can't help and no one else can control them. The switch comes when the other person gives up trying. The payoff for the player is proof that no one can help them even though they remain passive. Feelings of sadness or anger may accompany this.

The other player in this game may feel helpless and frustrated that they have been unable to help the starter of the game – these feelings are likely to be very familiar too and reinforce a belief that they are not a very good friend, problem solver, therapist, etc. It takes two to play a game.

Why do we play games?

Games are a way in which we can get strokes without risking intimacy and confirm our beliefs (mostly wrongly held ones) about life.

How do we stop Playing games?

The first thing we need to do is identify what games we are playing. Ask yourself what patterns keep emerging in your life? What predictable events occur? What feelings do you often end up having? Spot the games and bring them into the light, where you can chew them over and decide whether you want to keep on playing or do things differently, avoiding the negative payoff.

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IN-TEXT QUESTIONS

MCQs

10) . _____ proposed the concept of life positions.

i. Thomas Harris

ii. Eric Berne

iii. Paul Federn

iv None of the above

11. _____ is basic unit of motivation.

i. Stroke

ii. Life Positions

iii. Ego States

iv. Script Analysis

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5.10 JOHARI WINDOW

Johari window is a framework developed by two psychologists, Joseph Luft and Harrington Ingham, who combined their first names to name the model. It is a widely used model to understand and train self-awareness and biases for personal development and to improve communications, group dynamics, team development, interpersonal relationships, and inter-group relationships.

People using the framework engage in two primary ideas, acquiring trust by revealing information about oneself to others and receiving feedback to learn more about themselves. The Johari Window model captures such information (feelings, attitudes, opinions, intentions, etc.) from four perspectives, as shown in the four quadrants.

	Known to self	Not known to self
Know to others	OPEN AREAN or ARENA	BLIND SPOT
Not known to others	HIDDEN AREA Or FACADE	UNKNOWN

Fig.5.14: Johari Window

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- **Open Area** (*Anything about yourself that you're willing to share with others)*: This is the region where actions, behaviours, and information are known to the individual and those around him. This type of interaction is marked by openness and compatibility and has a very little possibility for defensive feelings and behaviour. An "Open Area" is desirable as a team because when we work in this area with others, we are at our most effective and productive. This is the space where good communications and cooperation occur, free from distractions, mistrust, confusion, conflict, and misunderstanding. Soliciting feedback can help increase this area horizontally to reduce the blind spot while sharing one's feelings, and can extend the area vertically, reducing the hidden area.

- **Blind Area:** (*Anything about oneself that you are unaware of but that others have become aware of):* It reflects behaviour, feelings and motivation known to other parties but not to self. A person's observable habits, manners, feelings, etc., may be unknown to the self but known by others. Others may interpret these actions differently than what one expects them to. In fact, an individual may even annoy others unintentionally. This area could also be referred to as ignorance about oneself or issues in which one is deluded. Seeking feedback can help reduce this blind spot.

- **Hidden Area:** (*Anything about yourself that you are reluctant to reveal to others is in the hidden area):* It reflects behaviour, feelings and motivation known to self but not known to others. In other words, the individual understands themselves but does not know about others. The individual tends to be hidden from others for fear of their reactions. The true feelings or attitude of the individual may remain a secret from others. It also includes sensitivities, fear, hidden agendas, manipulative intentions, and secrets- anything that person knows but does not reveal. Individuals are reluctant to share such information as it may affect their relationships. Disclosing information to others can help decrease the hidden area.

- **Unknown Area:** Any region that neither you nor anyone else is familiar with is the unknown area. The information in this quadrant is mysterious and has unknown potential. This includes subconscious information such as early childhood memories, undiscovered talents, etc. These feelings and motivations remain unclear till people allow these to surface. Uncovering 'hidden talents' that is unknown aptitudes and skills should not be confused with developing the Johari 'hidden area'. It is another aspect of developing the unknown area and is not as sensitive as unknown feelings. The unknown area could also include repressed or subconscious feelings rooted in formative events and past traumatic experiences, which can stay unknown for a lifetime.

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There are two interpersonal processes of 'disclosure' and 'feedback', which cause the redistribution of awareness and changes in the size and form of the four quadrants. The model assumes that an 'open self' becomes larger, and the relationship tends to be more rewarding and productive. Thus, the model is dynamic and sensitive, especially to the interpersonal application of 'disclosure' and 'feedback'. The 'hidden self' can be reduced, and the 'open self' can be increased through disclosure.

The 'blind area' can be reduced by seeking feedback from others, thereby increasing the open area i.e., to increase self-awareness. Therefore, managers must promote a climate of non-judgmental feedback and group response to individual disclosure and reduce fear.

In the 'hidden area', relevant hidden information and feelings, etc., should be moved into the open area through the process of 'self-disclosure' and 'exposure' process. The extent to which an individual discloses personal feelings and information must always be at the individual's discretion. Organizational culture and working atmosphere significantly influence team members' preparedness to disclose their hidden selves.

The use of self-disclosure forms a mechanism for sharing awareness with others. However, self-disclosure involves risk for the individual, and the outcome must be worth the cost. Likewise, the 'feedback' process can decrease 'the blind self 'and simultaneously increase the 'open self. In other words, others must give, and the individual must use the 'feedback' in social encounters. It forms the means whereby the individual encourages, supports, and presents himself as open to the disclosure of others. In this context, the active solicitation of feedback data in social interactions is essential.

IN-TEXT QUESTIONS –

12. Fill in the blanks-

    a) _____ developed the model of Johari Window

13. State True/False

    a) There are five quadrants in the model of Johari Window

    b) Undiscovered/ or unknown self is also termed as mysterious

14. MCQs

    Which process can cause change in the size & form of the four Johari Window quadrants:

    a) Suppression
    b) Feedback
    c) Disclosure
    d) Both B&C

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5.10.1 Application of Johari Window in Business

The Johari window serves as an essential tool to analyse the employees' potential, work on organizational relations, and improve team performance.

The other people associated with the business also contribute to organizational improvement and development. These are the financial institutions, shareholders, customers, suppliers, etc.

Taking into consideration the known and unknown facts by the company and the customers, the Johari window provides us with four quadrants.

Let us see the various ways of modifying business relations using this model:

Feedback to Reduce Blind Area

Taking constant feedback from the customers and knowing about the competitive products the consumers may prefer; makes the company aware of customer satisfaction level, product performance, consumer loyalty, level of competition, etc.

Being updated with the market trend and response diminishes the blind spot of the organization.

Move Out of your Comfort Zone to Decrease Unknown Area

Innovation leads to learning, and learning contributes to growth and development.

Therefore, the organization must explore new possibilities or diversify into new products or means of production through proper research and development, to increase market share and profitability.

Exploring the untapped opportunities and developing new ideas can maximize the open area by diminishing the unknown region and shrinking the blind spot and the hidden area.

Disclosure to Reduce Hidden Area

At times, some strengths or positive traits of the product or the organization are not promoted. As a result, these may not be known to the customers creating a hidden area for the organization.

Therefore, the organization must reveal its strengths, like the premium quality of raw materials used, the better shelf life of products, etc., to develop customers' trust and loyalty.

Conclusion

As we know that all four quadrants are unique but to maintain transparency and cordial relations within a team, it is essential to maximize the open area.

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Thus, the Johari window aims to improve interpersonal relationships, behaviour, attitude, and skills within an organization by continually assessing the scope of growth.

5.11 SUMMARY

Transactional Analysis is one of the most accessible theories of modern psychology. In the 1950s, Eric Berne began developing his Transactional Analysis theories. He said that verbal communication, particularly face-to-face, is at the centre of human social relationships and psychoanalysis. Transaction refers to the communication between two persons. The transaction could be both Complementary and Cross in nature. Healthy communication occurs when individuals follow Complementary Transactions, whereas Crossed Transaction causes most difficulties in social situations. The concept of ego states, life positions, psychological games, strokes, and the Johari window could help us understand how interpersonal relationships could become smooth. This life position influences our behaviour when we interact with others. The Life Position refers to the specific behaviour towards others that an individual learns based on certain assumptions made very early in life. Life positions develop an individual's perception, which may be positive or negative. Johari Window Model is dynamic to the interactive processes of disclosure and feedback. It assumes that interpersonal relationships tend to be more productive and rewarding as one's "open self' expands.

5.12 ANSWERS TO IN-TEXT QUESTIONS

1.a) Adult, Child, and Parent	7. Life Positions; Ego States
b) Eric Berne	8. I am Ok; you're OK
c)Paul Federn	9. I am not Ok; you're not OK
2.a) ALL the above; b) Logical	10. Thomas Harris
3. Ulterior transactions	11. stroke
4. Complementary Transaction	12. a) Joseph Luft and Harry Ingham
5. Crossed Transaction	13. a) False; b) True
6. Gallows Transaction	14) Both b and C

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5.13 SELF-ASSESMENT QUESTIONS

1. "Transactional analysis tends to improve interpersonal communication". Comment. Also, explain the utility of transactional analysis.
2. Explain three ego states with suitable examples.
3. Discuss the concept of Life Positions. Name the "ideal life position". Also, explain the utility of understanding life positions to a manager.
4. Explain the concept of the Johari Window. How can it help in improving interpersonal relations?
5. State the implication of Johari Awareness Model.

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LESSON-6

MOTIVATION AT WORK

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STRUCTURE

6.1. Learning Objectives
6.2. Introduction
6.3. Process of Motivation
6.4. Approaches to Motivation
 6.4.1. Cognitive Models
 6.4.2. Content Theories
 6.4.3. Process Theories
 6.4.4. Non-Cognitive or Reinforcement Model
6.5. Maslow's Need Hierarchy Theory
 6.5.1 Appraisal of Maslow's Need Hierarchy Theory
6.6. McClelland's Theory of Needs
 6.6.1. Implication Of McClelland's Theory of Needs
6.7. Alderfer's ERG Theory
6.8. Herzberg Two Factor Theory
 6.8.1. Contribution of Herzberg's two Factor Theory
 6.8.2 Relationship Between Herzberg's Theory and McClelland's Theory of Motivation
 6.8.3. Appraisal of Herzberg Two Factor Theory
6.9. Comparison Between Maslow's & Herzberg's Theory of Motivation
6.10. Theory X and Theory Y

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6.11. Vroom's Expectancy Theory
6.12. Equity Theory
6.13. Goal Setting Theory
6.14. Reinforcement Theory
6.14.1. Schedules of Reinforcement
6.14.2. Behaviour Modification and Reinforcement
6.15. Types of Motivation: Cognitive Evaluation Theory
6.15.1. Intrinsic Motivation
6.15.2. Extrinsic Motivation
6.16. Application of Motivation Concepts
6.16.1. Job Design and Motivation: The Job Characteristics Model (JCM)
6.16.2. Redesigning of Jobs to Motivate Employees
6.17. Alternative Work Arrangements
6.18. Management by Objectives (MBO)
6.19. Employee Involvement Program
6.20. Summary
6.21. Answers to In-Text Questions
6.22. Self-Assessment Questions
6.23. References
6.24. Suggested Readings

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6.1. LEARNING OBJECTIVES

At the end of this lesson, the student should be able to-

- Define Motivation
- Explain the need for and process of motivation in an organisation.
- Develop an understanding of the importance of motivation in an organisation.
- Explain various theories of motivation.
- Differentiate between content and process theories of motivation.

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Opening Case Study

Amrita and Shweta together has recently joined "Edu Drive". Edu drive is an innovative learning organisation that collaborates with various schools and promotes the concept of experiential learning. The office is near to Amrita's house, Amrita finds the job suitable to her in terms payment and location. Whereas it takes 30 minutes to Shweta to reach office. At the Edu Drive, Amrita works under the supervision of Mr Das, and Shweta works under the supervision of Mr Jain. As managers, Mr Jain and Mr Das are quite different.

Mr Jain supports job rotation, employee participation, equal treatment to all subordinates, etc. He assigns different tasks each week to reduce boredom; this also allows employees to understand how the tasks are operated Edu drive, as they are allowed to do a variety of tasks. For instance, Shweta has worked at the content/ PowerPoint presentation development, video development, and addressing queries through online portal. In addition to this, Mr Jain also motivates Shweta to address concerns of teachers in case of urgency.

Mr Das, on the other hand, feels it is essential to specialize in a particular task, due to which he prefers repeating the same task repeatedly. For instance, Amrita has only worked on Organizing and formatting the content and PowerPoint presentations.

Mr Das supports specialization and is very particular about time. According to him, monetary and non-monetary benefits could vary from person to person. Two employees in the same position could receive different benefits based on their performance.

On a fine day, Amrita met Shweta at lunch. Since morning Amrita has been formatting documents. During lunch hour, Amrita shared her awful experience with Shweta.

Amrita - I am tired of this monotonous job. Every day I do the same thing

Shweta - Why don't you tell Mr Das you want something else? I have heard he allows Daisy to work in other areas, even though I have heard daisy is paid $2 more an hour. Is that true?

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Opening Case Study…. Continue

Amrita - Yeah, though I do exactly what she does. What I don't do is tell Mr Das how cool his dressing sense is. If you ask me, his dressing sense is pathetic.

Shweta - That's bad. You put in equal effort.

Amrita - Efforts? In what? Formatting ppts. This job is so meaningless. Even if I format more documents what will I get, another badge that says a good job.

Anyhow, what about you? How's your job going?

Shweta - Pretty good. Today Mr Jain and I discussed targets that I have to achieve in the next week. It is to counsel 40 teachers at TGT level. Through my contacts, If I succeed in doing so, then I'll get a bonus of $75. It is difficult, but I want to give it a shot.

Amrita - Good to know. I would have left this job if I didn't have monetary constraints.

Shweta - Look at the brighter side; you are paid more than Rahul. Rahul joined before you joined.

Amrita-True. Rahul gives way too much effort, and to me, it doesn't even make sense. If daisy is getting more pay, then I think daisy should also take all responsibilities as well.

Shweta - I understand. Mr Jain is the best supervisor.

Amrita - (while looking at the watch) yeah, I am getting late; Mr Das is very particular about time. He expects his subordinates to reach 5 minutes before time. I think it's time to format documents.

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6.2. INTRODUCTION

A manager's responsibility is to inspire staff to perform their tasks effectively. So how do managers accomplish this? The solution is "Motivation", the process through which managers make employees more productive and effective. It is the process in which basic need leads to creating drives aimed at a goal. Highly driven people put in much effort at their jobs, whereas those who lack motivation do not. Employees who are "happy" are sometimes mistaken for those who are "motivated." These may be connected, but motivation reflects the degree of drive workers have to work hard regardless of their level of enjoyment. It is a force that directs employees to act in a certain way. Motivated employees are more productive and engaged and feel more immersed in their work.

The phenomenon of motivation is complex, with multiple definitions. The common frame of reference contains one of the following words in the definition: drives, goals, incentives, desires, wants, and needs. The motivation process accounts for an individual's intensity, direction, and persistence of effort toward achieving a goal. The concept of motivation is situational, and its level varies between different individuals and at different times. If you understand what motivates people, you have the most powerful tool for dealing with them at your command. Motivating employees is one of the most crucial roles of management. It includes the skills of communicating, leading by example, challenging, encouraging, obtaining feedback, involving, informing, briefing, and rewarding. Motivation is a catalyst since it impacts the intensity of willingness and the level of work a person puts forth to attain organisational goals.

6.3. PROCESS OF MOTIVATION

The motivational process begins with identifying an employee's needs and drives. Needs are the deficiencies a person experiences at a particular point in time that makes specific outcomes appear attractive. These deficiencies cause psychological (e.g., need for recognition) or physiological (e.g. need for water, shelter, or food) imbalances within the individuals. The deprived person, in turn, examines the environment (surroundings) to find the sources to gratify these imbalances. An unsatisfied need often acts as an energizer as they create tension within the individuals. Therefore, employees explore ways to satisfy them.

Next comes the effort given by employees within a context of opportunity (resources at disposal) to bridge the gap. Actions should be goal-oriented, as motivation is primarily goal-

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directed. Goal-directed efforts lead to performance towards which skill and technology (i.e., ability) undoubtedly contribute significantly. In the next phase, if performance is suitably rewarded, it results in need satisfaction. Finally, once the employees have received rewards, they reassess their needs.

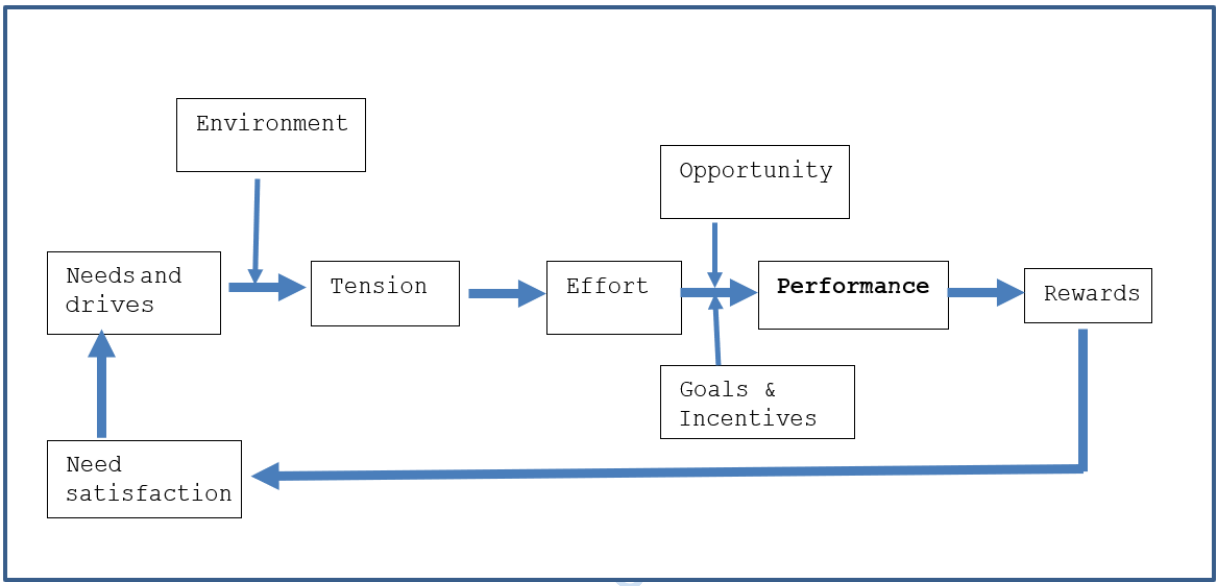

Figure 1 Process of Motivation

The managers today have a challenge to cater to diverse employees and their needs to help employees get attuned to working in different cultures. Training and retaining the exemplary employees and supporting their growth is another reason managers need to utilize the insights and implications suggested by motivational theories. Several theories attempt to explain how motivation works. The foundation of these motivation theories took place during the 1950s. In management circles, probably the most popular explanations of motivation are based on the needs of the individual. However, there has been a shift in the business environment with regard to globalization in terms of the blending of work cultures and social cultures, increasing participation of women, raising awareness of the issue, and increased competition. All this has made motivation an even more prominent subject.

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6.4. APPROACHES TO MOTIVATION

Several theories attempt to explain how motivation works. The theories could be broadly categorized into Cognitive and non-cognitive models.

6.4.1. Cognitive Models: The cognitive model of motivation consists of theories that focus on the human mind's internal state. The focus is on mental processes that emerge from human needs, desires, expectations, and drives. Theories under the cognitive model could be further subdivided into Content and Process theories.

6.4.1.1. Content Theories- Content (or need) theories of motivation focus on factors internal to the individual that energize and direct behaviour. These theories suggest that people have certain needs and/or desires which are internalized. In general, such theories regard motivation as the product of internal drives that compel an individual to act or move (hence, "motivate") toward satisfying individual needs. It answers the following question-

"WHAT MOTIVATES EMPLOYEES?"

The motivation process starts with specific unsatisfied needs (as mentioned above). These psychological and physiological needs create tension in the mind of employees. The employees explore ways and act in a particular manner to satisfy these unsatisfied needs. Content theories explain different types of needs within employees. Following are some popular content theories-

- Maslow's Need Hierarchy Theory
- Herzberg's Motivation Hygiene Theory
- Alderfer's ERG Theory
- McClelland's Needs Theory

6.4.1.2. Process Theories: Process theories are concerned with determining how individual behaviour is directed and maintained in the specifically self-directed human cognitive processes. Process theories of motivation are based on early cognitive ideas which posit that behaviour results from conscious decision-making processes. It looks at what people are thinking about when deciding whether to put effort into a particular activity. It answers the following question-

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- **HOW MOTIVATION OCCURS?**

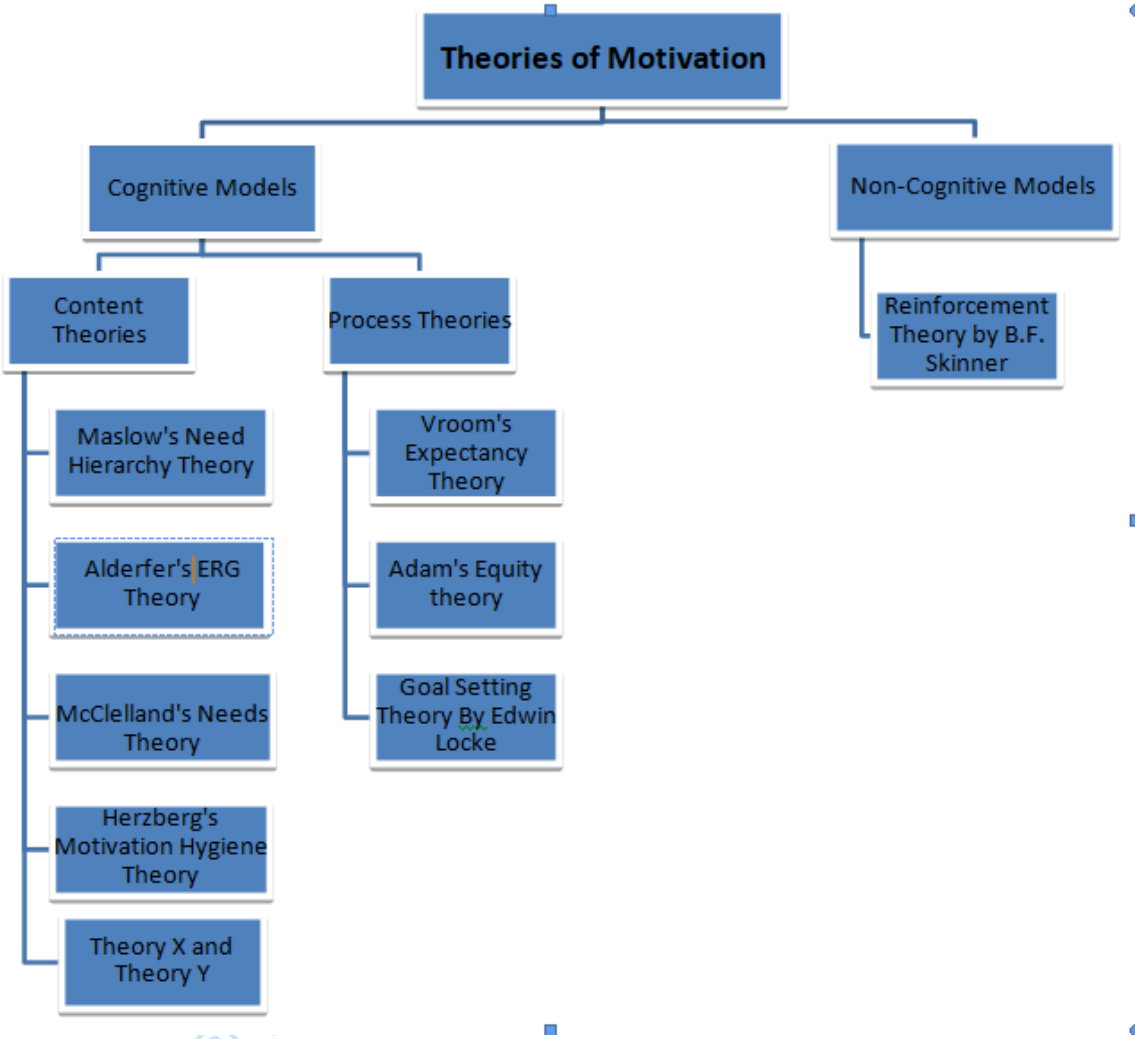

Figure 2 Cognitive and Non-Cognitive Models of Motivation

Process theories explain process within the human mind that leads to motivation. Following are some popular process theories-

- Vroom's Expectancy Theory
- Adam's Equity theory
- Goal Setting Theory

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6.4.2. Non-Cognitive or Reinforcement Model: Unlike the cognitive model, which focuses on the internal state, the non-cognitive model focuses on external forces. If an action is rewarded, the employee is motivated to repeat the action. Similarly, if action is punished, employees will be motivated not to repeat it. A manager could use various external forces, like rewarding, punishing, ignoring, etc., to motivate employees to behave in a particular manner. Both cognitive and non-cognitive models are complementary to each other. It is not mutually exclusive. It means both models work together to motivate employees.

IN-TEXT QUESTIONS

3. Fill in the blanks-

2. The motivational process begins with identifying an employee's ____ and _____.
3. These theories of motivation could be broadly categorized into _____ and _____ models.
4. Cognitive model of motivation consist of theories that focus on _____.
5. Theories of motivation under cognitive model could be further sub-divided into_____ and _____.

4. MCQs

c) Content theories does not include:

v) Maslow's Need Hierarchy Theory

vi) Herzberg's Motivation Hygiene Theory

vii) McClelland's Needs Theory

viii) Adam's Equity theory

d) Process theories does not include:

i) Alderfer's ERG Theory

ii) Goal Setting Theory By Edwin Locke

iii) Vroom's Expectancy Theory

iv) Adam's Equity theory

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6.5. MASLOW'S NEED HIERARCHY THEORY

It is one of the popular motivation theories given by A.H. Maslow. Maslow suggested that employees' needs are arranged in a particular hierarchy (as shown in figure 3). As lower-order needs are satisfied, the hierarchy's next need becomes dominant. From the standpoint of the theory, we could say that no need is ever gratified. A substantially satisfied need no longer motivates. Maslow separated the needs into higher and lower-order needs. Physiological and safety needs are lower-order needs, while higher needs are social esteem and self-actualization. The differentiation is that the higher-order needs are satisfied only within a person, and the lower-order needs are satisfied by material things. Following is a brief on various categories of need as mentioned by Maslow-

- Physiological Needs: Physiological needs are basic needs that are important for human survival, like water, food and shelter. Unless these basic needs are fulfilled, other needs won't be able to motivate employees.
- Safety and security Needs: Once physiological needs are met, one's attention turns to safety and security needs. Such needs might be fulfilled by living in a safe area, medical insurance, job security and financial reserves.
- Social Needs: Employees are social beings. The need for social circle and belongingness remains important. Social needs are the first higher-level wants that become essential after a person has satisfied their lower-level physiological and safety requirements.
- Ego or Esteem Needs: Esteem needs may be classified as internal or external. Internal esteem needs are related to self-esteem, such as self-respect, independence, and achievement. External esteem needs are such as social status and recognition. Some esteem needs are self-respect, attention, recognition, and reputation.
- Self-Actualization: It is the quest of reaching one's full potential as an individual. Unlike lower-level needs, this need is never fully satisfied as one matures. There are always new opportunities to continue to grow. Self-actualized people tend to have needs such as truth, justice, wisdom, and meaning. Self-actualized persons have frequent occurrences of peak experiences, which are energized moments of profound happiness and harmony.

Note: However, not all people are driven by the same needs - at any time, different people may be made by entirely different factors. To motivate employees, managers must recognize

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the needs level at which the employee is operating and use those needs to motivate employees.

6.5.1 Appraisal of Maslow's' Need Hierarchy Theory

The theory suggests that needs follow a definite sequence. However, due to cultural differences, this may not hold. Some cultures appear to place social needs before others (for example, Spain and Belgium workers felt this way). Similarly, some assumptions might not work in all cases; for example, employees won't move to the next level need unless a lower need is fulfilled. Also, satisfied needs won't motivate employees further. Finally, there is little evidence to suggest that people are motivated to satisfy only one need level at a time, except when there is a conflict between needs. A "multiplicity of motives often guides employees". Even though Maslow's hierarchy lacks scientific support, it is pretty well-known and is the first theory of motivation to which many people are exposed.

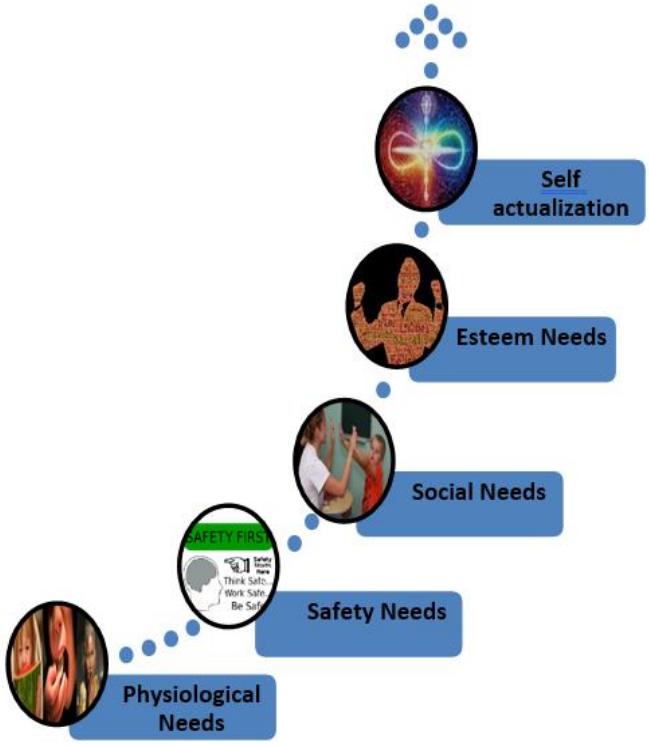

Figure 3 Maslow Needs Hierarchy Theory

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6.6 MCCLELLAND'S THEORY OF NEEDS

Three need model is formulated by `David McClelland'. David McClelland proposed that an individual's specific needs are acquired over time, shaping one's life experiences. The needs can be classified under three categories: Achievement, Affiliation, and Power. Also termed as the need for affiliation (n Aff), the need for power (n Pow), and the need for achievement (n Ach).

Figure 4 Three Need Theory

Need for achievement (n Ach) refers to the drive to excel, grow, strive, and succeed to a set of standards. People who need achievement differentiate themselves from others by their desire to do things better. They try to seek situations where they can achieve rapid feedback on their performance. Such individuals set moderately challenging goals. They are not gamblers, but they take up situations where the probability of winning is 50 -50. Such individuals also prefer to work hard and take personal responsibility for failures.

Need for power (n Pow): The need to make others behave in a particular manner in which they wouldn't have acted otherwise. The need for power is the desire to have an impact on others or to be able to influence or control others. Individuals with high 'Power Need' enjoy being in charge and prefer to be placed in competitive and status-oriented positions. McClelland categorized power into two categories, namely, institutionalized and personalized

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power. Here institutionalized power refers to the power used for social benefit, and personalized power refers to the power exercised for individual gain.

Need for affiliation (n Aff): The desire for friendly and close interpersonal relationships. It refers to the need for affiliation, i.e. the desire to be liked and accepted by others. Individuals with this need strive to maintain friendships and prefer cooperative situations.

6.6.1. Implication of the McClelland's theory of needs

David McClelland's Human Motivation Theory gives a manager a way of identifying people's motivating drivers. It can help get praise and feedback effectively, assign suitable tasks, and keep oneself highly motivated.

Certain problems have also been identified in theory: The degree to which we have each of the three needs is difficult to measure, and therefore the theory is difficult to put into practice. It is more common to find situations where managers aware of these motivational drivers label employees based on observations made over time. Therefore, the concepts are helpful but not often used objectively.

6.7. ALDERFER'S ERG THEORY

The ERG theory is an extension of Maslow's hierarchy of needs. The theory was developed to reduce the overlap between the five needs described by Maslow. Maslow's need theory was condensed into three types of needs, namely, existence, relatedness, and growth by Alderfer. It also assumes that no rigid structure of needs hierarchy is followed.

- **Existence Needs:** The existence needs comprise all those needs that relate to the physiological and safety aspects of human beings and are a prerequisite for survival. Thus, Maslow's physiological and safety needs are grouped into one category because of their same nature and similar impact on an individual's behaviour.

- **Relatedness Needs:** The relatedness needs refer to the social needs, that an individual seeks to establish relationships with those he cares for. The relatedness needs refer to our desire to maintain essential relationships interpersonally. These align with Maslow's social needs and the external component of Maslow's esteem needs

- **Growth Needs:** Growth needs refers to the intrinsic desire for personal development and the characteristics included under self-actualization. The ERG theory demonstrates that more than one need may be operative simultaneously, and if the

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gratification of a higher-level need is stifled, the desire to satisfy a lower-level need increases. Thus, growth needs are those needs that influence an individual to explore the maximum potential in the existing environment.

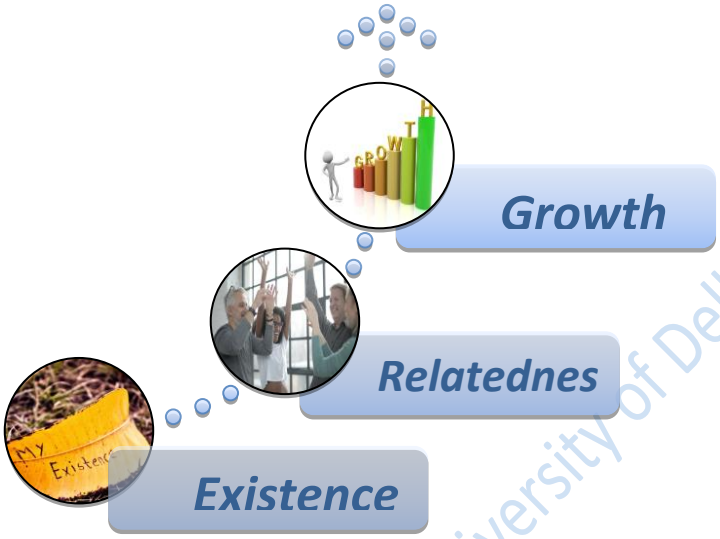

Figure 5 Alderfer's ERG Theory

6.8. HERZBERG TWO FACTOR THEORY

Frederick Herzberg proposed the two-factor theory of motivation. An empirical study was conducted using a sample of 200 engineers and accountants, and based on the study's findings, the various needs were categorized into two factors, namely, hygiene factors and motivators.

Hygiene factors, which were previously thought to be the motivators, do not result in motivation but are necessary to bring the level of motivation to a start level or platform so that the motivation of personnel from that platform becomes easier. It was reported in the study that the presence of hygiene factors would not cause satisfaction, but their absence would cause dissatisfaction. Hygiene factors must be present in the Job before motivators can be used to stimulate that person.

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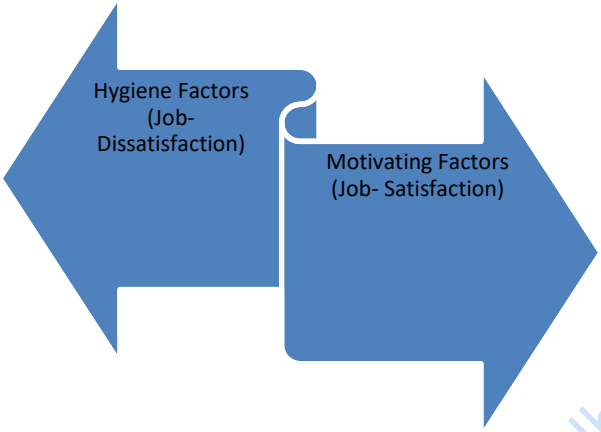

Figure 6 Herzberg's Theory

One cannot use motivators until all the hygiene factors are met. Herzberg's needs are specifically job-related and reflect some of the distinct things people want from their work as opposed to Maslow's Hierarchy of Needs which reflects all the needs in a person's life. The following table shows the difference between hygiene factors and motivators-

Hygiene factors	**Motivators**
Absence results in dissatisfaction; presence results in no dissatisfaction	Absence results in no satisfaction; presence results in satisfaction
Examples- company policy, administration, supervision, working conditions, equitable salary	Examples- Achievement, recognition, work itself, responsibility, and growth

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Figure 7 Examples of hygiene and motivation factors

Herzberg also reported that both factors are uni-dimensional, i.e., the effect could only be seen in one direction. In other words, hygiene factors are maintenance factors or dissatisfiers, meaning if they are present, they act as a maintenance factor, and if they are not, they act as a dissatisfier. Either way, they won't motivate employees. Similarly, motivators are satisfiers, which means they tend to motivate the employees if they are present.

6.8.1. Contribution of Herzberg's Two-Factor theory- Herzberg's two-factor theory has two essential Contributions.

First, improving work conditions and basic pay won't motivate employees to give higher performance. On the contrary, it would only reduce dissatisfaction among employees. It gave managers a different perspective, who believed this could motivate employees.

Secondly, Herzberg stressed that "work itself" is a motivator. It also gives a better understanding of the term "Job enrichment".

Additionally, Herzberg mentioned that today's motivator is tomorrow's hygiene factor. Because eventually, human needs shift to other needs.

Herzberg's Two Factor Theory continues to be essential for management in motivating their employees. His idea that satisfaction and dissatisfaction do not form a continuum, that one decreases with another increase, still holds. In fact, companies today are increasingly looking for ways to enrich their team's work. They are building enrichment into the appraisal and review process and investing in training and development opportunities. Job engagement has also become a key focus.

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Example- TESCO today focuses on factors causing satisfaction as well as dissatisfaction. Employees are motivated and empowered by timely and appropriate communication, involving personnel in decision-making, and delegating wherever possible. Forums are held every year in which staff can provide input on pay raises. Tesco personnel even get an opportunity to give their input when restaurant menus are designed, helping to prevent feelings of alienation and dissatisfaction.

6.8.2. Relationship between Herzberg's' theory and McClellands' theory of motivation

People with high achievement (n Ach) are more inclined towards motivators, whereas those who score low in achievement (n Ach) are more inclined towards maintenance factors.

For example, managerial people are expected to score high on achievement.

6.8.3. Appraisal of Herzberg Two factor Theory

Herzberg's' theory argues that job enrichment is required for intrinsic motivation. According to Herzberg, the Job should have a sufficient challenge to utilize the full ability of the employee. If the motivation-hygiene theory holds, management must not only provide hygiene factors to avoid employee dissatisfaction but also provide factors intrinsic to the work itself for employees to be satisfied with their jobs. Herzberg's theory is highly appreciated but has also been criticized due to the following reasons-

1. **Limited sample of Professions**- the study's finding was based on the limited sample of professionals, who might value challenging tasks, but it is difficult to generalize the findings or say that financial benefits or payments are not a motivator.

2. Too much emphasis is given to the enrichment of jobs. For example-Employees do get satisfaction through status and pay; but such components have not been given much focus.

3**. Situational factors** have been ignored. For example, pay may motivate a worker, but the same is not true for an employee.

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IN-TEXT QUESTIONS

3. MCQs

I. Physiological and safety needs are the _____ of motivation given by A.H. Maslow.

a) lower order needs
b) Higher-order needs
c) Important needs
d) Required needs

II. Higher order needs are _____ and _____

a) social esteem
b) self-actualisation
c) Safety needs
d) Both (a) and (b)

III. _____proposed the two-factor theory of motivation.

a) Frederick Herzberg
b) A.H. Maslow.
c) Alderfer
d) Locke

IV. Absence of Hygiene factors results in dissatisfaction, presence results in _____

a) no dissatisfaction
b) Satisfaction
c) Achievement
d) Dissatisfaction

V. _____argued that job enrichment is required for intrinsic motivation.

a) Herzberg's' Two-factor Theory
b) Maslow's Need Hierarchy Theory
c) Alderfer's ERG Theory
d) McClelland's Needs Theory

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6.9. COMPARISON BETWEEN MASLOWS' & HERZBERGS' THEORY OF MOTIVATION

There are some similarities and differences between Herzberg two factor theory and Maslow's' need hierarchy. Herzberg's maintenance factors include part of self-esteem needs. Esteem needs consist of two portions; one is intrinsic in nature, like recognition. Recognition comes through competencies and achievements. Hence it acts as a motivator. However, esteem needs are extrinsic, like status gained through the position one occupies, which only falls under the hygiene factor. As shown in figure 7, motivation factors are higher-order needs.

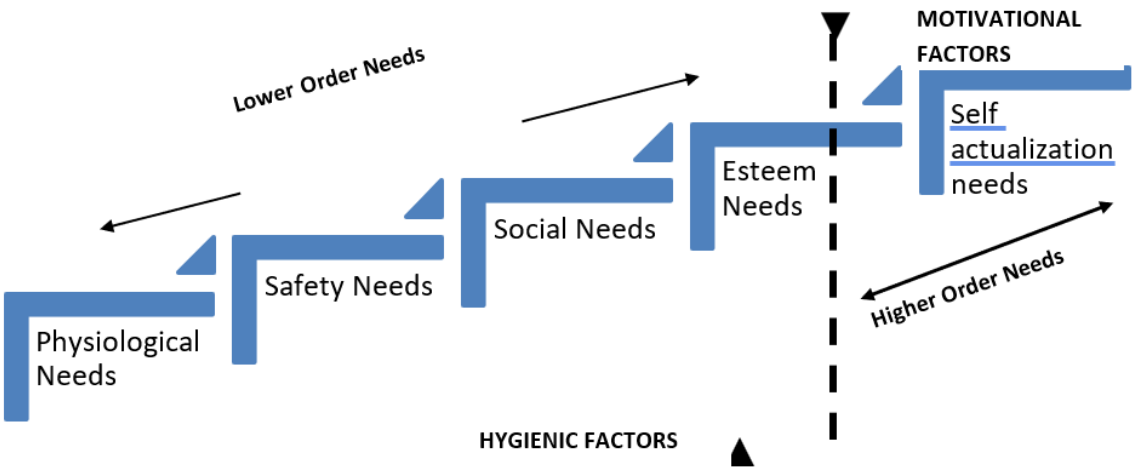

Figure 8 Relationship between Maslow's' and Herzberg's' Model

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Following are some noticeable differences between both the theories:

Herzberg	**Maslow**
The theory given by Herzberg is based on an empirical study.	It is not based on an empirical study.
The theory fails to explain the behaviour of workers. It is more relevant for professionals.	It is true for all employees in general.
Only higher-order needs are treated as motivators.	All unsatisfied needs could be a motivator.
It is prescriptive in nature.	It is Descriptive in nature
It doesn't follow any sequence.	It follows a hierarchical arrangement of needs.

6.10 THEORY X AND THEORY Y

Douglas McGregor formulates theory X and Y. After studying managers' dealing with employees, McGregor identified two different viewpoints based on the assumptions a manager follows while managing employees.

Theory X

Assumptions

- Employees in general does not like work and if possible, tries to avoid it.
- Unless manager closely supervise employees, it is difficult to ensure task completion. Therefore, manager must push employees to work either through reward or punishment.

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- Employees lacks aspiration and dislikes responsibility. They give more weightage to job security.
- Manager needs to direct them at every step.

Under the first viewpoint, the manager believes that employees dislike working and therefore it is important to direct them as managers. This viewpoint is based on the "*Carrot and Stick Approach*". According to the "Carrot and Stick" approach, a manager could motivate such employees through rewards or could make them work through punishments. In other words, Theory X assumes that lower-order needs (as Maslow suggested) dominate the employees. It represents a pessimistic viewpoint.

Theory Y

Assumptions

- Unlike Theory X, employee like their work.
- Employees possess self-direction and self-control. They are dedicated to achieve the goals set by organisation.
- Employees are loyal and committed towards organisations.
- Employees are ready to take responsibility, and they possess capabilities to solve problems and complete the task on their own.

Unlike theory X, Under Theory Y is an optimistic viewpoint. Here, managers assume that employees are self-motivated and like to do the work. If we look at Maslow's need hierarchy, then according to theory Y employees are motivated by higher-order needs, like esteem and self-actualization needs motivates employees.

Implication of Theory X and Theory Y

Theory Y encourages employee participation in decision making process. It encourages decentralization. According to this theory employee are problem solver and knows how to discover new ways to complete a task. It is found to be more reasonable and valid as compared to Theory X. Unfortunately, no evidence confirms that either set of assumptions is valid. Theory X and Theory Y lack empirical support, which is vital for accepting the OB theories.

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IN-TEXT QUESTIONS

4. MCQs

I. Three need model is given `_____

e) David McClelland
f) Frederick Herzberg
g) A.H. Maslow.
h) Alderfer

II. The need for _____ is the desire to have an impact on others or to be able to influence or control others.

e) Affiliation
f) Power
g) Safety needs
h) Achievement

III. The desire for friendly and close interpersonal relationships. It refers to the need for _____

e) Affiliation
f) Power
g) Safety needs
h) Achievements

IV. People with high on _____are more inclined toward motivators

e) Achievement needs
f) Affiliation needs
g) Safety needs
h) Social needs

V. The _____ is an extension of Maslow's hierarchy of needs.

e) Herzberg's' Two factor Theory
f) Goal Setting Theory by Edwin Locke
g) Alderfer's ERG Theory
h) McClelland's Needs Theory

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6.11 VROOM'S EXPECTANCY THEORY

Expectancy theory is part of process theories. Unlike previous theories, where the focus was on what motivates employees? Expectancy theories attempt to answer how motivation takes place in employees' minds. Expectancy, Instrumentality and Valence interact psychologically to create a motivational force such that the employee acts in ways that bring pleasure and avoid pain. In other words, individuals' perception of the outcomes of their actions and the value they add to the outcomes will determine their motivation to do a particular action. The Vrooms' theory of motivation consists of three components: Expectancy, Instrumentality, and Valence.

Expectancy (Effort -performance probability) -Employees have different expectations and levels of confidence about what they can do. Expectancy refers to an employee's perception of his/her capabilities to perform the given task. It could range from 0 to 1. ***Example***: If an employee believes that s/he lacks the required knowledge and the chances to complete the given task are zero, zero will be scored in expectancy. Similarly, if s/he believes that s/he will be able to complete the task based on confidence level, higher score on expectancy would be obtained.

Instrumentality refers to employees' perception about receiving desired rewards if they perform the given task. In other words, employees' beliefs about doing specific actions will lead to promised rewards (strength of relationship). It could range from 0 to 1. ***Example:*** Let us assume an employee X needs a promotion. Suppose Employee X believes that his/her efforts will give him the promotion. Then, s/he will score high on Instrumentality. Similarly, if s/he believes the efforts have nothing to do with promotion, s/he will score zero in Instrumentality.

Valence– This represents employees' preference for the reward. In other words, it refers to how highly the employees value the rewards. It could range from -1 to 1. If an employee is indifferent about the reward, his valence will be zero.

All three components could be arranged in the form of an equation:

Motivation= Expectancy x Instrumentality x Valence

All components should score above zero. If either of them becomes zero, motivation among employees will become zero. Conversely, motivation will be high if all three components will score high.

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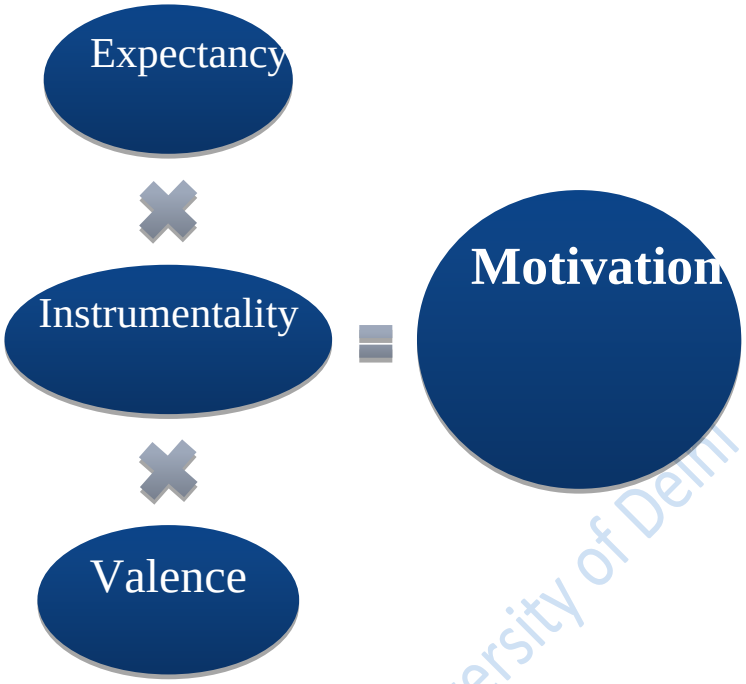

Figure 9 Vroom expectancy theory

6.12 EQUITY THEORY

J.S. Adams formulated the Equity Theory of motivation. The equity theory helps us understand the importance of equal treatment of all employees in an organisation. The theory explains the process through two components, namely inputs and outcomes. People use subjective judgement to balance the outcomes and inputs for comparing other employees with themselves. If people feel they are not equally rewarded, they either reduce the quantity or quality of work. However, if people perceive that they are rewarded higher, then they are motivated to work harder.

This theory believes that a manager's fair treatment and balanced decisions are crucial in an organisation and states that an employee compares his/her job's input and outcomes with others, whether within or outside the organisation and then responds to eliminate these inequalities.

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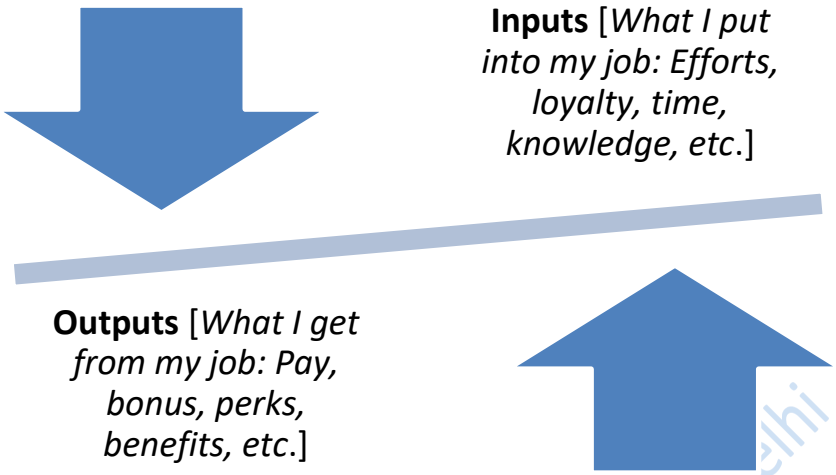

Figure 10 Equity Theory

Here 'Input' refers to everything that an employee gives to the organisation (example-skills, knowledge, efforts, time, idea, etc.); and 'Outcomes' refers to various rewards that he receives from an organisation (for example- pay, recognition, promotion, benefits, friendly relationships, etc.). The employee tends to compare the inputs he gives to an organisation with the outcomes he receives. Additionally, s/he tends to compare his input- outcomes ratio with others.

According to Equity theory, employees take measures to re-establish fair treatment in case of inequity. Following are some examples through which employees could re-establish equity -

- Changing their inputs by giving less effort.
- Changing outcomes by asking for higher returns
- Plans to leave the organisation
- Changing the employee with whom they compare themselves.

Porter and Lawler's expectancy model is an improvement over the expectancy theory formulated by Vroom. The model states that combining individual factors and the environment determines behaviour.

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IN-TEXT QUESTIONS

5. MCQs

I. Theory X and Y are formulated by `_____

a) David McClelland; b) Frederick Herzberg; c) A.H. Maslow; d) Douglas McGregor

II. Under this, manager believes that employees usually dislike working and therefore as a manager it is important to direct them

a) Theory X; b) Theory Y; c) Theory Z; d) Three need theory

III. Expectancy theory is part of _____

a) Process theories
b) Content Theories
c) Non cognitive Theories
d) Reinforcement Theory

IV. _____ refers to how highly do the employees value the rewards.

a) Valence
b) Instrumentality
c) Expectancy
d) None of the above

V. "If people feel that they are not equally rewarded they either reduce the quantity or quality of work to some other organization.", the statement holds true as per-

a) J.S. Adams Equity theory
b) Equity theory by Edwin Locke
c) Alderfer's Equity theory
d) McClelland's Equity theory

6.13 GOAL SETTING THEORY

Edwin Locke and Gary Latham formulated the goal-setting theory. The theory states that goals affect employees' motivation. The goal-setting theory emphasizes on the importance of setting specific and challenging goals for achieving motivated behaviour. Challenging goals are difficult but not impossible to attain.

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Instead of giving vague tasks to people, specific objectives are more helpful. It revolves around the concept of "Self-efficacy," i.e., an individual's belief that he or she can perform a given task. According to Locke and Latham, goals affect individual performance through four mechanisms. First, goals, direct effort toward goal-related activities and away from unrelated activities. Second, goals energise employees. Challenging goals lead to higher employee effort than easy goals. Third, goals affect persistence. Employees exert more effort to achieve high goals. Fourth, goals motivate employees to use their existing knowledge to attain a goal or to acquire the knowledge needed to do so.

The goal-setting model indicates that individuals have needs and values that influence their desires. According to Maslow's hierarchy of needs, all individuals possess some basic needs. Individuals do, however, differ in their values. Therefore, if an employee finds that they are not satisfied with the current situation, goal setting becomes a way of achieving what they want.

6.14 REINFORCEMENT THEORY

B.F. Skinner formulated reinforcement theory. This theory proposes that behaviour is a function of its consequences. In other words, unlike cognitive theories of motivation, other than the inner state, motivation can be enhanced through external factors. People are motivated or demotivated by the action of their consequences. Positive consequences lead to people repeating their behavior, whereas negative consequences restrict employees from repeating their actions.

Skinner argued that individuals' internal needs and drives could be ignored because people learn to exhibit certain behaviours based on what happens to them as a result of their behaviour. Skinner states that the work environment should be made suitable for the individuals. He also mentioned that punishments lead to frustration and de-motivation. Hence, the only way to motivate is to keep making positive changes in the organisation's external environment. The focus is on operant

conditioning. There are two types of reinforcement, namely, positive and negative. Positive reinforcement refers to the occurrence of a valued behavioural consequence that strengthens the probability of the behaviour being repeated. The specific behavioural consequence is called a reinforcer.

An example of positive reinforcement might be a salesperson that exerts extra effort to meet a sales quota (behaviour) and is then rewarded with a bonus (positive reinforcer). The

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administration of the positive reinforcer should make it more likely that the salesperson will continue to exert the necessary effort in the future.

Negative reinforcement refers to an undesirable behavioural consequence that is withheld, with the effect of strengthening the probability of the behaviour being repeated. Negative reinforcement is often confused with punishment, but they are not the same. Punishment attempts to decrease the probability of specific behaviours; negative reinforcement attempts to increase desired behaviour. Thus, both positive and negative reinforcement increases the likelihood that a particular behaviour will be learned and repeated.

An example of negative reinforcement might be a salesperson who exerts effort to increase sales in his or her sales territory (behaviour), followed by a decision not to reassign the salesperson to an undesirable sales route (negative reinforcer). The administration of the negative reinforcer should make it more likely that the salesperson will continue to exert the necessary effort in the future.

As mentioned above, punishment attempts to decrease the probability of exhibiting specific behaviours. Punishment is the administration of an undesirable behavioural consequence to reduce the occurrence of unwanted behaviour. Punishment is one of the more commonly used reinforcement-theory strategies, but many learning experts suggest that it should be used only if positive and negative reinforcement cannot be used in the given circumstances. For an example of punishment might be demoting an employee who does not meet performance goals or suspending an employee without pay for violating work rules.

The purpose of extinction is to reduce unwanted behaviour. In this manager tends to ignore the behaviour completely. Due to the absence of desired response, the employee avoids the behaviour.

For example, if an employee receives no praise for his/her contribution for months, his/her desirable behaviours will diminish. Thus, managers may continue to offer posit behavioral consequences to avoid unwanted Extinction.

6.14.1. SCHEDULES OF REINFORCEMENT

The reinforcement schedule is timing the behavioural consequences following a given behaviour. There are two broad types of reinforcement schedules: continuous and intermittent. If a behaviour is reinforced each time it occurs, it is called continuous reinforcement. Researchers suggest continuous reinforcement is the fastest way to establish new behaviours or eliminate undesired ones. However, this type of reinforcement is generally not practical in an organisational setting. Therefore, intermittent schedules are usually employed. Intermittent reinforcement means rewards are given at irregular intervals. There

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are four types of intermittent reinforcement schedules: fixed interval, fixed ratio, variable interval, and variable ratio.

Fixed interval schedules of reinforcement occur when desired behaviours are reinforced after set periods. The simplest example of a fixed interval schedule is a monthly paycheck.

The **fixed ratio** schedule of reinforcement applies the reinforcer after a set number of occurrences of the desired behaviours. For example, the sales commission is based on the number of units sold. Like the fixed interval schedule, the fixed ratio schedule may not produce consistent, long-lasting behavioural change

Variable interval reinforcement schedules are employed when desired behaviours are reinforced after varying periods. Examples of variable interval schedules would be special recognition for successful performance and promotions to higher-level positions. This reinforcement schedule appears to elicit desired behavioural change resistant to Extinction.

Finally, the variable ratio reinforcement schedule is the reinforcer after a number of desired behaviours have occurred, with the number changing from situation to situation. The most common example of this reinforcement schedule is the slot machine in a casino, in which a different and unknown number of desired behaviours (i.e., feeding a quarter into the machine) is required before the reward (i.e., a jackpot) is realized. Organisational examples of variable ratio schedules are bonuses or special awards that are applied after varying numbers of desired behaviours occur.

6.14.2. BEHAVIOUR MODIFICATION AND REINFORCEMENT

Behaviour modification is the use of empirically demonstrated behaviour change techniques to improve behaviour, such as altering an individual's behaviours and reactions to stimuli through positive and negative reinforcement.

REINFORCEMENT THEORY APPLIED TO ORGANISATIONAL SETTINGS

The best-known application of reinforcement theory principles to organisational settings is called behavioural modification or behavioural contingency management. Typically, a behavioural modification program consists of four steps:

- Specifying the desired behaviour as objectively as possible.
- Measuring the current incidence of desired behaviour.
- Providing behavioural consequences that reinforce desired behaviour

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- Determining the effectiveness of the program by systematically assessing behavioural change.

Reinforcement theory is an important explanation of how people learn behaviour. Behavior modification focuses on the external environment by stating that manipulating consequences can affect behaviours. The alternative consequences include positive and negative reinforcement, punishment, and extinction. Reinforcement can be applied according to either continuous or partial schedules. The major benefit of behaviour modification is that it makes managers conscious motivators. It encourages managers to analyse employee behaviour, explore why it occurs and how often, and identify specific consequences that will help change it when those consequences are applied systematically.

6.15 TYPES OF MOTIVATION: COGNITIVE EVALUATION THEORY

Motivation activates human behaviour and gives it direction. Cognitive evaluation theory suggests that there are two types of motivation; intrinsic and extrinsic. Intrinsic (internal) motivation is an internal state or condition that drives behaviour, such as a hobby. On the other hand, extrinsic (external) motivation refers to direction from outside the person, including the promise of rewards, the threat of punishments, intimidation, and coercion. Both intrinsic and extrinsic motivations are essentially related to goals.

6.15.1. Intrinsic Motivation

Any of the following may determine intrinsic motivation:

1. **Physiological States/Needs**: Employees may seek sensory stimulation to decrease hunger, thirst, or physical discomfort.
2. **Emotional Needs**: An employee may seek to calm over-aroused emotions, increase good feelings, decrease negative emotions, maintain optimism and enthusiasm, develop a sense of productivity, or increase self-esteem.
3. **Cognitive Needs**: Employees may seek to increase knowledge and understanding, maintain attention to interesting and personally meaningful events and activities, solve problems, or resolve uncertainty or confusion.
4. **Social Needs**: Employee(s) may seek to be like a role model, to be part of a group, to help others, or to be accepted by peers and have friends.

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5. **Volitional/Self-Determination Need**s: Finally, an employee may seek to achieve goals that he has set for herself, take control of her affairs, reduce others' control over her (become self-determined), or pursue her dreams.

In summary, intrinsically motivated employees act as they do because of their own needs, goals drive them, and wants versus external inducements, they like the outcomes, and the outcomes make them feel good — give them a sense of satisfaction. The motivation agent is inside the person; they have an internal locus of control. It is worth noting that the idea of reward for achievement is absent from this model of intrinsic motivation since rewards are an extrinsic factor.

6.15.2. Extrinsic Motivation

Management systems in many rehabilitation centers, schools, and homes are based on the assumption that people are extrinsically motivated and will not engage in positive behaviour without external inducements. The underlying belief is that most human resources engage in activities because they are directed to do so, because they are required to do so, or because they are provided with either promise of rewards or threats of punishment to sustain their participation. Thus rewards (e.g., monetary or non-monetary) play an essential role. All factors mentioned above (under reinforcement theory) represent external factors that motivate or demotivate employees.

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IN-TEXT QUESTIONS

6. MCQs

I. The motivational process & not the Motivators as such is associated with

a) Need hierarchy theory. b) Two factor theory
c) Berg theory d) Expectancy theory

II. Who has given the Reinforcement theory of motivation?

a) Abraham Maslow b) David McClelland
c) Victor Vroom d) Frederick Herzberg

III. How many levels are there in Needs Hierarchy theory of motivation?

a. 2 b. 3
c. 4 d. 5

IV. Name the motivation theory that is based on Satisfaction-progression?

a. Alderfer – ERG theory
b. Maslow – hierarchy of needs theory
c. Herzberg – Two factor theory
d. Skinner's reinforcement theory

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6.16 APPLICATION OF MOTIVATION CONCEPTS

It is essential to apply various motivational concepts to organisations. Some of the applications of motivation and their linking with motivational theories have been discussed below.

6.16.1. Job Design and Motivation: The Job Characteristics Model (JCM)

Job Design refers to how elements of a job are organised. The model states that any job could be described in terms of the following five dimensions-

Skill Variety: The variety of activities an employee is expected to do while performing a particular job. For example, an employee who invests 7 hrs in spraying paint scores low on this dimension, and a garage owner-operator who is involved in various tasks like repair, customer interaction, rebuilding engines, bodywork, etc., will score high on this dimension.

Task Identity: The degree of completion of work which makes the Job an identifiable piece.

Task Significance: The degree of impact a job has on the Job of others.

Autonomy: The degree of freedom the job provides to an employee in determining procedures, methods and scheduling of work to be carried out. For example: If an employee at the customer care office is given a set of procedures or questions for taking up queries, then such an employee scores low on this dimension.

Feedback.: Feedback is the degree to which an employee about the performance receives direct and clear information. For example An iPad assembler, assembling and testing if it works properly is an example of high feedback.

From a motivational standpoint, if employees score high on these dimensions, they will be more motivated to perform than the situation otherwise. In addition, employees with higher-order needs (like growth or achievement) will prefer more autonomy. The dimensions could be further used to compute a consolidated motivational potential score (MPS).

6.16.2. Redesigning of jobs to motivate employees

The nature of the Job itself impacts the level of motivation. The same is suggested in the JCM model and Herzberg's motivational theory. Through the following ways, jobs could be redesigned to motivate the employees-

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Job Rotation:

The periodic shifting of employees from one Job to another is known as Job rotation. Job rotation could be helpful if the Job lacks skill variety and the employee suffers from over-routinization. In addition, job rotation helps reduce boredom and helps employees understand how their work contributes to the organisation. ***Example***: Ticket agents may be involved in baggage handling. The Singapore Airlines is well known for its extensive job rotation.

Job Enrichment:

Job enrichment refers to a vertical movement. The skill variety dimension is increased by adding more tasks to the current Job. It makes existing jobs comparatively more challenging. Job enrichment adds more meaning to a job and gives more freedom to the employees. Recent studies suggest that job enrichment works best when equivalent rewards accompany it.

6.17 ALTERNATIVE WORK ARRANGEMENTS

Organisations could also motivate employees through various work arrangements like Flexitime, job sharing and telecommunication. These arrangements are beneficial in the current scenario because of diversity in the workforce, like a single parent and dual-earner couple.

Job Sharing:

Job sharing refers two a system in which two or more employees split a 40-hour-a-week job. ***For example, Ford engineers*** Julie Levine and Julie Rocco engaged in a job-sharing program. One worked in a morning slot, while the other worked in an evening slot. It helped them in managing their work-life balance while working on the Job of redesigning the Explorer Crossover.

Job sharing combines the talent of two or more employees and gives flexibility to employees, which could motivate them to perform better. Japanese organisation follows Job sharing for different reasons, like avoiding layoffs due to overstaffing.

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Case Study

Sunaina works at "Insta International". She is a coordinator responsible for handling applications received from agency partners. She is also responsible for reviewing and ensuring all fields are filled properly. She is also responsible for following up with agency partners and building a relationship with agency partners. As per the job description, it is a full-time job requiring a minimum of 8 hours of commitment. Presently, her office timing is from 10 a.m. to 6 p.m.

Sunaina is a good performer who meets her deadlines. Last year her performance rating was above average. She also received "applause" from her immediate manager. Keeping her professional life aside, In her personal life, Sunaina is a single mother. She wakes up at 5 a.m. and prefers to sleep before 9 a.m. Recently her daughter has started going to school, due to which from next month she needs to pick her daughter up from school at 3 p.m.

Now Sunaina has no choice other than to leave her present job. Sunaina goes to meet her manager, Mr Amit, in person with a resignation letter-

Amit: Hi Sunaina, How are you?

Sunaina: I am good. Due to some personal engagements, I am afraid I won't be able to continue with this job.

Amit: Why? What happened?

Sunaina explained her situation and left the resignation letter on his desk. After two days, Amit calls Sunaina in his office.

Amit: I was going through your resignation letter. I can recall that we lost hardworking employees in the past for similar reasons. After talking with the HR department, we have come across an alternative. The office opens at 6 a.m. and closes at 8 p.m., and you are supposed to devote 8 hours to the office. We could give you an option to pick up suitable hours, provided the hours should fall within the opening and closing time of the office.

QUESTIONS:

Question 1: Identify the alternative work arrangement that Mr Amit provides to Ms Sunaina

Question 2: State the benefits and limitations of such alternative work arrangements.

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Flexi time:

Flexi time refers to flexible work hours. Under this, organisations give an option to employees to choose working hours. In most cases, core hours remain the same. However, the flexibility of two to four hours is given beyond the fixed hours. Flexi hours provides various benefits to organisations; for example, it reduces absenteeism, reduces work productivity, reduces hostility towards manager, eliminates tardiness, increases autonomy, etc. However, other than the advantages, Flexi hours have certain limitations, like it is not suitable for all types of jobs. For example, if Sunaina is involved in direct customer dealing and customers are usually unavailable before 10 a.m., it won't be possible to give any alternative.

Telecommuting:

Work from home facility. For at least two days a week, employees could work from home. Post covid, many organisations across the globe allow telecommuting. It not only gives flexibility to employees but also is a cost-saving way for an organisation.

6.18 MANAGEMENT BY OBJECTIVES (MBO)

In his book "The Practice of Management", Peter Drucker formulated management by Objectives (MBO) in 1954. Management by objectives (MBO) is a systematic and organised approach that allows management to focus on achievable goals and attain the best results from available resources. It aims to increase organisational performance by aligning goals and subordinate objectives. Ideally, employees get strong input to identify their objectives, timelines for completion, etc. In addition, MBO includes ongoing tracking and feedback in reaching objectives. The principle behind MBO is to ensure that everybody within the organisation has a clear understanding of the aims, or objectives, of that organisation, as well as awareness of their roles and responsibilities in achieving those aims.

Principles of Management by objective:

- Cascading of organisational goals and objectives
- Specific objectives for each member

GOAL SETTING AND ITS EFFECTS ON PERFORMANCE

Motivation is goal-directed. A goal is the object or aim of an action, for example, to attain a specific standard of proficiency, usually within a specified time limit. An employee's goals

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often are driving forces, and accomplishing those goals affects performance. Goals affect performance through four mechanisms.

First, goals serve a directive function; they direct attention and effort toward goal-relevant activities and away from goal-irrelevant activities. Second, goals have an energising function. High goals lead to greater effort than low goals. Third, goals affect persistence. When participants are allowed to control the time they spend on a task, challenging goals prolong effort. Fourth, goals affect action indirectly by leading to the arousal, discovery, and/or use of task-relevant knowledge and strategies.

6.19 EMPLOYEE INVOLVEMENT PROGRAM

Employee involvement programs use inputs for employees in the decision-making process. Employee involvement creates an environment in which people impact decisions and actions that affect their jobs. Employee involvement is not the goal or tool practised in many organisations. Instead, employee involvement is a management and leadership philosophy about how people are most enabled to contribute. It is a participative process that uses the total capacity of employees and is designed to encourage increased commitment to" the organisation's success.

Following are a few Employee involvement programs-

Participative management refers to a process where subordinates share decision-making power with the superior. The degree of power is significant, but the subordinate should have the required knowledge and competencies to participate. It helps in motivating employees.

Quality Circles - A group of employees meeting regularly to discuss their quality problems, investigate causes, recommend solutions, and take corrective actions.

Employee Stock Ownership Plans - Company established benefit plans in which employees acquire stock as part of their benefits.

Linking Employee Involvement Programs and Motivation Theories

Many motivational theories can be linked with employee involvement programs. For example, theory Y of motivation shows consistency with participative management, while in the case of hygiene theory, employee involvement programs could provide employees with intrinsic motivation by increasing opportunities for growth, responsibility, and involvement in

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the work itself. Employee involvement is attuned with ERG theory and efforts to stimulate the achievement need.

Answer the following questions based on Opening Case Study-

1. Name the various motivation theories that have been highlighted in the above case

2. Identify the motivation theory that explains Amrita's behaviour towards the end.

3. Using expectancy theory explains the difference in motivation between Amrita and Shweta.

6.20 SUMMARY

Motivation is the process in which basic need leads to creating drives aimed at a goal. Highly driven people put in much effort at their jobs, whereas those who lack motivation do not.

- The cognitive model of motivation consists of theories that focus on the human mind's internal state. Theories under the cognitive model could be further subdivided into Content and Process theories.
- Content (or need) theories of motivation focus on factors internal to the individual that energise and direct behaviour. In contrast, Process theories are concerned with determining how individual behaviour is directed and maintained in the specifically self-directed human cognitive processes.
- Content theory includes Maslow's Need Hierarchy Theory; Herzberg's Motivational Hygiene Theory; Alderfer's ERG Theory; and McClelland's Needs theory; while Vroom's Expectancy Theory, Adam's Equity theory; and Goal Setting Theory fall under Process Theories.
- B.F. Skinner formulated reinforcement theory. This theory proposes that behaviour is a function of its consequences. In other words, unlike cognitive theories of motivation, other than the inner state, motivation can be enhanced through external factors.

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- Cognitive evaluation theory suggests that there are two types of motivation; intrinsic and extrinsic.
- It is essential to apply various motivational concepts to organisations. Some of the applications of motivation and their linking with motivational theories includes redesigning of job, providing alternative work arrangements to employees; management by objective, initiating employee involvement programs and employee participation programs.

6.21 ANSWERS TO IN-TEXT QUESTIONS

1. a) needs and drives; b) Cognitive and non-cognitive models; c) internal state of human mind; d) content and process theories.
2. a) Adam's Equity theory; b) Alderfer's ERG Theory
3. I) Lower order needs; II) Both (a) and (b); III) Fredrick Herzberg; IV) No dissatisfaction; V) Herzberg's' Two factor Theory
4. I) David McClelland ; II) Power; III) affiliation; IV) Achievement needs; V) Alderfer's ERG Theory
5. I) Douglas McGregor; II) Theory X; III) Process theories ; IV) Valance; V) J.S. Adams Equity theory
6. I) Expectancy theory; II) B.F. Skinner; III) 5; IV) Maslow – hierarchy of needs theory

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6.22 SELF ASSESSMENT QUESTIONS

1. Define motivation & Explain the process of motivation.
2. Explain Cognitive evaluation theory. State the effect of intrinsic and extrinsic rewards on the behavior of the employees.
3. Explain Maslow's need theory and its implications for management.

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4. Do you believe that motivational theories are affected by the Culture? Justify your answer with suitable examples.
5. "Millionaires keep working even in the later years of their lives" What motivates them to work.

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6.24 SUGGESTED READINGS

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LESSON-7

LEADERSHIP

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STRUCTURE

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7.1 LEARNING OBJECTIVES

After reading this lesson, students will be able to:

1. Understand the meaning and traits of a leader.
2. Distinguish between a leader and a manager.
3. Understand different leadership styles and their importance.
4. Understand the evolution of leadership theories.
5. Relate to the contemporary theories of leadership.

7.2 INTRODUCTION

"If your actions inspire others to dream more, learn more, do more and become more, you are a leader!" - John Quincy Adams.

Leadership is one of the most complex and multidimensional phenomena. It has been studied extensively over the years and has taken on greater importance than ever before in today's fast-paced and increasingly globalised world. Nonetheless, leadership continues to generate captivating and confusing debate due to the complexity of the subject.

The present lesson traces the historical evolution of leadership theories and reviews the progress over the years. It explores four main eras in leadership theory: trait, behavioral, contingency, and contemporary leadership theories.

7.3 WHAT IS LEADERSHIP?

Simply speaking, "leadership" is defined as "the ability to lead." Leadership in business is the capacity of a company's management to set and achieve challenging goals, take fast and decisive action when needed, outperform the competition, and inspire others to perform at the highest level they can.

Researchers have proposed many different definitions and theories of leadership. Some of the definitions of leadership given by eminent researchers are:

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Stogdill (1974) says that:

"Leadership is the initiation and maintenance of structure in expectation and interaction."

James MacGregor Burns (1978) concedes that:

"Leadership is leaders inducing followers to act for certain goals that represent the values and the motivations - 'the wants and needs, the aspirations and expectations - of both leaders and followers. And the genius of leadership lies in the manner in which leaders see and act on their own and their followers' values and motivations."

According to Katz and Kahn (1978):

"Leadership is the influential increment over and above mechanical compliance with the routine directives of the organization."

According to John Gardner (1990):

"Leadership is the process of persuasion and example by which an individual (or leadership team) induces a group to take action that is in accord with the leader's purpose or for the shared purposes of all."

Buchannan and Huczynski (1997) explain leadership as:

"A social process in which one individual influences the behaviour of others without the use of threat or violence."

7.3.1 Characteristics of a leader:

There is no clear cut formula for becoming a successful leader. Nonetheless, a few must-have traits are enumerated as follows:

1. Integrity: a leader must embody impeccable standards of integrity and honesty. Her/His decisions should be objective and unbiased.
2. Initiative: a good leader has an enterprise trait. S/He is resourceful and thinks on her/his feet and grabs the lucrative opportunities given half a chance.
3. Communication skills: a leader should be eloquent and should be able to articulate his/her vision and goals with brevity.

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4. Motivation skills: a leader must be able to influence followers to work towards shared goals and concurrently achieve their individual goals.
5. Adaptive: in this ever-changing world, a leader must be receptive to new ideas and ways of doing things.

7.3.2 Leader vs Manager:

A leader leads by example, whereas a manager dictates terms. A leader is someone whom people follow or someone who guides others. On the other hand, is someone responsible for directing and controlling the work and staff in an organisation. The following table states a few subtle differences between the two:

Leader	**Manager**
Innovator	Administrator
People Focused	Work focused
Have followers	Have subordinates
Do the right thing	Do things rightly
Creating value	Counting value
Change seeker	Prefer stability
Influence and inspire	Power and control

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7.4 UNIVERSITY OF IOWA STUDIES

The University of Iowa Studies was the first to examine different leadership styles using scientific methodology. Kurt Lewin, in collaboration with Lippit and White, wanted to dissect different leadership styles and their effectiveness which resulted in concluding that there are three leadership styles - authoritarian, democratic, and laissez-faire. These are widely studied leadership styles around the globe.

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7.4.1 What is the University of Iowa Studies?

In 1939, the great depression was about to dissipate, and industries were back on their feet. Yet, no one tried to fathom out which leadership style tics the subordinates the most. Psychologist Kurt Lewin was the first to do so. The Iowa Studies of leadership set out to identify different styles of leadership. This early study was very influential and established three major leadership styles.

In the first part of the study, they trained adults to act as authoritarian, democratic, or laissez-faire leaders. Later, they assigned schoolchildren of the same IQ to one of the three groups. They gave each group the same task. The performance was evaluated on the amount of quality of work accomplished. The three group leaders assumed different styles as they shifted every six weeks from group to group. The objective was to gauge the bearing of different leadership styles on the level of satisfaction/frustration of an individual.

The Three Styles of Leadership:

1. **Authoritarian Leadership:**

Under this style, a leader makes all the decisions. He passes a dictum telling all the subordinates what to do, how to do it and when to do it. No leeway for creativity or innovation gets bestowed upon an employee.

Under the authoritarian leadership style, a leader is believed to be a know-it-all brass and will do what is best for the organization. Employees are presumed to be ignorant, work-shy, lack ambition, dislike responsibility, and prefer to be led. They are not trusted to do what is beneficial for the organization. Unlimited authority is thus rightly vested in the leader.

Against its conspicuous flaws, authoritarian leadership is befitting to situations where there is little time for group decision-making or where the leader is the most knowledgeable member of the group.

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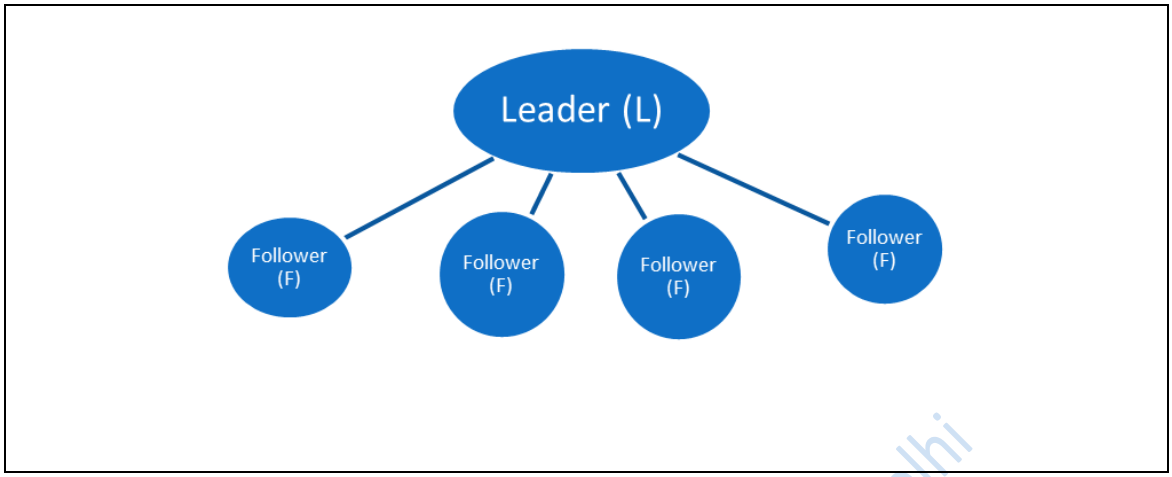

Figure 7.1: Authoritarian Leadership

2. Democratic Style

This style is characterized by a structured but cooperative approach to decision-making. It focuses on group relationships and sensitivity to the people in the organization. This type of leadership style fosters professional competence. Subordinates are encouraged to express their ideas and make suggestions. However, shared decisions are not likely to occur in all aspects of organizational operations. Democratic leaders sell a vision. They tend to be warm, confident, and friendly. The democratic leadership style encourages employee participation and professional growth.

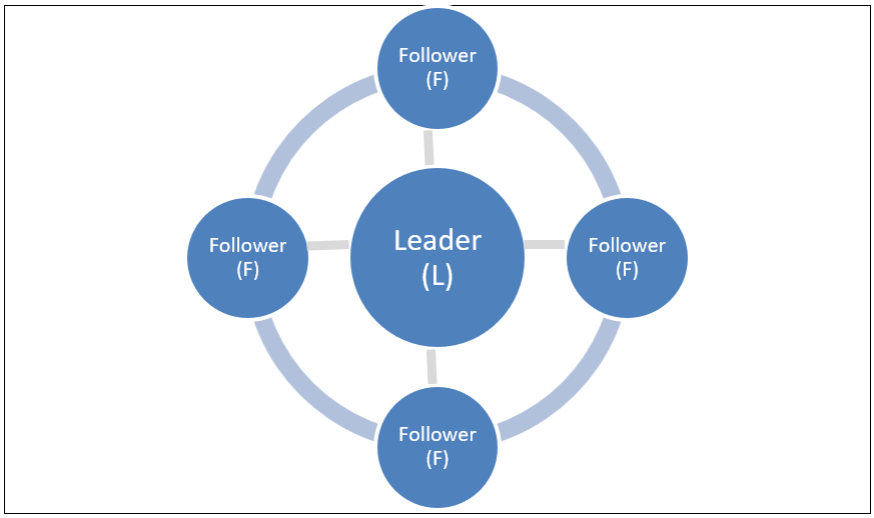

Figure 7.2: Democratic Style

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It is well suited in environments where people have a very high level of expertise, like software engineers, lawyers, doctors, mature teachers, etc. The democratic leadership style promotes greater job satisfaction and improved morale.

3. Laissez-faire

Laissez-faire is a hands-off approach. A leader trusts his employees and gives them carte blanche to use their skills and accomplish the organization's goals. But this is not a one-size fits its approach. Only individuals with high internal motivation and requisite skill sets can work under this minimalistic leadership style. On the other hand, if employees are not skilled or lack motivation, in that case, this style will drive the productivity of the organization into the ground.

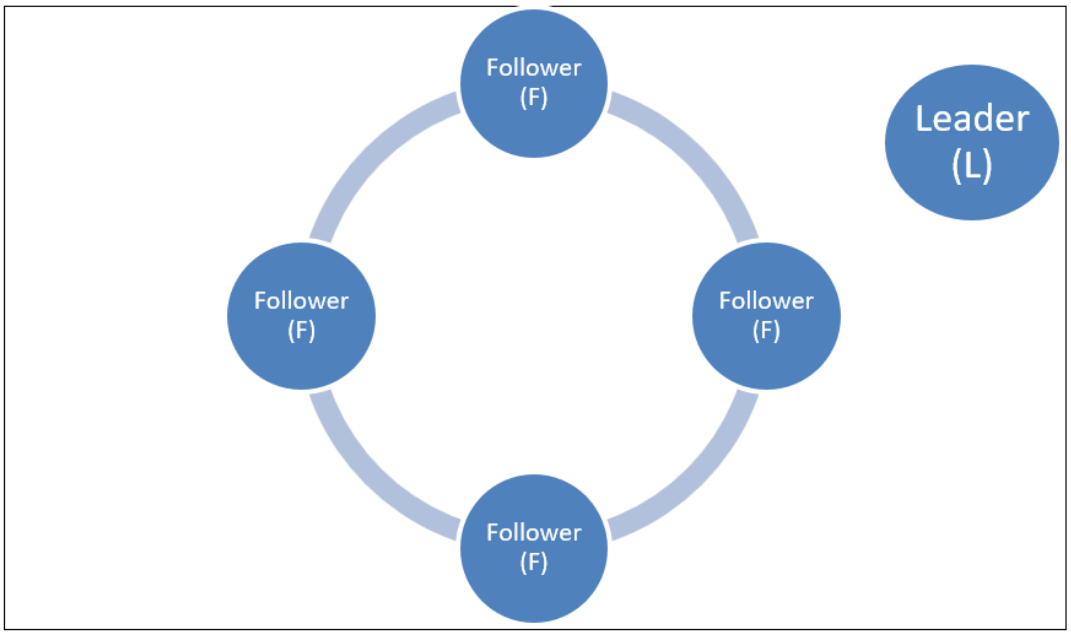

Figure 7.3: Laissez-faire

7.4.2 Observations of the study:

Nineteen out of twenty boys liked the democratic leadership style. The only boy who liked the authoritarian style happened to be the son of an army officer. Seven out of ten boys preferred the laissez-faire leader to the autocratic one as they preferred confusion and disorder to strictness and rigidity present in the autocratic style. The boys under the latter style exhibited more aggressive, hostile, and indifferent behaviour than their counterparts under other leadership styles. They either showed hostility or cracked jokes about hostility

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towards others. Others belonging to the democratic style showed less aggressive and more indifferent behaviour when brought under the autocratic style of a leader. Even under the laissez-faire style of the leader, boys committed more aggressive acts than the ones under the democratic style.

The studies found the democratic style to be less productive than the autocratic style. On the flip side, quality was a rung higher with a democratic leader atop than the group with an autocratic leader. Besides, decision-making was less creative under authoritarian leadership than under democratic leadership. The researchers concluded that democratic leadership was the most effective form.

7.4.3 Conclusion:

Undoubtedly a study on ten-year-old boys cannot be juxtaposed with the leadership behaviour of adults with much more intricate jobs. Nonetheless, the study in its own right was a trailblazer for the understanding of leadership styles from the point of scientific methodology. It depicts how the same group can deliver different results based on the leadership style deployed by the superiors.

7.5 LIKERT'S MANAGEMENT SYSTEMS BY RENSIS LIKERT

In the 1960s, social psychologist Rensis Likert and his colleagues at the University of Michigan in the United States administered questionnaires to managers from 200 organizations. He wanted to gauge management performance by determining which leadership style could extract maximum productivity from the subordinates.

7.5.1 What is Likert's Management System?

Likert's management systems are management styles developed by Rensis Likert in the 1960s. He studied the patterns and styles of managers for three decades and established a four-fold model of management systems. His four systems are designed to highlight various organisational dynamics and characteristics built around interactions between individuals. Notably, the systems explore several soft management skills, such as trust-building and their effects on the broader dynamic of the organisation itself.

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The four management systems by Likert:

1. **System 1 - Exploitative Authoritative:** under this system, decision-making and responsibility lie in the hands of the people at the upper echelons of the hierarchy. The top management makes the policies and rules. The employees at the lower level are bound to follow the instructions. The superior has no trust and confidence in subordinates. Dictums get imposed on employees. They cannot freely converse about their jobs with the managers. The managers play on fear - punishment and threats get used as motivation tools. Teamwork and communication are minimal.
2. **System 2 - Benevolent Authoritative:** The responsibility lies at the managerial levels but not at the lower levels of the organizational hierarchy. The superior has condescending confidence and trust in subordinates (master-servant relationship). Here again, the subordinates do not feel free to discuss things about the job with their superiors. Teamwork or communication is very little, and motivation is based on a system of rewards.
3. **System 3 - Consultative:** Under this system, managers have greater trust in their subordinates and demonstrate it by implementing ideas or beliefs that they share with their team members. There is an open level of communication throughout the organization, and team members are often consulted during the decision-making process, particularly when any changes will affect them substantially. However, the ultimate power of decisions remains with those at the highest levels within the organization. Employee motivation gets roused by incentives, including rewards and the responsibility for specific tasks. In this style, employees are given greater freedom and involvement in meaningful tasks is used to boost intrinsic motivation.
4. **System 4 - Participative:** Responsibility for achieving the organizational goals is widespread throughout the organizational hierarchy. The superior has a high level of confidence in his subordinates. The level of communication is high, both horizontally and vertically, and teamwork is regular.

7.5.2 Key concepts:

Under Likert's Management Systems, several dynamics determine which management system is at play. These are:

- Motivation
- Communication

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- Influence
- Decision-making

1. **Motivation:** Motivation is a driving force that stimulates the employees to accomplish the organization's objectives. Now, it can be used both positively (through rewards and incentives) and negatively (through punishment and threats). Exploitative Authoritative and Benevolent Authoritative primarily focus on punishment, whilst Consultative and Participative are angled more towards a system of reward, though none is committed to any one approach. Rewards can come in the form of monetary bonuses, extra responsibility, opportunities for development, or the improvement of employee relationships with superiors.

2. **Communication:** In Exploitative Authoritative Systems, communication is virtually one-way, with decisions being dictated directly from higher management to subordinates, on the other hand, in Participative Systems, communications are horizontal, with employees participating in the day-to-day decision-making process.

3. **Influence:** The levels of influence employees hold are a conspicuous indicator of the management system at play. In Benevolent and Exploitative Authoritative Systems, subordinates are generally not consulted about decisions that relate to their role. On the other hand, in Participative Systems, employees are encouraged to add their pennyworth to the discussions.

4. **Decision-making:** When employees are asked their opinions and ideas regarding the running of the business, they may indirectly influence the decision-making of their superiors, with their thoughts, ideas and values being included in any strategic planning. However, in either of the Authoritative Systems, the final decision is made by individuals at the upper levels of the organizational hierarchy. Alternatively, in Consultative Systems, the employees are given a role in the decision-making process through consultation and in a Participative System, subordinates may have as much influence in decision-making and goal setting as their manager.

7.5.3 Conclusion:

Likert's studies confirmed that the departments or units employing management practices within Systems 1 and 2 were the least productive, and the departments or units employing management practices within Systems 3 and 4 were the most productive.

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With the help of the profile developed by Likert, it became possible to quantify the results of the work done in the field of group dynamics.

The Likert theory also facilitated the measurement of the "soft" areas of management, such as trust and communication.

According to Rensis Likert, *the* nearer the behavioural characteristics of an organization's approach System 4 (Participative), the more likely this will lead to long-term improvement in staff turnover and high productivity, low scrap, low costs, and high earnings.

7.6 THEORIES OF LEADERSHIP

Leadership theories seek to explain how and why certain people become leaders. Initially, the focus was on ascertaining the characteristics of leaders, but some attempted to identify the behaviours that people can adopt to improve their leadership abilities in different situations.

Early debates on leadership often suggested that such skills were innate abilities. In other words, these theories proposed that certain people were "born leaders." More recent theories propose that possessing certain traits may help make people nature leaders, but that experience and situational variables also play a critical role.

What exactly makes a great leader? Do certain personality traits make people better suited to leadership roles, or do characteristics of the situation make it more likely that certain people will take charge? When we look at the leaders around us—be it our employer or the President—we might find ourselves wondering exactly why these individuals excel in such positions.

People have long been interested in leadership throughout human history, but it has only been relatively recently that several formal leadership theories have emerged. Interest in leadership increased during the early part of the twentieth century.

Early leadership theories focused on what qualities distinguished between leaders and followers, while subsequent theories looked at other variables such as situational factors and skill levels. While many different leadership theories have emerged, most can be categorized into one of the five broad types: Great man theory, trait theory, behavioural theories, contingency theories, and contemporary theories.

7.7 GREAT MAN THEORY

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Are some people born to lead? A cursory glance at the history provides numerous anecdotal evidence. Alexander the Great, Julius Caesar, Napoleon, Mahatma Gandhi, and Abraham Lincoln were the nonpareil leaders of their times. They had a strong moral fiber, great resolute to achieve their objective and a clear vision. Even today, the belief that truly great leaders are born is common.

7.7.1 What is the great man theory?

In the 19th century, a historian named Thomas Carlyle said, "The history of the world is the biography of great men". According to him, a leader is one gifted with unique qualities that captures the imagination of the masses.

The Great Man Theory of leadership espouses that great leaders are born, not made. It states that some people are born with traits that are the mainstay of a successful leader. Under the Great Man Theory, prominent leaders throughout history were born to lead and deserved to do so on the back of their natural abilities and talents. The theory gives the semblance of heroism.

7.7.2 Criticism:

One of the central problems with the Great Man theory of leadership is that not all people who possess the so-called natural leadership qualities become great leaders. If leadership is simply an inborn quality, then every individual endowed with the said traits must have eventually found themselves in leadership roles.

The Great Man Theory gives the semblance of heroism. Accordingly, a leader is a hero who accomplishes goals against all odds for his followers. Such assumptions are unrealistic.

Many of the traits cited as being vital to being an effective leader are typical masculine traits. In contemporary research, there is a significant shift in such a mentality.

7.7.3 Conclusion:

The Great Man Theory was a catalyst for arousing the interest of the researchers in understanding what leadership is - Who is a leader? What are the distinguishing traits of a great leader? From this emerged the trait theory of leadership.

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7.8 TRAIT THEORY

The Great Man Theory is the earliest theory of leadership. It suggested that great leaders were born and not made. They had some inborn qualities, and this made them great. However, there was no agreement on the traits these leaders shared or how to identify such people. In trait theory, the researchers attempted to identify these traits of a leader.

7.8.1 What is the trait theory?

The Trait Theory is an extension of the Great Man Theory. The objective of the Trait Theory was to discern the innate traits embodied by an individual that transmogrify them into successful leaders. Different researchers worked on this theory, like Francis Galton. Galton stated that leadership quality is for those who have specific traits that are rigid by birth. Cowley also said in 1931 that traits should be part of research in leadership study. In 1948, Ralph Melvin Stogdill also supported Trait theory and did value addition to it. He added further that leadership is based not only on inherent traits but also on the way a leader interacts with the situation.

The theory sought personality, social, physical, or intellectual traits that differentiated leaders from non-leaders. Underlying this approach was the assumption that some people are natural leaders endowed with certain traits not possessed by others. It attributed managerial success to extraordinary abilities such as tireless energy, intuition, uncanny foresight, and irresistible persuasive powers. Some of the traits identified were as follows:

i. Personality traits: self-confident, adaptable, assertive, emotionally stable etc.

ii. Task-related characteristics: driven to excel, accepting of responsibility, having initiative, results-oriented etc.

iii. Physical traits: young to middle-aged, energetic, tall, handsome etc.

iv. Social characteristics: charismatic, charming, tactful, popular, cooperative, diplomatic etc.

7.8.2 Assumptions:

The kernel of this theory is its three assumptions, which are as follows:

- Individuals have innate leadership traits.
- A specific set of traits induces a particular behavior pattern.

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- This behaviour pattern is irrespective of the situation, i.e., doesn't change according to the situation.

7.8.3 Results:

There were many studies conducted during the l930s and 1940s to discover these elusive qualities focusing on the trait of leaders. But the research effort failed to find any traits that would guarantee leadership success. It could not identify a universal set of traits to recognize a leader in all situations.

7.8.4 Criticism:

The trait theory of leadership lacks in providing better and clear results. It is not fit for all situations, as different traits were set forth by different researchers ergo, there is no uniform list. Consideration of other factors that affect leadership is also missing. Also, the comparative analysis of traits and their importance is undetermined. It couldn't justify why some people with these traits were not influential leaders and why some others with streaks of rigidness were successful. Tests to measure these traits are also not present.

IN-TEXT QUESTIONS

1. Fill in the blanks- _____ holds a formal position in the organisation, whereas _____ can influence the group even without a formal position in the organisation (Leader/Manager)

2. Leaders who practice Laissez- faire style is very good at _____

a) Decision Making b) Delegating work
c)Communicating with employees d) None of the above

3. Under this leadership style followers feel they are participating in the decision making, but they are not-

a) Benevolent Autocratic b) Dictator Leadership style
c) Manipulative Leadership Style d) Laissez- faire leadership style

4. ____ leadership theory assumes that leaders are born not made.

a) Trait Theory b) Authentic leadership
c) Great man theory of leadership d) Transactional theory of leadership

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7.9 BEHAVIOURAL APPROACH

The behavioural leadership theory focuses on how leaders behave. Sometimes called the style theory, it suggests that leaders aren't born successful but can be created based on learnable behaviour. Behavioural theories focus heavily on the actions of a leader—this theory suggests that the best predictor of leadership success is viewing how a leader acts. Action rather than qualities are the focal points of behavioural learning theory.

The main difference between trait theory and behavioural theory is the process of becoming a leader. In the trait theory of leadership, people can become leaders smoothly because they were born with the requisite skills. In the behavioural theory of leadership, however, anyone can become a leader after learning leadership skills.

7.9.1 Ohio State Studies:

The researchers at the Ohio State University ushered in the direction of studying leadership extensively. The objective was the examine the impact of a leader's behaviour on job performance and satisfaction of employees. For this purpose, they administered the Leader Behaviour Description Questionnaire (LBDQ) to scores of employees. The LBDQ consisted of 150 statements concerning leadership behaviour. Each employee responded depending on the degree of a leader's engagement in various behaviours.

After studying the results of the ratings, the researchers subsumed the leader's behaviour under two categories. First, consideration, and second initiating structure.

i. Consideration: the extent to which the leader exhibits concern for the welfare of the employees. A leader high in consideration respects employees' ideas, tries to solve their problems, is approachable, treats them as equals and frequently appreciates their work. S/He focuses on forging mutual trust and a conducive environment for his employees.

ii. Initiating structure: the extent to which the leader defines individual roles. A leader high in initiating structure will set clear goals and emphasize meeting performance targets and deadlines. S/He will set much store by systematic coordination of work. Will delineate job descriptions of each employee along the pecking order.

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Ohio State Leadership Grid:

According to Ohio State Leadership Studies, a leader can elicit both behaviours concurrently, which means consideration and initiating structure are not mutually exclusive.

Hence, leadership behaviour can be plotted on two separate axes rather than on a single continuum, as shown in the following diagram:

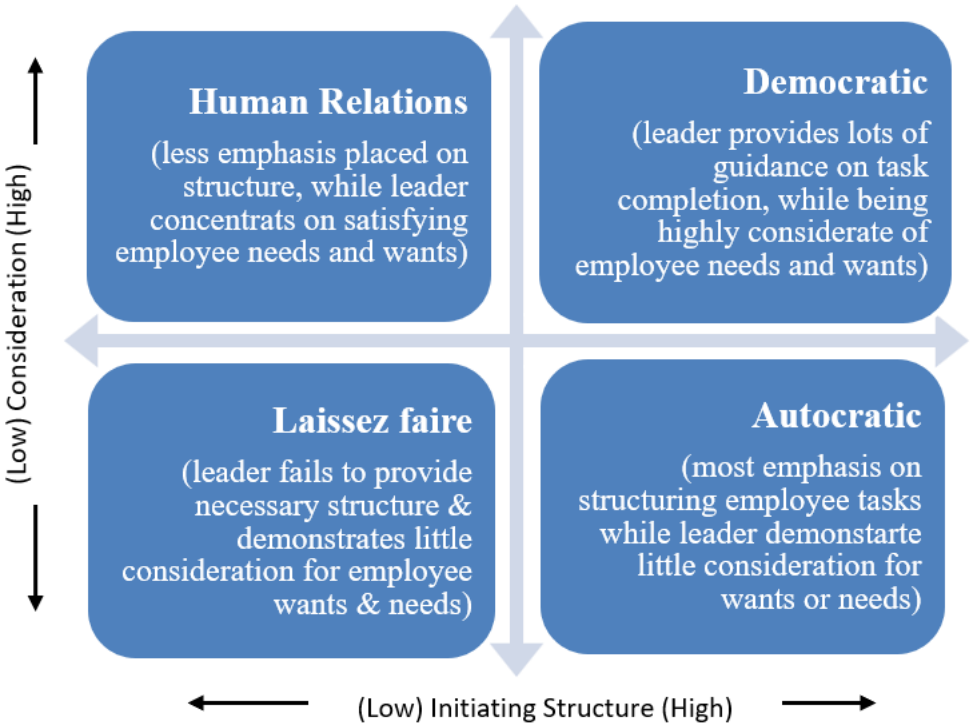

Figure 7.4: Ohio State Leadership Quadrants

Each quadrant in the above diagram is a mixture of varying degrees of initiating structure and consideration. A manager adopts any one style. The four quadrants are as follows:

1. Low structure and low consideration: the leader neither provides a rigid structure nor demonstrates much consideration for his employees. He projects a laissez-faire leadership style and is suitable for highly skilled employees with high intrinsic motivation.

2. High structure and low consideration: the leader is pedantic about structuring the work and roles of employees. He projects an autocratic leadership style and does not care much about his employees' needs and wants.

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3. Low structure and high consideration: a leader sets much store by the needs and wants of his employees. His primary concern is the welfare of his employees. For instance, a leader might define the problem and ask the group members to decide how they will work together to accomplish the task.

4. High structure and high consideration: a leader is highly active and considerate of his employees. He defines the structure but is open to alteration to squeeze in employees' ideas, needs and wants.

Conclusion:

The Ohio State Leadership study found that a leader who is high in initiating structure and consideration (a high-high leader) is predominantly effective. He achieves high employee performance and satisfaction. However, in a significant number of cases, there were exceptions found. These exceptions indicated a need to take situational factors into cognizance.

7.9.2 University of Michigan:

a study commenced at the University of Michigan intending to identify the leadership styles that achieved maximum performance and job satisfaction among employees. It draws much semblance to Ohio State studies. The study identifies two broad leadership styles: employee-oriented and production-oriented leadership style.

i. Production-oriented leader: This is quite similar to a leader under the Ohio State study who is high on initiating structure focusing on task-oriented activities. The leader considers employees as stakeholders.

ii. Employee-oriented leader: This is similar to a leader under the Ohio State study who is high on the consideration emphasizing on human relations. The leader considers employees as a means to achieve production targets.

Conclusion:

According to the University of Michigan, employee-oriented leadership coupled with general direction and not overbearing supervision would yield maximum performance and job satisfaction.

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Criticism:

The overarching assertion that an employee-oriented style leads to better productivity is contentious. It does not account for the employees and the circumstances that may warrant the use of a production-oriented leadership as more effective.

For instance, some intricate jobs might require a more hands-on approach from the leader.

Also, the same leadership style may not yield the same results for two different organisations due to different dynamics.

7.9.3 Leadership Grid:

The leadership studies at the University of Michigan and the Ohio State University hinged on task-oriented and employee-oriented leadership styles. In the 1960s, Robert Blake and Jane Mouton also built their work on these dimensions. They proposed a grid known as the managerial grid (also known as the leadership grid). The x-axis of the grid indicates concern for production (keeping tight schedules) by the leader, and the y-axis portrays concern for people (accommodating people's needs and giving them priority). Each dimension ranges from low (1) to high (9) and thus rendering 81 different positions in which the leadership style may fall.

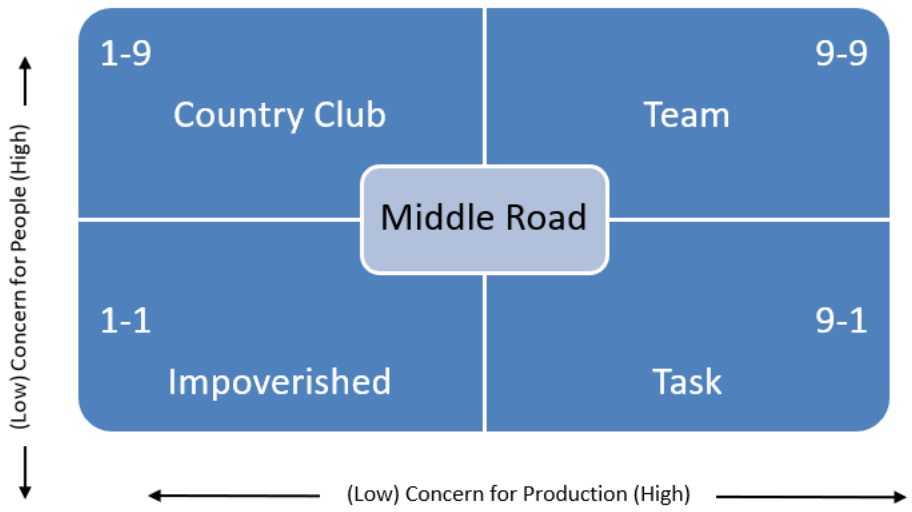

Figure 7.5: Leadership Grid

The five resulting leadership styles are as follows:

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i. The impoverished style (1, 1): The managers have low concern for; people and production. Managers use this style to avoid getting into trouble. The main concern for the manager is not to be held responsible for any mistakes, which results in less innovative decisions.

The leader uses a "delegate and disappears" management style. They are not committed to either task accomplishment or employee satisfaction, which leads to chaos, disharmony within the organisation and high employee turnover.

ii. The country club style (1, 9): This style has a high concern for people and a low concern for production. Managers using this style pay much attention to the security and comfort of the employees in the hope that this will increase their performance. The resulting atmosphere is buoyant but not necessarily productive.

iii. The task management style (9, 1): With a high concern for production and a low concern for people, this style finds employee needs unimportant. Managers using this style manage their employees through rules and punishments. This dictatorial style is based on Theory X and perceives employees as a mere means to an end.

iv. The middle-of-the-road style (5, 5): the manager tries to balance the company's goals and workers' needs. This is a halfway between employees' needs and the company's needs, which are viewed as disparate by the manager. He believes it to be the best way possible as he assumes that employees' needs and the company's goals can not be reconciled and hence, tries to achieve acceptable performance.

v. The team style (9, 9): In this style a manager pays high concern to both people and production. The manager premises his leadership style on Theory Y, where s/he fosters teamwork. This method relies heavily on making employees feel like a quintessential part of the company.

The manager leads by positive example and endeavors to harness a team environment in which all team members can reach their highest potential, both as a team and as an individual. He or She encourages the team to accomplish team goals effectively and work as a team to strengthen the bonds among the various members.

Conclusion:

The Managerial Grid is used to help managers analyze their leadership styles through a technique known as grid training. Under this training, questionnaires get administered to the

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employees that help managers identify how they stand in their concern for production and people. The training aims to help leaders reach the ideal state (9, 9).

Nevertheless, the model ignores the importance of internal and external limits, matter, and scenarios.

IN-TEXT QUESTIONS

5. Hersey and Blanchard Model is part of _____ theories

a) Trait Theories

b) Behavioural Theories

c) Contingency theories

d) Contemporary theories

6. Leadership Grid is part of _____ theories

a) Trait Theories

b) Behavioural Theories

c) Contingency theories

d) Contemporary theories

7. Ohio state studies is part of _____ theories

a) Trait Theories

b) Behavioural Theories

c) Contingency theories

d) Contemporary theories

8. If a leader shows more concern for employees over the task, such a leader falls under quadrant which is popularly also known as ____ as per the Leadership grid.

a) Impoverished

b) Teamwork

c) Task oriented

d) Country club

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IN-TEXT QUESTIONS

9. If a leader shows more concern for task over the employees, such a leader falls under quadrant which is popularly also known as ____ as per the Managerial grid.

a) Impoverished

b) Teamwork

c) Task oriented

d) Country club

10. If a leader shows more concern for both task and employees, such a leader falls under quadrant which is popularly also known as ____ as per the Managerial grid.

a) Impoverished

b) Teamwork

c) Task oriented

d) Country club

11. _____ quadrant is best position for a leader as per behavioural theory of Managerial grid.

a) Impoverished

b) Teamwork

c) Task oriented

d) Mid Way

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7.10 CONTINGENCY THEORIES

The contingency leadership theory, sometimes called situational theory, focuses on the context of a leader. A leader's effectiveness is directly determined by the situational context in addition to his behaviour. This theory takes the specific leadership styles and suggests that good leaders can adjust their leadership style situationally. It also advocates that it will be best to find the right leader for a specific situation. Types of contingency theories include Fiedler's Contingency Theory, Evans and House's Path-Goal Theory, and Hershey and Blanchard's Situational Theory.

7.10.1 Fiedler Contingency Model:

Till the late 1960s, the building blocks of leadership theories were; the innate skill set to be a leader, and there were predominantly two leadership styles (task-oriented leadership and relationship-oriented leadership style). None of the theories factored in the clout of external factors on the effectiveness of a particular leadership style.

In 1967, an Austrian psychologist, Professor Fred Fiedler, concurred with the idea of natural leadership style dyed-in-the-wool, which is hard to change. Nevertheless, as per him, situational factors have an equal sway on the efficacy of a leadership style. Fiedler contended that there is no infallible leadership style for every situation. For this reason, there must be a match between the leadership style and the situation at hand. So, the two vital tenets of his theory were:

i. Natural leadership style, and

ii. Situation favorableness

Assumptions:

The model contended that an individual premises his leadership style on his past experiences and psychology. It is impossible to change one's natural leadership style. There are only two ways to improve the outcome of an organisation:

i. Change the situation, or

ii. Change the leader

Steps for application of the Model:

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Step 1: Identify the leadership style

To riddle out one's leadership style, Fiedler curated the Least Preferred Coworker (LPC) questionnaire. The questionnaire asks respondents to describe the one co-worker they least enjoyed working with by rating that person on a scale of 1 to 8 for each of 16 sets of contrasting adjectives (such as pleasant–unpleasant, efficient–inefficient, open–guarded, supportive–hostile). If the respondent even held this co-worker in high regard and scored him high, Fiedler categorized him/her as a relationship-oriented leader. By contrast, if the respondent gave a low score to this co-worker, it is deduced that his natural leadership style is task oriented. About 16 per cent of respondents scored in the middle range and consequently weeded out of the study.

Step 2: Defining the situation

Every situation calling for leadership requires a specific leadership style geared towards it. For this reason, one must assess the favorableness of the situation. This hinges on three variables:

i. Leader-member relationship: This is a measure of trust, confidence, and respect members have for their leader. The higher the confidence, the more favourable the situation is.

ii. Task structure: It is highly streamlined structure leading to a favourable situation. The more precise the tasks are – the higher the task structure.

iii. Power position: It gauges the authority of a leader over power variables like hiring, firing, promotions, and salary increase. Stronger the power position, the more favourable the situation.

Essentially,

Favourable situation = Good leader-member relationship + high task structure + strong power position.

An unfavourable situation is on the other end of the continuum.

Step 3: Matching leaders and situations

Combining the three contingency dimensions yields eight possible situations in which leaders can find themselves. The Fiedler model proposes matching a respondent's LPC score and these eight situations to achieve maximum leadership effectiveness. Fiedler concluded that task-oriented leaders perform better in very favourable and very unfavourable situations. Relationship-oriented leaders, however, perform better in moderately favourable situations.

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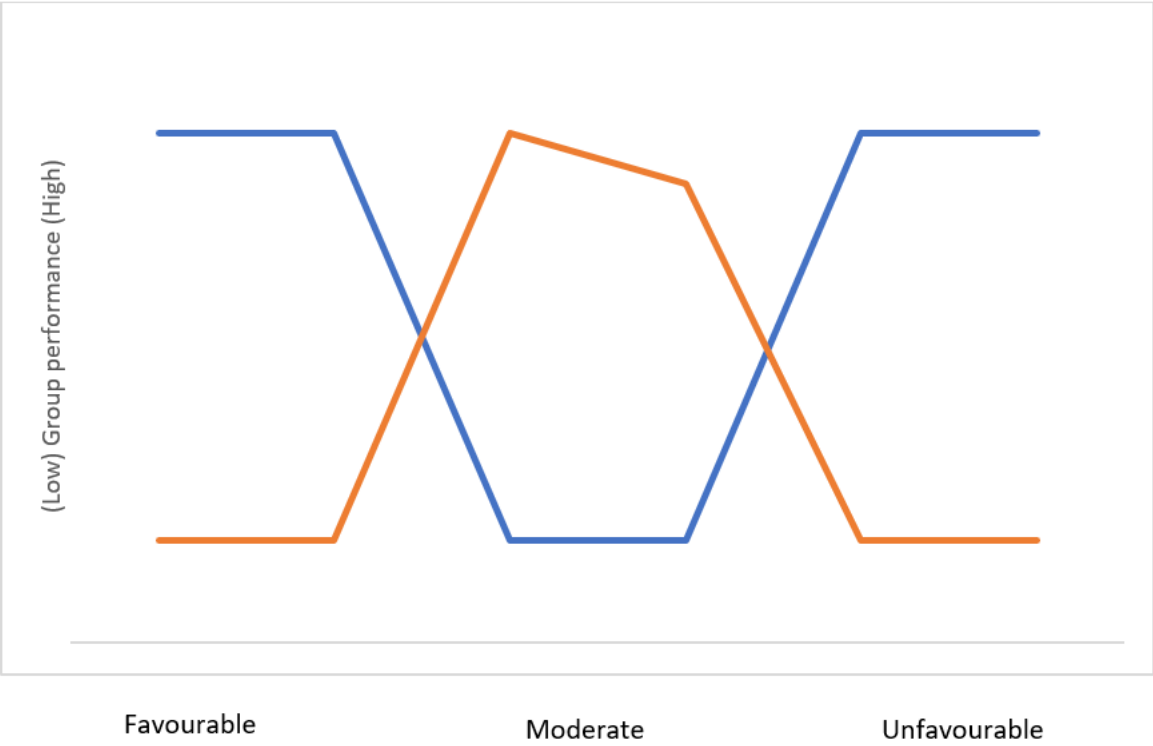

Figure 7.6: Fiedler Contingency Model

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Situation	**Favourable**		**Moderate**				**Unfavourable**	
Leader-member relations	High	High	High	High	Low	Low	Low	Low
Task structure	High	High	Low	Low	High	High	Low	Low
Position Power	High	Low	High	Low	High	Low	High	Low

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Conclusion:

Fiedler's theory is far too rigid. It states that you can not change your leadership style, so when a scenario arises where your leadership style and the situation at hand are at odds, you should bow out. Also, if your score falls in the middle range of the LPC test, the theory does not categorize you into any leadership style.

7.10.2 Hersey and Blanchard's Situational Theory:

Until this time, leadership theories focused on the leaders and their traits. However, Paul Hersey and Ken Blanchard premised their leadership model on the subordinate's maturity. Under this model, leadership style is not static and should be geared based on employees' maturity levels. The maturity level has two components:

- Psychological maturity: reflects their self-confidence, willingness, and readiness to accept responsibility.
- Task maturity: reflects their relevant skills and technical knowledge. High job maturity means the employee has the ability to execute the task at hand with efficacy.

Four leadership styles:

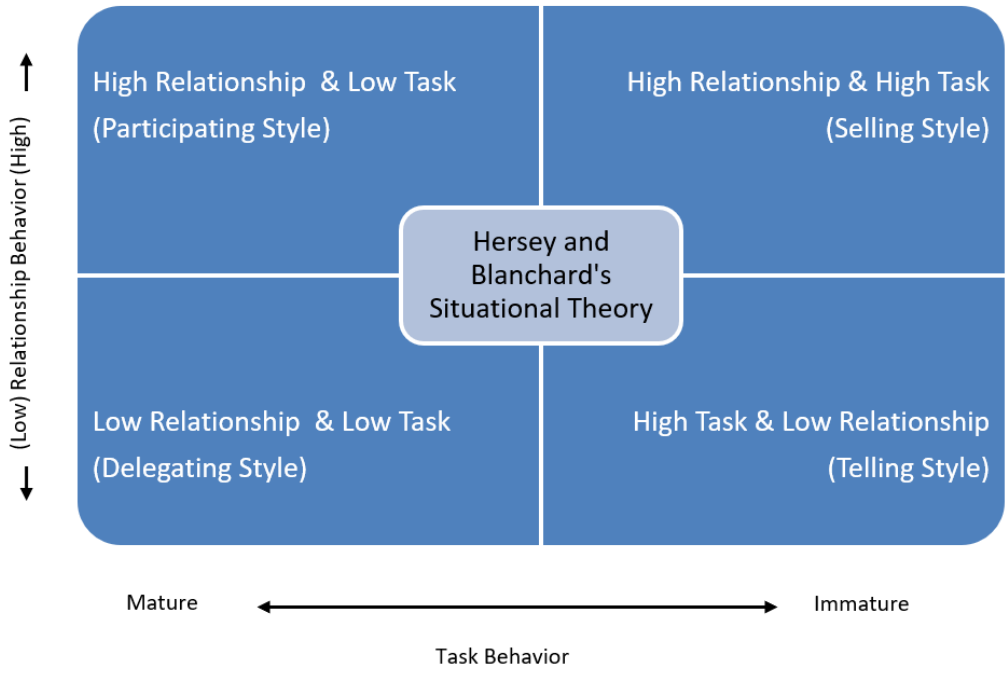

Figure 7.8: Hersey and Blanchard's Situational Theory

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1. **Delegating style:** a low-task, low-relationship style wherein the leader gives carte blanche to the employees to accomplish the goal. This style is befitting for employees with high psychological and task maturity.
2. **Participating style:** a low-task, high-relationship style wherein the leader kindles the employees to partake in decision-making. This style is suitable for employees with high task maturity but a flagging willingness to execute the task.
3. **Selling style:** a high-task, high-relationship style wherein the leader helps employees to gain confidence. He tries to sell his ideas and vision to the employees. This style is befitting for employees with high task maturity but, with time, have lost enthusiasm.
4. **Telling style:** a high-task, low-relationship style wherein the leader gives explicit directions and supervises work closes. This style is geared towards low-maturity employees.

Conclusion:

The upside of the model is that it provides leeway for the leaders to gear their leadership style based on their employees' maturity, understanding and context of the organisation. It advocates that leadership is flexible and not static, like Fiedler's Contingency Model, which believes that an individual's leadership style is fixed.

The downside is it places too much responsibility on the leader's ability to decide and change his leadership style as per the situation. However, these decisions may be flawed.

7.10.3 Path-Goal Theory:

The path-goal theory was the brainchild of Robert House. It has the expectancy theory of motivation at its core. The path-goal theory expounds on the impact of a leader's behaviour on an employee's perception of expectancies between his effort and performance. It is incumbent on the leader to define goals, clarify the path to achieve goals, and heave any obstacles from that path.

The path-goal theory endorses servant leadership. Servant leadership theory advocates that a leader is a facilitator. He should provide the information, support, and all other resources required by employees to complete the task. According to the path-goal theory, the choice of leadership style is contingent on several employee and environmental factors. Compendious details of each component are as follows:

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Leadership styles:

There are four leadership styles:

1. Directive: in this, the leader envisions the present and future goals of the organisation. Then, he breaks it down into smaller manageable goals with checkpoints at each step. Employees have explicit information about their work and how to do it. The leader uses the carrot-and-stick approach. He makes judicious use of rewards and punishments. This is the same as the task-oriented leadership style.

2. Supportive: the leader is cordial and empathetic. He demonstrates thoughtfulness and concern for his employees' welfare. This is the same as the people-oriented leadership style.

3. Participative: a leader doesn't consider his employee as a cog in the machine but as a stakeholder. He consults his employees on important decisions related to goal setting and the path to achieving those goals.

4. Achievement-oriented: The leader sets challenging goals and encourages employees to reach their peak performance. The leader believes that employees are responsible enough to accomplish challenging goals. This is the same as the goal-setting theory.

Contingencies:

The relationship between a leader's style and effectiveness is dependent on the following variables:

i. Employee factors: these include factors such as employees' needs, locus of control, experience, perceived ability, satisfaction, willingness to leave the organization, and anxiety. For instance, if there is an employee with low motivation, then a participative leadership style will be preferable.

ii. Environment factors: these include factors such as task structure and team dynamics that are outside the employees' control. For example, for employees performing simple and routine tasks, a supportive style is much more effective than a directive one.

Conclusion:

The theory has been subjected to empirical testing in several studies and has received considerable research support. This theory consistently reminds leaders that their primary role as a leader is to assist their subordinates in defining their goals and then to assist them in accomplishing those goals most efficiently and effectively. This theory gives a guide map to the leaders about how to increase subordinates' satisfaction and performance levels.

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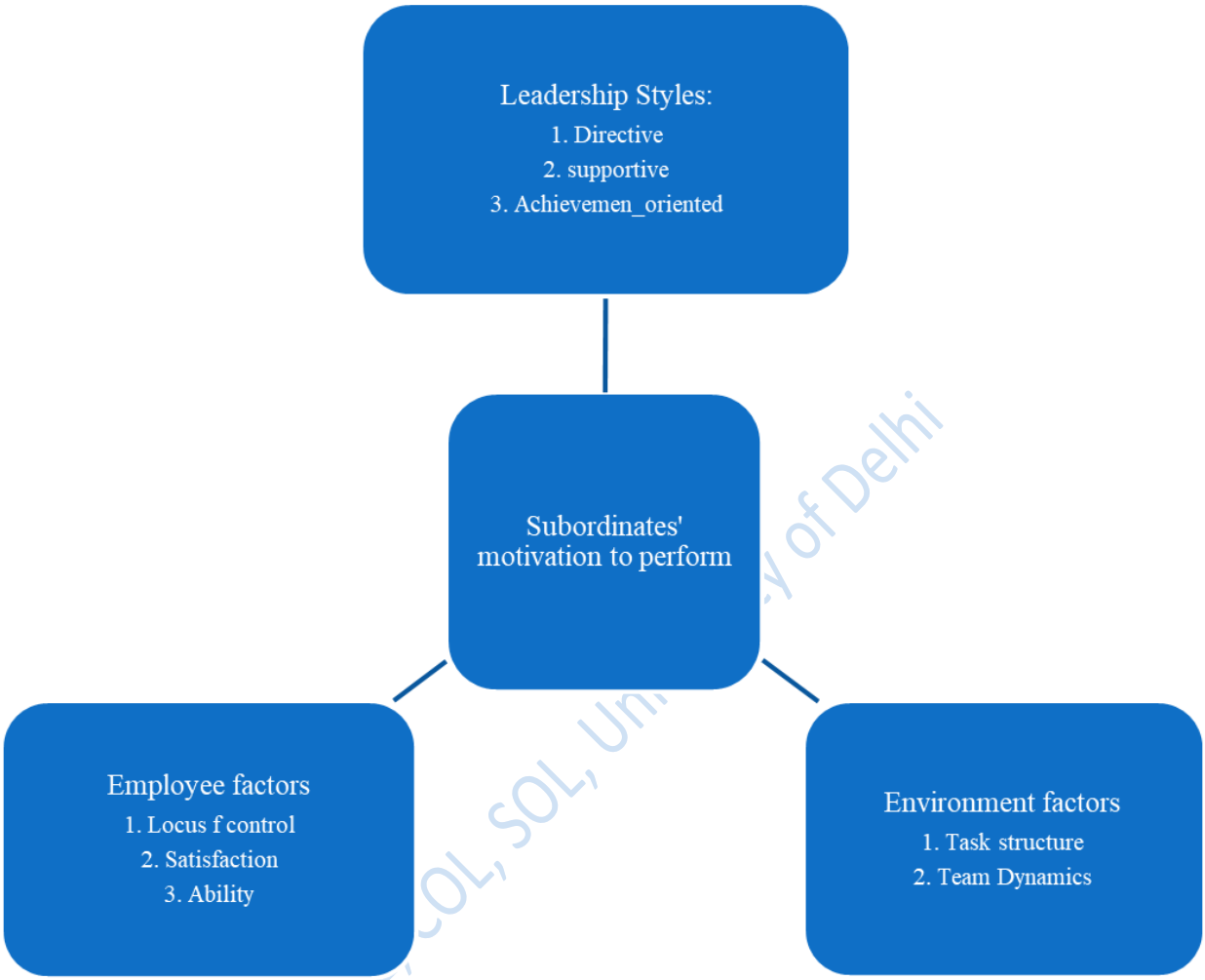

Figure 7.9: Path-Goal Theory

7.10.4 Continuum of Leadership Behaviour by Tannenbaum and Schmidt:

The "contingency" approach argues that leadership style should be based on a particular situation and not on the leader's personal preferences.

Contingency theorists Robert Tannenbaum and Warren Schmidt identified seven leadership styles. They run in a continuum, from rigid authority at one end to full freedom for your team at the other. The below diagram displays all the styles:

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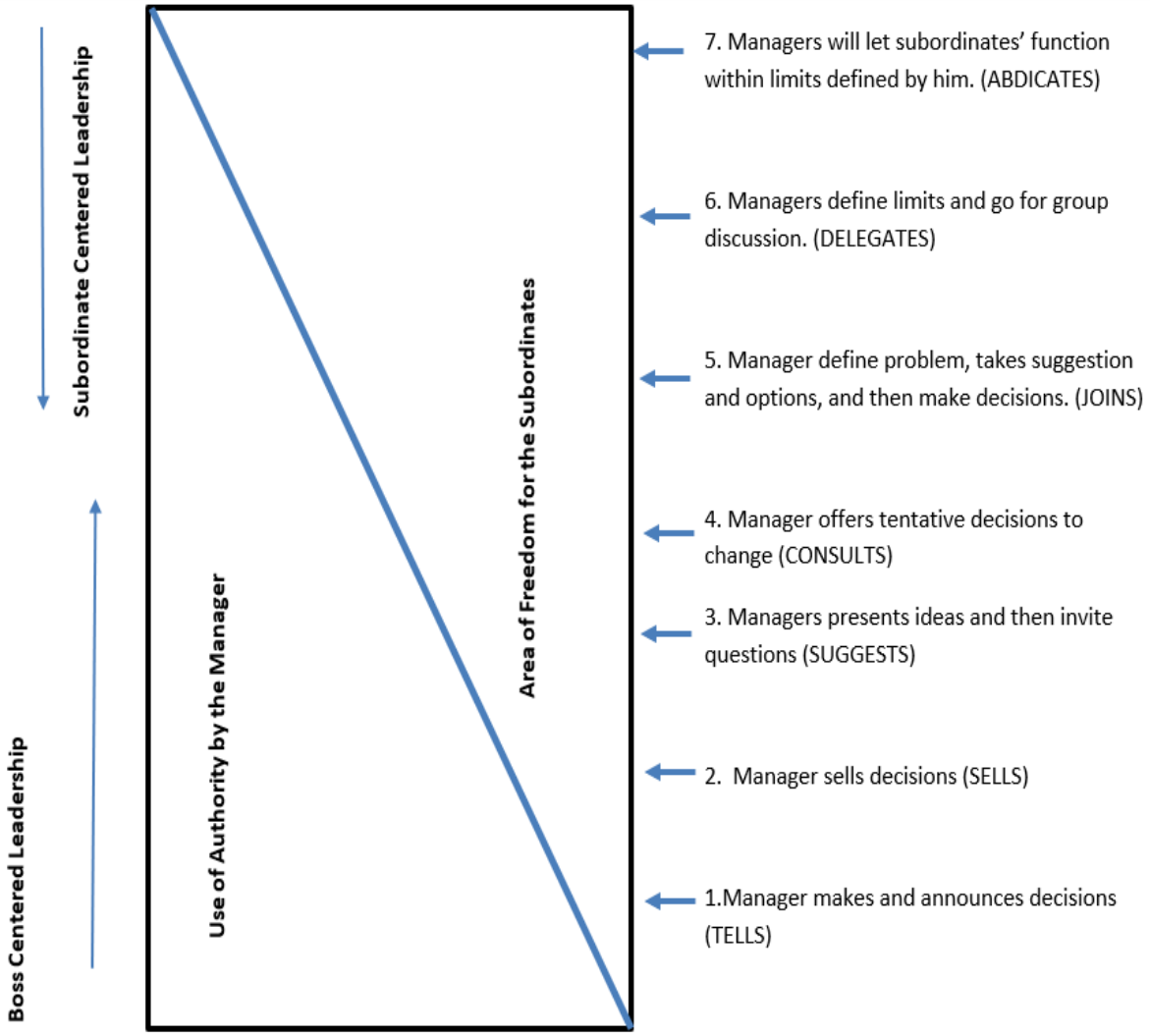

Figure 7.10: Range of Leadership Behaviour

The seven leadership styles broadly correspond to a team's level of development. As trust and competency grow, so does the amount of freedom that the team members want and that leaders feel comfortable providing.

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7.11 CONTEMPORARY THEORIES

7.11.1 Transactional and Transformational Leadership Style:

Burns suggested the initial idea of transactional and transformational Leadership, and Bass formally introduced the theory. Transactional leaders mainly focus on ongoing work. They work with employees to fulfil organizational goals and simultaneously plan for the next actions. Based on the results and performance manager also rewards and punishes employees. Under transactional Leadership, employees are appreciated for their contribution, but the manager usually neglects employees who lack required capabilities and skills. Transactional leaders are more concerned about completing goals as suggested in path-goal theory, Fiedlers' model, etc.

The transactional leadership style compliments the transformational leadership style. The last decades of the 20th century recognized the need for leaders who could develop their followers' behaviour and transform them into new leaders. Various researchers extensively explored the theory. It is a leadership style where leaders like Richard Branson (Virgin), Andrea Jung (Avon) etc., tend to inspire their followers. Transformational Leaders change or transform followers' perceptions and help them solve old problems in new ways. They motivate employees to put extra effort into achieving the set goals. Bass suggested four factors that form transformational Leadership: idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. Transformational leaders help employees improve and grow to do their jobs independently. They ensure that employees change and improve for the betterment of an organization.

Transformational Leadership goes beyond transaction or task completion and helps followers transform themselves to adopt new ways of doing the task. They pursue employees to be more creative and innovative. The transformational leader does have qualities of transactional Leadership. But the same is not true in the wise-versa case. The transactional leader follows the Laissez-Faire style, he hands over the responsibility to followers, and mostly they tend to intervene when set standards are not met. In addition, to following roles, transformational leaders also provide vision to the followers. They communicate challenging goals and motivate employees to perform above expectations using a problem-solving approach. Unfortunately, sometimes employees and Leaders get enthusiastic and become over-engaged with loyal employees and piling up too many tasks and responsibilities.

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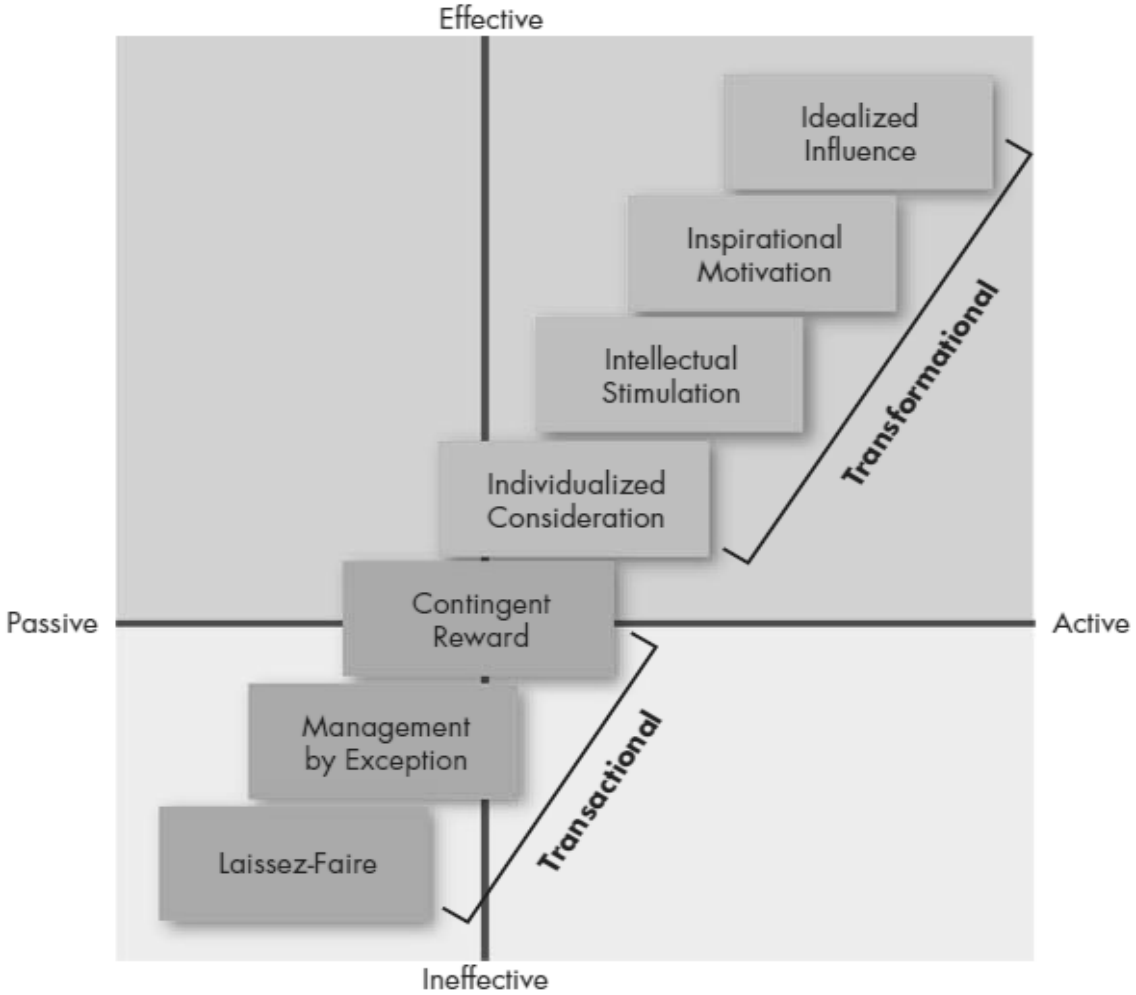

Figure 7.11: Transactional and transformational leadership

Source: Robbins, S. P., Judge, T. A., & Vohra, N. (2019). *Organizational behavior by Pearson 18e*. Pearson Education India.

Transformational leaders are more creative and ready to take more risks. Such leaders are able to boost the confidence among followers to pursue ambitious goals. They make followers believe that goals are personally essential for them. They have a charisma that motivates employees to give extra effort. But vision dominates charisma, unlike charismatic Leadership. Leaders are found to be committed to the organization and can win the followers' trust.

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CASE STUDY

Leadership styles played a critical role in the inability of Xerox to capitalize on its invention of the first user-friendly personal computer. The researchers in the Xerox Palo Alto Research Centre (PARC) developed the first graphical user interface, mouse and menu driven computer-technological advances that made computing accessible to the novice user (Bennis & Biederman, 1997). The lab's charismatic leader, Bob Taylor, recruited only the very brightest scientists, gave them the freedom to innovate and inspired them to work together to solve tremendously complex problems. Researchers at PARC invented new products, obtained multiple patents, and pioneered many of the computer technologies we now take for granted. However, because Xerox PARC was not well integrated into the rest of the company, Xerox's top management was skeptical of the inventions the lab developed and didn't see how they fit in with their current copying equipment (Poe, 2000). Xerox lacked a transactional leadership style in the top management team to provide the structure and systems that could capture the knowledge generated in the PARC labs. Where Xerox failed, Apple succeeded. Steve Jobs visited the PARC facility in 1979 and immediately saw the future of computing in the mouse-driven graphical user interface (Bennis & Biederman, 1997). Jobs left the PARC labs without any hardware or software but with a vision for how computers should operate. Jobs and his Apple employees were able to convert the innovative PARC ideas into the Macintosh computer, which debuted in 1984, changing the face of computing. Because of Jobs' Leadership, Apple created the systems and structures that were able to convert their knowledge into a valuable product. Jobs exhibited both transformational and transactional leadership styles. He used a transformational leadership style to create a vision for the Macintosh and challenge his employees to reach nearly impossible goals. He used a transactional leadership style to create the systems and structures in Apple that allowed the knowledge created at all levels of the organization to be converted into a valuable product-the Macintosh personal computer.

a. Using the instances from the case study, differentiate between transformational, transactional, and charismatic Leadership.

b. What led to the success of Apple under the Leadership of Steve Jobs.

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7.11.2 Charismatic Leadership:

The followers' positive perception of their leader (like Martin Luther King Jr., Steve Jobs, Indira Gandhi, and Narendra Modi etc.) makes such leaders powerful and influential. However, followers sometimes don't even have rational reasons behind such beliefs. This term was initially suggested by sociologist Max Weber. The word "Charisma" is derived from a Greek word which means gifts.

Charismatic Leadership refers to a "*Certain qualities of an individual personality, by which they are set apart from ordinary people and are treated as endowed with exceptional powers or qualities. Such qualities are not accessible to the normal person and are regarded as the divine origin or exemplary, and based on them, the individual is treated as a leader.*"

Later in 1977, Robert J. House studied it in organizational settings. According to Robert House, followers' positive perception of certain observed behaviours in an individual makes them leaders. Charismatic leaders usually have a vision and are ready to take risks at a personal level to achieve their vision. They are susceptible to the follower's needs and generally show behaviour that is perceived as a novel.

It has been observed that charismatic leaders influence followers with an appealing vision followed by a long-term strategy that could result in a better future. The followers can visualize a challenging yet achievable vision from a charismatic leader. The vision usually fits the ongoing circumstances and gives uniqueness to the organization. They can increase confidence in followers that the vision could be attained through a given strategy and high performance. Employees can identify with the leader personally. Such leaders also communicate a certain set of values to achieve the goal. Overall, employees are able to connect with such leaders at an emotional level. The combination of certain personality traits and situational factors mainly leads to the rise of charismatic leaders. Charismatic leaders possess high confidence and are generally achievement-oriented, for example, Barack Obama. Similarly, followers become more receptive to charismatic leaders when they face stress and crises. For instance, In the 1930s, Franklin D. Roosevelt's vision was to get people out of the Great Depression.

7.11.3 Authentic Leadership:

The dawn of the 20th century and the beginning of the 21st century saw some infamous large-scale scams (like the fall of top companies like Enron and WorldCom) and periods of recession due to the deteriorating rate of leaders' moral and ethical conduct among employees. This led to the emergence of new theories of Leadership that were more value-

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laden and ethical such as "Authentic Leadership." Practitioners like Bill George, academicians like Avolio, leadership consultants like Kevin Cashman, etc, initially recognized the concept of Authentic Leadership. Authentic leaders are more effective at optimizing their effectiveness to achieve superior long-term results.

Authentic leaders are the one who maintains consistency in their words, actions, and internal value system. In addition, such leaders foster a long-term relationship with an organization in a self-disciplined manner; such leaders are not only passionate about their work but are deeply grounded in the roots of their value system and moral conduct. Balanced processing internalized moral perspective, relational transparency, and self-awareness are the four significant constructs of authentic leadership that are widely accepted.

Authentic leadership is an approach to leadership that emphasizes building the leader's legitimacy through honest relationships with followers who value their input and are built on an ethical foundation. Generally, authentic leaders are positive people with truthful self-concepts who promote openness. Building on the simple but essential idea that leaders may construct their sense of self-based on who they are as distinct individuals and based on who they are.

7.12 SUMMARY

Leadership largely depends upon the followers' perception and their acceptance. There are various leadership styles and theories in literature that helps us in understanding what makes an effective leader. The 19th century witnessed the rule of dictators, and Power - influence behavior among the leaders. The leadership at that time was mostly all about the one-man show, the Great man theory, and the Trait theories are grounded in this and were an attempt to search common traits that make a common man a powerful leader. Even today a leader equipped with such traits adds to the leadership effectiveness. With time union conflicts, uneducated workers, adaptation of new technology, etc., emerged and it became difficult to generalize trait theory. The focus of leadership researchers turned towards the behavior of leaders. The leader's behavior plays a crucial role especially in controlling today's information era's highly qualified employees. Due to the accelerated rate of technological advancements and associated unpredictability in the work environment, the need for contingency and situational leadership arises. The last decades of the 20th century recognized the need for leaders who could develop their followers' behaviour and transform them into new leaders. This led to the development of transactional and transformational theories of leadership. Till today many organizations are following the transformational style of

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leadership that was introduced in the 20th century. It involves five dimensions namely attributable and behavioral influence, inspirational motivation, the focus of intellectual growth, and individual consideration. The dawn of the 20th century and the beginning of the 21st century saw some infamous large-scale scams and periods of recession due to the deteriorating rate of leaders' moral and ethical conduct among the employees. The overall societal loss at the macro level and maintenance of investors' trust at the organizational level led to the emergence of new theories of leadership that were more value-laden and ethical such as Authentic Leadership. Looking at the various theories it can be stated that it is difficult to define leadership in few words. The current leader should follow a style/approach that fits the needs of all the stakeholders.

7.13 ANSWERS TO IN-TEXT QUESTIONS

1. Manager, Leader.	6. Behavioural Theories
2. Delegating work	7. Behavioural Theories
3. Manipulative Leadership Style	8. Country club
4. Great man theory of leadership	9. Task oriented
5. Contingency theories;	10. Teamwork
	11. Teamwork

7.14 SELF-ASSESSMENT QUESTIONS

1. Define Authentic Leadership. Do Ethics and trust relevant concepts to becoming an effective leader?
2. State the limitations of behavioural theories of Leadership.
3. Differentiate between a manager and a leader. Why does a manager need to become a leader?
4. Write a short note on the following- (any 5)
    1. Three Need Theory

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2. Adams theory
3. Tannenbaum and Schmidt Continuum
4. Managerial Grid
5. Situational Leadership Theory
6. Minzberg Managerial roles

5. Presently work environment has become very challenging in terms of competition. Additionally, Post Covid-19, many organizations are working in Hybrid mode (Physically and Work from home). Which leadership style or combination of leadership styles is more suitable for the present-day leader?

7.15 SUGGESTED READINGS

Koontz, H, Essentials of Management, McGraw Hill Education, 2020

Stoner, J. et. Al. Management, New Delhi, Prentice Hall of India, 2018

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LESSON-8

WORK TEAMS AND GROUPS

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STRUCTURE

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8.2 Introduction
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  8.3.2 Reasons for joining group and Types of Groups
  8.3.3 Group Development Process
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8.10 References

8.11 Suggested Readings

8.1 LEARNING OBJECTIVES

1) Analyse the growing popularity of using team in organizations.
2) Differentiate between work team and group.
3) Compare and contrast types of teams.

8.2 INTRODUCTION

In the previous chapters, you have well understood the concepts of individuals and their behaviors. It is worth mentioning that individual' behavior changes when they join a group. Once an individual is a part of a group, group behavior as a whole becomes crucial for performance. Let's understand the same with cricket match example. You must have watched cricket match; either a one day, 20-20 or test match format. The success and failure completely depend on the team spirit and team performance. Individual player may be good bowler or good batsman or good goalkeeper etc. Even though all the players are physically and mentally fit but for winning a match team performance is essential. If only few players are performing well but others are not then even a best of the team will fail to win the match. It is important to understand that if one can play as a team member and build a good team with essential skill set, nothing can stop the team to achieve its objectives. The beauty of teamwork can be explained as problem gets divided and strengths get multiplied when a team stands together. In other words, work team is a backbone of an organization. Big ventures are not possible without a good team.

Being a student of organizational behavior, one wants to know how people working in an organization behave or interact with one another as an individual, as a team member and/or as a group member inside of a business organization for the success of the business.

Individuals may be efficient but may not be effective when it comes to their performance when they work individually in the organization. As part of a group and team, individuals are responsible, accountable and have sufficient authority for proper execution of allocated work which creates a synergy by performing collectively.

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8.3 WORK GROUPS

Work groups share information, interact mainly to make decisions and help every group member in performing and fulfilling responsibility within their area of operation.

a) Goal- share information

b) Synergy- neutral (somethings negative)

c) Accountability- individual

d) Skills- random and varied

8.3.1 Group Properties:

a) Roles: Everybody in a team has to play a role in a well-coordinated expected manner. For which one has to identify their role as per given position. Identification of role depends upon how others believe us to act in a given situation. This calls for our own understanding of others' beliefs. If the compliance of role is as per divergent role expectation, it results in role conflict that can be minimized if monitored closely.

b) Norms: Norms are acceptable standards of behaviour (do's and don'ts) which are shared among the group members. It means groups create strong pressure on individual members for conformity in respect to changing their attitudes and behaviour to the group's standard.

c) Status: Is a rank or a position assigned to members of a group or to some group by others in terms of permeates. The determinants of status are (i) the power exercised by a person over the others, (ii) ability of a person to contribute to the goals which are set by the group, and (iii) an individual's personal traits.

d) Size: The size of the group, which depends on goal, also affects the group's behaviour.

e) Cohesiveness: It is the degree to which group members are willing or motivated to stay in the group as they have spent a great deal of time together. The degree of cohesiveness depends upon the relationship between group cohesiveness and performance norms that affects group productivity.

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f) Diversity: It refers to the extent to which group members are different or similar to one another. It identifies both costs in terms of group conflict resulting in dropout rates and benefits in terms of increased productivity.

8.3.2 Reasons for Joining Groups:

People cannot live and survive in isolation for a long period. For a variety of reasons, people join group. Some of them are as below:

a) **Security:** people join a particular group to get the sense of security from adverse environments created by management and reduce insecurity from threats.

b) **Self-Esteem:** joining a group increases self-esteem through group membership.

c) **Affiliation:** to show association or relationship with a group.

d) **Power:** it gives a sense of power to members of the group who join the group. Group power lies in being united as a group. People like to control others and make an impact on others. Membership of group offers power to people and enables them to use it over the others.

e) **Status:** People join groups to gain a status in the society. It provides recognition to the members of the group.

f) **Goal achievement:** The group is able to achieve organizational goals which cannot be achieved when working individually.

Types of Groups:

It is generally seen that an organization has different types of groups which work for the achievement of common organizational goals. A group is a collection of individuals who have a relation to one another that make them interdependent to some significant degree. Group can be classified as formal and informal.

a) **Formal Group:** Formal group is designated work group defined by an organization's structure. Crew members in the ship are the example of a formal group.

A formal group can be divided into the command group and task group.

(i) **Command Group or Functional Group:** A command group is reflected through the organizational chart and determines who the reporting officer is. Various functions of the organization like finance, marketing, human resource, research and development have functional groups.

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(ii) **Task Group or Project Group:** This group is created in the organization to identify and provide solutions for a specific problem. For a particular project a deadline is fixed and the efforts are made to meet the deadline. Budget for these projects are fixed in advance to facilitate the time bound resolving of the problem. The group is dissolved when the project gets completed.

(iii) **Task Force or Ad hoc Committee:** It is very similar to a task group. As the name suggests it is temporarily created to address a specific issue. Task force gets dissolved after making a recommendation on the specific issue. Issue can be redesigning of the reward system in the organization.

(iv) **Quality Circle:** Organizations are very much concerned for quality and want to ensure that each employee is committed to maintaining quality and will upgrade themselves. A small employee group is created to deal with productivity, and quality related issues. This group ensures that issues related to quality are resolved so that organization's commitment to quality can be ensured in all times to come.

b) **Informal Groups:** Informal groups are more social in nature. These groups are not defined by role relationships. The behavior that team members should engage in are stipulated by and directed toward organizational goals. Employees from different departments playing chess together is an example of an informal group.

Informal groups are also classified into two groups.

(i) **Interest Group:** Interest group is a group where people come together to attain a specific objective with which each one is concerned. A common interest binds the group members. Members may not belong to the same organization or department. Joining and leaving the group is at the will of the members and nothing is formal. For example, the Indian Commerce Association.

(ii) **Friendship Group:** People have social needs and want to be part of some social group. Social activities, religious beliefs, other common basis may be create friendship group. Yoga group, potpourri group, and birthday groups are very commonly found in the organizations.

Difference between formal and informal groups:

Basis for difference	Formal Group	Informal Group

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1. Meaning	Groups created by organization are to accomplish a specific task	Groups created by the employees to satisfy their social needs
2. Formation	Deliberately	Voluntarily
3. Size	Large	Comparatively small
4. Life	It depends on the type of group	It depends on the members
5. Structure	Well defined	Not well defined
6. Importance	Given to position	Given to person
7. Relationship	Professional	Personal
8. Communication	Moves in a defined direction	Stretches in all the directions

8.3.3 Group Development Process:

All groups go through various stages which are as follows:

a. **Forming:** The first stage of group development is forming, which brings together a group of individuals who look upto the leader for guidance and direction regarding the goals, tasks and skills required to achieve the goals.

b. **Storming**: This stage is one of intergroup conflict which is concerned with who will control the group. Members accept the existence of the group but resist the constraints it imposes on individuals. Members may feel agreeable or frustrated with the task or with other members of the group.

c. **Norming**: In the third stage members begin to take greater responsibility for tasks and come forward to resolve issues, setting up of group processes, formulation of group policies, procedures and values resulting in developing confidence in the group and its members and also start expressing their satisfaction to be part of the group.

d. **Performing**: The fourth stage is performing. Now the group is functional with active members who take initiatives and involve themselves to complete a task. Group members adhere to the group norms and collective efforts are made to ensure the group effectiveness.

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e. **Adjourning**: It is the final stage in group development which involves the termination of task and disagreement from relationships. The group may have mixed feelings. Some may be thrilled over their past achievements and performances, some may be unhappy to depart. This stage may happen for some groups quite early and some may experience it in a very long run.

IN-TEXT QUESTIONS

Q1. Which of the following statement is TRUE or FALSE?

Group refers to a collection of individuals who may interact.

The accountability of work group is individual.

The goal of group is to share information.

Groups create strong pressure on individual members for conformity in respect to change their attitudes and behaviour to group's standard.

One of the reasons to join group is security.

Diversity refers to the extent to which group members are different or similar to one another

The stages of group development process are five.

In forming, Work output is low, focused on defining the goals and tasks.

Performing relates to highly productive.

Adjourning is related to termination of task.

Leadership is shared in norming stage of group process.

Q2. Match list I with List II:

List I	List II
1. Group	(a) Two or more interacting and interdependent individuals who come together to achieve specific goals
2. Work group	(b) Interacts primarily to share information and to make decision.
3. Formal group	(c) Designated work group defined by an organization's structure.
4. Informal group	(d) It is social in nature.

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IN-TEXT QUESTIONS contd.

Q3. Fill in the blanks:

a) The first stage of group development process is ……
b) The last stage of group development process is ……
c) Work group has…… accountability.
d) Work group goals are ……
e) …….has face to face interaction.
f) The formations of informal groups are …….
g) Friendship group is an example of …….
h) Quality Circle is an example of …….

Q4. Arrange the following in right sequence:

i. Adjourning
ii. Performing
iii. Forming
iv. Storming
v. Norming

8.4 WORK TEAMS

A work team generates positive synergy through coordinated efforts. Team performance increases due to coordinated individual efforts. Individuals contribute to achieving goals and are accountable for the same. Individual inputs such as goal (collective performance), synergy (positive), accountability (individual and mutual), and skills (complementary) are crucial.

In business terms, teamwork means when a group of people use their skills to overcome each other's weakness by collaborating to achieve a mutual goal and creating a synergy effect. In other words, setting aside any personal conflict and coming to a mutual conclusion that benefits the group and the organization is teamwork in business. It involves constructive feedback and improving each other's ability without any personal grudges and feuds.

Teamwork has tremendous power. A team with good tuning can multiply the efficiency of a person by many times, and the total output can be unimaginable.

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8.4.1 Types of Teams

Teams have the potential to out stand products, provide services, coordinate different projects and negotiate the deals and make decisions. This section describes the four most common types of teams in an organization. These teams are capable of delivering the results and achieving the goals in a focused manner.

a) Problem Solving Teams:

A team of 5 to 12 employees of the same department meet on a weekly basis to discuss issues related to efficiency, work environment and quality concerns. They discuss the matter and make a recommendation to the manager. They can only recommend the solutions and have no authority to implement the recommendations.

b) Self-Managed Work Teams:

Self-managed work teams are ahead of problem solving teams. They not only make recommendations but also have authority to implement the solutions and take ownership of the results. These teams have 10 to 15 employees who are engaged in interdependent or highly related jobs and are fully responsible for the jobs which they have been assigned with.

c) Cross-Functional Teams:

Cross functional teams are formed with the employees who come from different work areas but more or less from the same hierarchical level. This team is formed to accomplish a task. Cross functional teams have become very popular because of their capacity to handle complex projects.

d) Virtual Teams:

Teams which meet virtually are commonly termed as virtual teams. All above teams meet face to face and perform their tasks. Virtual teams use computers, internet, software and other aids to let team members meet at a virtual platform even though members are physically dispersed. During Covid 19 pandemic, many of us have used virtual platforms to conduct meetings and connect colleagues with specific goals. We have experienced how it feels to be virtually present. Video conferencing has become very common.

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8.4.2 Difference between Group and Team is given below:

Terms 'groups' and 'teams' are used interchangeably. Cane suggests that organizations are sometimes unsure whether they have teams or simply groups of people working together. There is some difference between team and group which is discussed as below:

Basis	**Team**	**Group**
Definition	A team is a cooperative small group in regular contact that is engaged in coordinated action. Team is a specific type of group, hold interdependent roles and goals	When two or more persons interact and are interdependent on each other for achieving an objective it is called a group. In other words, a group refers to a collection of individuals who may interact.
Common superior	Team may not have a common superior.	Group has a common superior
Interaction:	Team may not have face to face interaction.	Group has face to face interaction.
Commitment:	Team members are supposed to be highly committed to work.	Group members are not much committed to work.
Interdependency	Team has the higher degree of interdependence	Group has a small degree of interdependence.
Accountability	Team members themselves are mutually accountable.	Group members are not themselves so accountable.
Size	Limited	Medium or large
Selection	Crucial	Immaterial
Leadership	Shared or rotating	Solo
Synergy	Positive	Neutral (sometime negative)
Skills	Complementary	Random and varied
Goals	Collective performance	Share information

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8.4.3 Creating Effective Teams

Nothing becomes effective without putting in some effort. So to make a team effective it calls for efforts from the management. Our discussion is based on Team effectiveness model has four components- context, composition, work design and process. Let's discuss.

Team Effectiveness Model

Context	Composition	Work Design	Process
Adequate resources	Ability of members	Autonomy	Common purpose
Leadership and structures	Personality	Skill variety	Specific goals
Climate of trust	Allocating roles	Task identity	Team efficacy
Performance evaluation and reward systems	Diversity	Task significance	Conflict levels
	Size of teams		Social loafing
	Member flexibility		
	Member preferences		

I. Context: factors which significantly contribute towards effectiveness are adequate resources, leadership and structures, climate of trust and performance evaluation and reward system.

Adequate Resources: Scarcity of resources is the limitation which almost all the teams face. This reduces the ability to give their best and perform effectively to achieve its goal. Teams are dependent on the organization to provide adequate resources to the teams. Organisational support is crucial. Resources are critical for teams. Timely information, optimum staff, adequate equipment and administrative assistance are critical for the teams.

Leadership and Structures: All the members in the team have to perform certain tasks. This has to be decided by the team leader. Leader not only leads the team but play an important role in the team. Leader has to empower the team members and play the role of a facilitator.

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Teams that establish shared leadership by effectively delegating it are more effective than teams with a traditional single-leader structure.

Climate of Trust: Trust is the base of every successful team. Trust among the members and on the leaders facilitates cooperation, creates bond, capacity to bear risk increases and reduces vulnerabilities. A climate of trust makes a strong foundation for a team.

Performance Evaluation and Reward system: Rather than having individual performance evaluation system, organisations should recognize team players and reward individuals for their team performance. Organisations must adopt group based appraisals, gainsharing, profit sharing, and small-group incentives can motivate teams to commit for attainment of goals by team efforts.

II. Team Composition: Each member in the team is selected on the basis of their skills sets and abilities. Selection is very focused and limited. Under team composition the ability, member's personality, role allocation, team size, diversity, and members' flexibility and preference for teamwork is discussed below:

Abilities of Members: Each member of the team is important. Selection depends on skills, knowledge and abilities. Members must complement each other. Selecting the best of the employees is not the key. Sometimes a mediocre employee turns out to be excellent and determined team builder and has precision for work. Managers need to understand the requirements of the team. For complex problems and high ability teams with intelligent members must be selected.

Personality of Members: Individual behavior is significantly influenced by personality. Different dimensions of personality are crucial for team effectiveness. Big five personality model provides a good base about the relationship between personality and effectiveness. Teams which reflect high conscientiousness and are open to experiences are better performers. Studies suggest that specific behavioral tendencies such as personal organization, cognitive structuring, achievement orientation, and endurance boost higher levels of team performance.

Allocation of Roles: Identification of potential roles and selecting the members keeping the roles can be very effective. Team should have a proper blend of experienced and skilled members. Managers must understand each individual strengths and weaknesses and allocate assignments that most suit them.

Diversity of Members: Diversity, like race and gender diversity, among the team can show different results. One, it may not at all impact the team performance. Two, it may impact team performance in a very positive manner and third, may produce negative impact on team

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performance. Diversity in function, education, and expertise are positively related to group performance, but these effects are quite small and depend on the situation. Leaders can play an important role in managing diversity effectively.

Size of Teams: Effectiveness lies in keeping the team small in size. Most effective teams have five to nine members. Managers must focus on roles / tasks and accordingly select most responsible and accountable members. Small is beautiful is the *mantra*.

Member Flexibility & Preferences: Every employee is not a team player. Many employees prefer to work alone than in teams. High-performing teams are composed of members who prefer working as part of a team. Managers must identify the work preference and accordingly select the members.

III. Work Design: Work designs are motivating by nature because it increases the sense of ownership of work and makes employees responsible for the tasks done. Variables which are concerned with work design such as autonomy, skill variety, task identity, and task significance are discussed below:

Autonomy: Is the freedom to do the task as per my choice which doesn't violate the generally accepted rules. It answers the question 'how much does the task let employees exercise its freedom?'

Skill variety: Opportunity to use different skills and talents to complete the tasks.

Task identity: Task identity is related to the ability to complete a task in a given time. A task needs to be understood well and identified completely to execute it well.

Task significance: Task significance means a task should create substantial impact on others. Team members should be more than willing to work on such tasks or projects which create impact on others.

IV. Team Processes: Common purpose, specific team goals, team efficacy, level of conflict, and are some of the variables which contribute to the team effectiveness. The idea behind the team process is to enhance process gains by reducing process losses to create positive synergy.

Common Purpose: Organizations mission has to translate at all levels of the organization. Teams follow the mission and develop their goals. Strategies are developed to achieve the goals. Clarity over the purpose is vital for the success of the teams. Directionless team will lead to nowhere. It is worth spending time to thoroughly draft the mission, vision of the organization and then for a specific team.

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Specific Goals: Goals must be measurable, specific and realistic. Best of the specific goals fail if they are not properly communicated. Goal should be challenging. Team performance increases with attainable but difficult goals.

Team Efficacy: Teams work harder to achieve success and success further motivates the teams to work harder. Managers can provide training to the employees and also help the team achieve small targets to boost their confidence. High level of confidence will increase the capability to deliver and make a team effective.

Conflict Levels: Conflict is not always bad. Conflict has a complex relationship with team performance. Functional conflicts are positive and dysfunctional conflicts create frustrations. Task related conflicts are functional in nature and relationship conflicts are dysfunctional in nature. Moderate level of task conflict like disagreements among members on certain issues may ignite creative thinking and team may lead to better decisions. Dysfunctional conflicts like incompatibilities and tensions among the members may become complex and lead to negative outcomes.

IN-TEXT QUESTIONS

Q5. Which of the following statement is TRUE or FALSE?

a) A work team generates positive synergy.
b) Team performance increases due to coordinated efforts.
c) A team with good tuning multiply the productivity of the person.
d) Virtual teams connected through the use of internet.
e) Video conferencing is an example of virtual team.

Q6. Fill in the blanks:

a) Team members themselves are ……..accountable.
b) The goal of team is …….performance.
c) The leadership of team is……..
d) There are …….components of effective team.
e) Strategies are developed to …….the goals.
f) Autonomy is the variables of ……

Social Loafing: It is the tendency when individuals put less effort to complete a task when working collectively than working alone. There is a general belief that productivity of the group working together will be higher than the total performance of the individual members working independently in the group. Members can engage in social loafing so making members individually and jointly accountable is logical.

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8.5 GROUP COHESIVENESS

Group cohesiveness is important for the smooth functioning of a group. Group differs in their cohesiveness. Cohesiveness is the tendency of a group to remain together while working towards a goal for the emotional need satisfaction of its members. It develops over time.

Factors that influences group cohesiveness:

a. Time spent together,

b. Size of the group,

c. Structure of the group,

d. Agreed upon group goals,

e. Inter-group competition,

f. Task commitment,

g. Group pride,

h. Favorable evaluation.

Advantages:

a. Worker satisfaction

b. Low turn-over

c. Less absenteeism

d. Higher productivity

To encourage cohesiveness suggestions are given below:

- Make a small size group to create bonds among the members.
- Encourage members to have conformity with group goals.
- Time spent together by members should be increased.
- Membership in the group should be perceived as difficult to attain and status of the group should be increased.
- Offer a reward to the group rather than to individual members.
- Encourage inter group competitions.

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- Physically isolate the group.

8.5.1 GroupThink

Groupthink refers to the group pressure which is created on any member of the group which influences a member's ability and thought process to make a decision in a particular way. It denotes a situation where the members put aside their opinions and beliefs and try to conform to the group decision. In a highly cohesive group, any member's ideas or opinions or solutions are influenced by other group members.

Symptoms of Groupthink:

1. There is an illusion of unanimity that creates a belief that everyone is in full accord if they don't speak and abstention becomes in favor.
2. Group members present logical reasons and assumptions to rationalize any resistance from a group member. When a decision is agreed upon, that course of action is followed. It stops the member from reconsidering his opinion.
3. Members apply direct pressure on those who do not agree to conform by being pressured into an agreement.
4. Member avoids deviating from the group consensus by keeping silent about their doubts and difference of viewpoints.

What causes Groupthink?

a. Dictatorial leadership

b. Group cohesion

c. Dislike of confrontation

d. Time constraints

e. Decisional Stress

How to Minimise Groupthink?

a. Managers can monitor group size as size increases, people grow more intimidated and hesitant. There is no magic number that eliminates groupthink as individual feel less personal responsibility when group size is large

b. Group leaders should be encouraged to be impartial by organisational leaders.

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c. Deliberations of all kinds should be open and all divergent of views should be welcomed from \the members. Leaders should play an active role to make this process free and devoid of pressure tactics.

d. Stimulate an environment of healthy debate to avoid groupthink by which better ideas may arise.

e. Have people from different backgrounds who will have different experiences, beliefs, and views which prove to be beneficial in avoiding groupthink and can lead a productive debate.

f. Include members of other departments to get different perspectives.

g. Take time enough over decisions that enable you to properly analyze the situation and come to a more rational response.

h. Consult an outside expert to get knowledge and information that you don't have

8.5.2 GroupShift

Group shift refers to the tendency of group members to exaggerate their initial positions that they hold in the beginning of group discussion. While taking decisions in groups, the discussion leads to a significant shift from the initial positions of members in which they were before the discussion.

It is seen that group decisions are more conservative and riskier than individual decisions. Group decisions set individual members free from accountability for the group's final choice. No single individual can be held fully responsible even if the decision fails. Group can undertake greater risk in this case.

The main reasons for groupshift are diffusion of responsibility throughout the group by members. It is said that smaller groups have higher groupshift than larger groups.

Difference between Groupthink and Group Shift:

1. Groupthink refers to the group pressure which is created on any member of the group which influences member's ability and thought process to take decisions in a particular way, whereas, groupshift is the tendency of group members to exaggerate their initial positions that they hold in the beginning of group discussion.
2. In groupthink, the group creates pressure on the individual member, whereas, in groupshift, the individual member creates pressure on the group.
3. In groupthink, popular view is favored and personal view is put aside whereas, in groupshift, due to group influence personal view becomes much stronger.

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Techniques to Eliminate Groupthink & Groupshift

There are the following four techniques used to eliminate groupshift and groupthink from a group.

A. **Brainstorming:** it is a process of generating ideas in which the group leaders state the problem in a clear manner so all participants understand and are encouraged to interact, think the unusual while withholding any criticism of those alternatives. All ideas are recorded for later discussion and analysis with pros and cons. Brainstorming develops group cohesiveness. The following are the two brainstorming techniques that help groups arrive at a preferred solution:

a. **Nominal Group Thinking**

It is more structured than brainstorming but also very similar. Group coordinator describes the problem and members independently write solutions without discussing among themselves. This eliminates the tendency of groupthink. Then all the responses are collected, discussed and answered by the member who has written them. After discussion based on evaluations a rank is assigned by members and the solution which gets the highest ranking by most of the members is the final decision.

The nominal group technique is an inexpensive means for generating a large number of ideas. In this technique, the following steps are taken:

(i) Alternatives or the solutions are independently written by each member.

(ii) All ideas are then recorded and no discussion is initiated till the time all ideas are presented by the members.

(iii) Ideas are then discussed and the group evaluates them.

(iv) Ideas are then ranked by each member independently.

(v) Final decision is based on the members rank assigned to the ideas.

(vi) Idea which gets the highest rank by most of the members is the final decision.

b. Electronic meeting:

Decisions when made electronically with the use of computers are termed as electronic meetings. This is similar to nominal group technique but is conducted through electronic mode. Computer programmes are used for secrecy which encourages group members to take independent decisions without the effects of

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groupthink. An interacting group is good for achieving commitment to a solution. It minimizes social pressures and conflicts.

B. Delphi Technique

It is a technique in which questionnaires are sent to the members located at different places. The results of the questionnaires are compiled and a copy of results is sent to all members with the view to review the results and respond to the second questionnaire which may generate new solutions. This process is repeated until a consensus is reached.

IN-TEXT QUESTIONS

Q7. Which of the following statement is TRUE or FALSE?

a) Group cohesiveness develops over time.
b) One of the advantages of group cohesiveness is less absenteeism.
c) Brainstorming is a process of generating ideas.
d) The nominal group technique is an inexpensive means for generating a large number of ideas.
e) Delphi technique in used to develop consensus.

Q8. Fill in the blanks:

a) Group …….in their cohesiveness
b) Group cohesiveness is important for the ……..functioning of a group.
c) Groupthink refers to a ……..phenomenon.
d) Groupthink denotes a situation where the members ……...their opinions and beliefs.
e) Group shift refers to the ……..of group members to exaggerate their initial positions that they hold in the beginning of group discussion.
f) The main reasons from groupshift are ……..of responsibility.
g) Smaller groups have ……..groupshift than larger groups.

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CASE STUDY

Mumbai's Dabba Walas

Mumbai's Dabba wala is not a new name for any Indian. They have gained lot of popularity not because of glossy business but because of their efficiency and commitment to work. Dabba Wala's case study is discussed in the most renowned business schools in the world. The high level of effectiveness has earned them a six sigma certification for which other businesses strive and dream of.

The flawless quality service since 1890 has ensured complete customer satisfaction with regards to the reliability of the system from twelve decades in India.

Dabba Walas run a tiffin service in Mumbai whose objective is supply of packed lunch food in tiffin from the customer's home to the customers' work place every working day. They arrange the collection of packed lunch in traditional tiffin boxes, load them on local trains (a compartment is reserved for the bulk tiffins) and deliver to all the areas in Mumbai including suburbs of Mumbai. These meals are cooked and packed by wives or mothers (or sometimes local restaurants) for individual office workers in central Mumbai. The noticeable feature of this delivery is that every office workers gets home tiffin every working day on time without any fault or delay. Obviously, the contents (in terms of variety and taste) of each tiffin box are unique, which is the central appeal of the service. When the lunch time is over in the day, the dabba walas again collect the empty tiffins from the working place and return them to the workers' homes.

The supply system adopted by dabba walas is extremely unique and full of risks. At each of the central stations, where train stops for about 20 seconds, other members of dabba wala teams unload the tiffin boxes for destinations near the station and sort them for hand delivery to the offices and workshops where the individual recipient work. Sharp round 12:45 pm tiffins are delivered and then the process is reversed to return the empties boxes to the homes. The service cost per box is about Rs. 300 per month and each dabba wala earn about Rs. 4,500 a month. Customers pay one month's bonus to the organization for the Diwali festival.

This seems to be simple process but it's a highly complicated, precisely well-coordinated operation. Mumbai city is known for its traffic chaos and local train rush. Traffic delays and occasional chaos are very common. Some of the dabba walas negotiate the traffic on foot and by bicycle at a cracking pace irrespective of weather conditions; the tiffin must get through.

The error rate is said to be vanishingly very small; one box may go astray every two months; about one in six million deliveries.

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CASE STUDY

Mumbai's Dabba Walas Contd.

One of the eye-catching point is that there is no government or IT support except special reserved train coach, no track and trace, no computers, no bar codes is leveled, just a handwritten code on each box that allows the dabba walas to identify or recognize which station the box has to be sent to and unloaded, its ultimate destination and its return address.

Many of the dabba walas have low level of literacy, but their ability to decode and correctly route the boxes that they each carry through the crowded streets is the key to the whole system. This kind of supply chain system requires very low levels of capital intensiveness. It is the team work that makes the service happens. Dabba walas commitment has made them special and the guiding force behind this commitment is Shivaji. In the name of Shivaji the members find the motivation to do the hard work and serve people with their home cooked food. They have a team of 5000 dabba walas who serve almost 2,00,000 Mumbaikar daily.

The future of the service

Of late, the migrations of workers in search of job in metro cities at large are very high. Due to covid-19 pandemic, people are hesitant to have meals from the nearby local road side restaurants or *dhabas*. The people with all sphere of life irrespective of different regional styles and traditional loves to eat home cooked hygiene food. This diverse range of home-prepared meals reliably to the individual in the workplace is in high in demand. The growth of fast food centre is a global phenomenon who also delivers fast food at destination as they claim as hygienic. They do have a website and are now able to accept orders via the site or by SMS. It requires frequent ordering every day which is quite monotonous for the office going workers. It is also seen that some of meal delivery centre claim that they supply home cooked hygiene meal on order at destination but it is good only for few days or emergency time not for all days in terms of variety, quality and taste.

The reasons for using dabba walas services are the following appeals:

1. Homemade food is cheaper and hygienic.
2. Homemade food is best for health as against junk foods which make you sick.
3. If you love to eat food made by your wife or mother, dabba walas is the solution.
4. They assures that they deliver yours home cooked meal on time at right destination.

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IN-TEXT QUESTIONS contd.

Q9. Match list I with list II:

List I	**List II**
1. Brainstorming	(a) develops group cohesiveness
2. Delphi technique	(b) Develops consensus.
3. GroupShift	**(c)** No single individual can be held fully responsible even if the decision fails.
4. Groupthink	(d) an illusion of unanimity that creates a belief that everyone is in full accord.

Your tasks are:

a) If a team is defined as a group of dedicated people working towards a common goal, discuss the strengths and weaknesses of the dabbawalas practice of making team members as shareholders, rather than employees.

b) Analyze the cohesiveness and performance of the dabbawalas team.

c) To what extent does the dabbawalas service display the features of an effective work group?

d) Why has technology played a very meager role in the development of the dabbawalas service so far? Is this likely to change in future.

e) Identify ways in which this might affect the team spirit of the organization.

8.6 SUMMARY

Most of the work in organization is done in teams. People often join groups to satisfy their needs of security, status, self-esteem, affiliation, power and goal achievement. In any organization, many different types of groups coexist. Whatever be the kind of group, every group goes through five stages of development, namely forming, storming, norming, performing and adjourning. Group cohesiveness is very important for the smooth functioning

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of a group. Several factors influence the group cohesiveness. Various decision-making techniques are used in groups for the development of consensus decisions. Groupthink and groupshift are two very important concepts in group decision-making.

8.7 GLOSSARY

- Adjourning: the final stage of group development that involves termination of the group.
- Brainstorming: generating ideas without any criticism.
- Delphi technique: a decision-making method which does not require the physical presence of group members.
- Forming stage: the first stage of group development in which people join the group and then define the group's purpose, structure and leadership.
- Formal group: the organization's structure, with designed work assignments establishing tasks.
- Group cohesiveness: the tendency of a group to remain together.
- Group: a collection of individuals working in face-to-face relationships to share information and resources for a task to be achieved.
- Groupthink: when a group exerts extensive pressure on an individual to align his or her opinion with others opinions.
- Group-shift: changing the decision as per the group.
- Informal group: group that appear in response to the need for social contact
- Norming stage: the third stage of group development where resolving of differences takes place.
- Performing stage: the fourth stage of the group development when the group is fully functional and works on group tasks.
- Storming stage: the second stage of group development in which conflicts start arising.
- Team: a group of individuals working in face-to-face relationship for a common goal, having collective accountability for the outcome of its efforts.

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8.8 ANSWERS TO IN-TEXT QUESTIONS

Q1	All true			
Q2	1 (a)	2(b)	3(c)	4(d)
Q3	(a) forming	(b) Adjourning	(c) individual	(d) share information
	(a) group	(a) voluntarily	(b) informal groups	(c) formal groups
Q4	iii; ii; v; ii and i			
Q5	All true			
Q6	(a) Mutually	(b) Collectively	(c) Rotating	
	(d) four	(e) achieve	(f) work design	
Q7	All true			
Q8.	(a) Differ	(b) Smooth	(c) Psychological	(d) Put aside
	(e) Tendency	(f) Diffusion	(g) higher	
Q9.	1.(a) ; 2 (b) ; 3 (c); 4 (d)			

8.9 SELF-ASSESSMENT QUESTIONS

1. What do you mean by work team?
2. What do you mean by Work group?
3. What is the difference between a group and a team?
4. What are the different types of teams that can exist in an organisation? Why do people join groups? Discuss.
5. What are the main characteristics of a group?
6. What are the various types of formal groups? Discuss with examples.

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7. Explain the characteristics/features of an informal group. Describe the various types of informal groups.
8. Describe the five stage of model of group developments.
9. Explain the term group cohesiveness.
10. Discuss the various group decision-making techniques.
11. What is the difference between groupthink and groupshift.

8.10 REFERENCES

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8.11 SUGGESTED READINGS

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LESSON-9

DECISION MAKING

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STRUCTURE

9.1 Learning Objectives
9.2 Introduction
9.3 Meaning and Definitions of Decision making
  9.3.1 Types of Decisions
  9.3.2 Techniques of Group Decision making
9.4 Process of Decision Making
9.5 Decision-making Models
9.6 Decision-making and Ethics
9.7 Summary
9.8 Glossary
9.9 Answers to In-text Questions
9.10 Self-Assessment Questions
9.11 References
9.12 Suggested Readings

9.1 LEARNING OBJECTIVES

After learning this chapter student will be able to:

- Explain the process of decision-making.

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- Describe the individual and group decision-making.
- Explain the concept of rational decision making and contrast it with bounded rationality.
- Understand the role of ethics in decision making

9.2 INTRODUCTION

Decisions are an essential part of one's life both personally or professionally. Decision-making is an integral part of a managerial job. Decisions are required at all the levels of management, but it's particularly imperative to managers. It plays an important role and is a key to success in management. An organisation's success is largely driven by its superb decisions and its execution. Decision making is the essence of management because various functions of management cannot be performed since it all requires decisions.

9.3 MEANING AND DEFINITIONS OF DECISION MAKING MAKINHAIN B

A decision is a choice. It is at the core of planning in which managers have to take decision to select a most suitable or appropriate course of action from several alternative courses to be adopted to achieve objectives. Decision making process takes place only when managers have two or more options or alternatives.

Decision-making is a tough and conscious process of making objective decision which is acceptable by those who would execute it and is beneficial for the organisation.

A manager may make following decisions:

1. Planning: (a) what are the organisation's long-term objectives? (b) what strategies will best achieve those objectives? (c) what should be the organisation's short-term objectives; (d) how difficult should individual goals be?
2. Organising: (a) how many employees should report directly to the supervisor? (b) how much centralisation should be there be in the organisation (c) how should jobs be planned? (d) when should the organisation put into operation a different structure?

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3. Leading: (a) how to handle employees who appear to be low in motivation? (b) what is the most effective leadership style in a given situation? (c) how will a specific change affect worker productivity? (d) when is the right time to intervene in a conflict?

4. Controlling: (a) what activities in the organisation need to be controlled? (b) how should those activities be controlled? (c) when is a performance deviation significant? (d) what type of management information system should the organisation have?

Definitions:

Decision making has been defined by several management scholars. Some of the definitions are given hereunder:

According to **Stoner, Freeman & Gilbert**, "Decision making is the process of identifying to deal with a specific problem or take advantage of an opportunity."

R. Terry defines decision making as the "Selection of one behaviour alternative from two or more possible alternatives.", "Decision making involves the selection of a course of action from among two or more possible alternatives in order to arrive at a solution for a given problem."

Weihrich & Koontz state that - All management work is accomplished by decision-making.

According to Allen – management decision making is *the work a manager performs to arrive at conclusion and judgement*.

According to Shull, Delberg and Cummings - "A conscious and human process involving both individual and social phenomena based on factual and value premises which concludes with a choice of one behavioural activity from among one or more alternatives with the intention of moving towards a desired state of affairs."

Kreitner defines it as "Decision making is a process of identifying and choosing an alternative course of action in a manner appropriate to the demand of the situation."

In other words, at every stage of managing, the manager faces the challenge of making correct, qualitative and effective decision to get the best out of a situation. Managerial decisions are formally directed towards making the organisation a functional entity preserving its identity and maintaining continuity in its working life.

Managers at all levels make decisions such as top level executives take decisions on major issues and matters that are directly concerned with the survival, profitability and growth of the organisation. For handling the matters arising day-to-day operations, lower level

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managers are granted authority to decide upon them. Managers at all areas of organisations make decisions regarding production, distribution, finance, purchase, personnel, research and development etc.

Characteristics:

- Decision making is an integral part of planning.
- It aims at choosing an appropriate course of action by weighing and weeding out several available alternatives.
- It involves the judgement and discretion of the decision maker.
- It is an activity with a purpose.
- Decisions are made to solve problems, resolve crises and conflicts.
- It is all pervasive.

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IN-TEXT QUESTIONS

Q1. Which of the following statement is True or False:

a) Managers at all levels make decisions.
b) Decision making takes place only when managers have two or more than two options.
c) Decisions are an integral part of organisations' life.
d) Decision-making involves the discretion of the decision maker.

Q2. Fill in the blanks:

a) Decisions are made to .....problems, resolves..... and .....
b) Top level executives take decisions only on matters that are directly .....with survival.
c) Lower-level managers are granted..... to make decisions on day-to-day operations.
d) Decision is a .....
e) Decision making is the conscious .....of making decision.
f) Decision's managers may makes are.....
g) Whatever a manager does he does .....decision-making.
h) All management work is .....by decision-making.

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9.3.1 Types of Decisions:

Each day involves a series of decisions ranging from minor to significant. Managers in different organisations encounter unique situations and problems. Depending upon nature of the problem, decision can of following types:

(a) **Programmed decisions:** Programmed decisions are made with regard to routine and recurring problems and require the application of a pre-determined set of procedures, techniques and decision rules. As the problem arises, the prescribed procedure is applied and a decision is made. Decision rules permit busy managers to make routine decisions quickly without going through a comprehensive problem-solving procedure. It encourages lower-level managers to share responsibility, in terms of guiding and instructing workers for day-to-day activities; help to solve the grievances of the workers, for programmed decisions. It allows higher level managers to concentrate more on important non-programmed decisions. So, the structured problems have to be first defined. The programme decision may be of the following three types:

(i) **Procedure**: A procedure is a series of sequential steps used to respond to a structured problem. For example selection procedure of an employee.

(ii) **Rule:** A rule is an explicit statement that tells what can or cannot be done. For example, the rules of the roads, rules observed at petrol pump, rules about lateness and absenteeism permit supervisors to make disciplinary decisions rapidly and fairly.

(iii)**Policy:** It is a guiding principle for making a decision. It establishes general parameters for the decision maker. It may be general policy and specific policy. Policies typically contain an ambiguous term that leaves interpretation on the decision maker. Some of the example of policy statements may be:

- Nobody would accept any gift from the outsiders except token gift.
- The customer always comes first and should always be satisfied.
- Promotion from within, wherever possible.

(b) **Non-programmed decisions:** As managers move up the organisational hierarchy (upper level), the problems they confront become more unstructured that are new or unusual for which information is ambiguous or incomplete. Non-programmed decisions are unique and non-recurring that require a custom-made solution. That is why upper-level managers

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delegate routine decisions to their subordinates so that they can deal with more difficult issues. Example of non-programmed problems are:

- Top management lays down the objectives.
- Top management prepares strategic plans and policies for the enterprise.
- Issues necessary instructions for preparation of department budgets, procedures, schedules etc.
- Controls and coordinates the activities of all the departments.

Difference between Programmed and Non-programmed Decisions		
Characteristics	**Programmed Decisions**	**Non-programmed Decisions**
1. Type of problem	Structured	Unstructured
2. Management level	Lower levels	Upper levels
3. Frequency	Repetitive, routine	New, unusual
4. Information	Readily available	Ambiguous or incomplete
5. Goals	Clear, specific	Vague
6. Time frame for solution	Short	Relatively long
7. Solution relies on	Procedure, rules and policies	Judgement and creativity

(c) **Strategic Decisions:** Strategy is a deliberate search for a plan of action that will develop a business's competitive advantage and compound it. The search is an iterative process that begins with recognition of where you are and what you have now. The difference between you and your competitors are the basis of your advantage.

Strategic decisions are usually made by top-level management which are important and critical for the survival, success and profitability of the organisation.

Every organization has to make decisions throughout the day that will impact the outcome of the organization. Decisions can be simple, like deciding on what to wear to work or whether to organize a meeting or not. However, strategic decisions that impact

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the direction of the organization are harder to make and are often the most important. The examples of strategic decisions are the selection of a product and processes, making capacity planning, selecting location of plant, switching to new technology, taking over other organization, and strategic alliance etc. are taken by higher level of management.

The main characteristics of strategic decisions are that once they are taken, it is neither desirable nor feasible to withdraw them and is based on risk.

(d) **Operational Decisions:** Mere formulation of strategic decisions are not the guarantee of success of any organisation unless until such decisions are implemented by making many other operational or tactical decisions such as production planning, quality control, cost control, inventory control etc. These decisions are concerned with routine and repetitive matters to implementation of strategic decisions. That's why the authority for making tactical or operational decisions is vested in lower level management.

The differences between strategic and Operational decisions are as below:

Strategic Decisions	Operational Decisions
These are long-term decisions	These are not frequently taken
These are considered where the future planning is concerned.	These are medium period based decisions
It is taken in accordance with organisational mission and vision	These are taken in accordance with strategic and administrative decision.
These deal with organisational growth	These are related to production and factory growth

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(e) Individual Decision & Group Decision:

Individual Decision: In a practical situation, a person is different from others in respect of the way of thinking. Some people are logical and rational and they process information serially while other people are intuitive and creative and perceive things as a whole. That's why different people use different decision-making styles in the organisation such as:

(i) The analytical style: This style has a much higher tolerance for ambiguity and best characterised as careful decision-makers with the ability to adapt to or cope with novel and unexpected situations.

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(ii) The conceptual style: This style has a low tolerance for ambiguity and seeks rationality. They are efficient and logical requires minimal information.

(iii) The directive style: It makes decisions fast and they focus on the short-run.

(iv) The behavioural style: This style has a strong concern with well-being of the subordinates and usually in this style suggestions from others are sought.

Individuals have a tendency to think and question before performing, which is fruitful in analysis and forecasting of an individual's behaviour.

Advantages of individual decision-making:

i. Individual generally makes prompt decisions.

ii. Individual decision-making saves time, money and energy. In other words, it is cost effective.

iii. Individuals are responsible and accountable for their own decision. They have no excuse for their bad acts and performance.

Disadvantages:

i. An individual uses own intuition and may be biased.

ii. Individual decision-making is proved more fruitful and productive in very small business organisation like sole-proprietorship or in family matter.

iii. Lack of consensus decision-making.

Group Decision Making:

It is generally believed that two heads are better than one. In group decision, the final authority to take decisions is vested in the group itself rather than in an individual.

A group decision is one in which more than two people are participating, deliberating and developing an amicable solution to the problem. If group is diverse, better decisions may be made because different group members may have diverse ideas based on their background and experience.

To deal with the problems, the manager is delegated with enough authority and within the extent and scope of it decisions are made, both on important as well as less important matters. Whatever the power and authority they have, they can exercise it only through meetings in

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which they make decisions unanimously or by majority votes. Such decision is generally taken in executive body (Board of Directors) or in various committees formed for the purpose of deciding on various matters at the lower level of the organisation.

Sometimes, the superior involves subordinates to get their cooperation and involvement in decision making in which subordinates may be of more concern with the objective of their acceptance. Group decisions may also be in the following form:

(i) Group participation in decision-making: Where the superior shares authority of decision making by involving subordinates.

(ii) Group decision-making: where the members or subordinates may share the authority of decision making with the chief executive.

(iii) Workers participation in management: Where the superior and subordinates may share the authority of decision making with the workers.

Advantages of group decisions:

(i) Creates Synergy: It is found when output is more than the inputs, which means whole is greater than the sum of its parts. As group also creates synergy effects in the quality and productive decisions because two or more members are involved in deliberation and amicable solution of the problems that may increase or improve the results.

(ii) Sharing of information: In group decisions, the members of the group not only sit together around the table for making decisions but also they contribute fruitful information and expertise which increases understanding, clarity and facilitates movement towards a collective decision.

(iii) Team spirit: Members involved in group decision-making represent cooperation, trust, respect and develop a team spirit to get maximum contribution from them.

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IN-TEXT QUESTIONS

Q3. Which of the following statement is True or False?

a) Decision rules permit busy managers to make routine decisions quickly.
b) It establishes general parameters for the decision maker.
c) Non-programmed decisions are unique and non-recurring.
d) Programmed decisions are structured.
e) Strategic decisions are important and crucial for the survival of the organisation.
f) Conceptual style of decision making has a low tolerance for ambiguity and seeks rationality.
g) Analytical style of decision making has a much higher tolerance for ambiguity.

Q4. Fill in the blanks:

a) A .....decision is made with regard to routine and recurring problems.
b) Each and every day is a series of decisions from ..... to .....
c) Programmed decision requires the .....of a pre-determined set of procedures, techniques and decision rules.
d) A rule is an explicit .....
e) Operational decisions are concerned with .....and.....matters.
f) Directive style of decision making focus on the .....
g) Behavioural style of decision making concerned with the well-being of their.....

Disadvantages of group decisions: The flip side of the group decision making are as follows:

(i) Diffusion of Responsibility: Group members are not themselves so much responsible and accountable which affects the quality of decision making adversely. Everyone is responsible for a decision which might mean no one is responsible. They do not exhibit a sense of responsibility.

(ii) Reduce efficiency: Ordinate delay in decision-making is also marked in a group decisions because of long discussions, diverse opinions of members and procedural technicalities. It sometimes reduces the effectiveness of the decision making process.

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(iii) Encourage indecisiveness: If the least competent member dominates the group decision it impedes the efforts of the most competent ones.

(iv) Groups suffer from social loafing.

(v) Groups may also suffer from groupthink.

9.3.2 Techniques of Individual and Group Decision Making:

The use of techniques improves the efficiency of decision-making as well as the quality of the decisions made by the manager. These techniques are as under:

Individual Decision Making Techniques:

There are six decision making styles of an individual. Every individual is not only different in nature but also their approach of decision-making differs and depends on different situations.

5. Deep Deliberation: In this style, the person spends excessive time and attention on weighing all possibilities before deciding on any one possibility. This style is appropriate when an issue is of great importance such as family problem, career choice, or serious relationship issue.

6. Impulsive Decision: An impulsive behaviour is when one act quickly with no thought to the consequences. An impulsive person is commonly described as hot-headed, rash, unpredictable and unstable. It is simply a person's reaction to situation in front of others. Such decision is often intuitive one. It is inappropriate in the cases related to academic choice, career choice, and relationship etc.

7. Escape: in this style, decision-making is avoided, by giving temporary solution and escaping from the situation. Escape would be an appropriate style if one has to face reality and is attempting to avoid it.

8. Compliance: Compliance refers to the act of obeying an order, rule, or request. It is an integral part of decision-making. In this style, the decision is made by someone else and the individuals has to obey the decision because of they are not comfortable to take decision due to lack of sufficient information.

9. Safe playing: Safe playing refers as taking least risky decision. In this style, the person chooses the option that has the least amount of risk. It is best option particularly when high risk is involved in decision-making.

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10. Procrastination: It means voluntarily delaying or postponing actions. Despite understanding the negative consequences of unnecessary delay, people defer the actions. In this style, the decision is simply delayed which means refusing to make a decision so long that the options that were once available to them no more remain available. It is not an effective decision-making style particularly when there is urgency or a timeline. Often, delaying decision makes the ultimate decision more difficult. It can be seen as irrational behaviour.

Individual Decision-Style Model

High ↑ Low Tolerance for ambiguity	Analytical	Conceptual
	Directive	Behavioural
	Rational → Intuitive Way of thinking	

The above matrix shows that individual decision behaviour depends upon a combination of tolerance for ambiguity and way of thinking. On the X axis we have way of thinking and on the Y axis we have tolerance for ambiguity. If the tolerance level is high and way of thinking is rational then individual decision style will be analytical. Likewise, if the tolerance level is low and way of thinking is rational, individual decision style will be directive. If the tolerance level is high and way of thinking is intuitive, the decision style will be conceptual and if the tolerance level is low and way of thinking is intuitive, the decision style will be behavioural.

Group Decision Making Techniques:

(a) Brainstorming: Brainstorming is a process in which creative thinking is encouraged for developing creative solution to problems by small groups of managers. Generally one of them is given the role of leader of the group who throws light on the various aspects of the problems and explains its nature to the other members. This technique does not offer a readymade solution to the problem. Rather, aims to generate possible alternative solutions and leads to evaluation for selecting the best one.

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Rules of Brainstorming:

(i) All the members sit together and start discussing the problems with generation of creative ideas with tentative solution as a member of free association one by one without any interruption by others.

(ii) Once, each one point of view on the problems is recorded in black and white to make every member familiar with the ideas generated.

(iii) Again, they are given an opportunity to make improvements upon them.

(iv) Later on each member, one by one is allowed to give suggestion on the various ideas so generated with the purpose to improve upon these ideas.

(v) In the subsequent session, ideas so generated are reviewed and alternatives evaluated for selecting a suitable one.

(b) Delphi Technique: This is the technique in which a small group of specialised experts are formed to express their opinion on the problem and its solution. The opinion expressed by each expert independently is not made known to the others because anonymity is desired. The expert does not know on whose response what new question has been framed.

In this technique the organisation after collecting the responses of experts to solve the problems, the opinions of experts are consolidated and summarised by the group leader and sent back to the experts for further analysis unless until a unanimous decision come out to solve the problems.

The Delphi technique involves the following steps:

(i) Under this technique, the organisation prepares questionnaires in two or more sets on the various aspects of the problems after analysing the sets of responded questionnaire.

(ii) The first questionnaire is sent to experts to seek their responses independently and after getting the responses of the experts, the group leader compiles and analyse the responses.

(iii) Again the second new set of questionnaire is sent to the experts and they are asked to respond. After receiving the response, it is analysed.

(iv) If any area remains untouched or untouched adequately, a third questionnaire may be designed and sent, and the responses are again compiled and analysed.

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(v) The said process repeated unless until a unanimity develop on each aspect of the problem.

(c) Nominal Group Technique: Under this technique, a group of individuals is formed to address a particular problem. It resembles the brainstorming technique but is considered to improve the effective of group decision-making because all the members of group are physically present in the meeting but discussion among the group member is not allowed.

In this technique, a problem is presented before the group members to experience the problem and then following steps take place:

(i) Each one is asked to write independently all the possible ideas to solve the presented problem that come to their mind about it.

(ii) Thereafter, each member has to present their idea to the group.

(iii) Further, the members are asked to add new ideas to the list on the basis of the ideas presented by others.

(iv) Once all possible ideas have surfaced and been recorded, the members may be allowed to suggest a possible solution and comment on the ideas with their relative merits and demerits.

(v) After this, the members privately vote on an idea and assign a particular rank to it on the basis of priority of the alternative solution.

(vi) The ideas getting the highest aggregate ranking are selected as a solution to the problem.

(d) Fish Bowl Technique: It a technique of role rotation in which a group of experts is formed who sit around the table and the members of the group have opportunities to express their viewpoints as a member as well as leaders in each round of discussion which is more structured and direct in nature.

(i) The central place is occupied by a leader who expresses his opinion on the problem with some solution for it. The members are allowed to ask questions and clarification of the problem. Member present in the meeting put their point of view one by one on leader's opinion. Once his viewpoint is discussed fully and understood, the leader gives up his chair to another member who now becomes the leader.

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(ii) Again new second leader gives his viewpoint in the light of the views expressed by the first leader. The members can ask questions based on the new leader's ideas which must stem from the first round of discussion.

(iii) This cycle of discussion continue till all the members have done their turn as a group leader.

(iv) At the end, all the viewpoints and ideas are taken stock of and further discussed collectively to arrive at a suitable solution.

Difference between individual decision and group decision

Individual Decision Making		**Group Decision Making**	
Pros	**Cons**	**Pros**	**Cons**
Typically faster than group decision making	Fewer ideas	Diversity of ideas and can piggyback on others' ideas	Takes longer
Best individual in a group usually outperforms the group	Identifying the best individual can be challenging	Greater commitment to ideas	Group dynamics such as groupthink can occur
Accountability is easier to determine	Possible to put off making decisions if left alone to do it.	Interaction can be fun and serves as a team building task	Social loafing-harder to identify responsibility for decisions.

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IN-TEXT QUESTIONS

Q5. Which of the following statement is True or False?

a) The use of techniques improves the efficiency of decision-making.
b) Brainstorming technique does not offer a readymade solution to the problem.
c) In the Delphi technique, the opinions of experts are collected in multiple sets of questionnaire.
d) Nominal Group technique resembles the brainstorming technique.

Q6. Fill in the blanks:

a) Brainstorming aims to generate possible ..... solutions and leads to ..... for selecting the best one.
b) In Delphi technique the opinion expressed by experts is .....to the others.
c) Fish bowl technique in a technique of .....
d) Under the nominal group technique, the ideas getting the .....aggregate ranking are selected as a solution to the problem.

9.4 PROCESS OF DECISION MAKING

Decision making process is concerned with the developing a consensus that suits to solving a problem. The steps in decision making have been identified by various authors has been summarised as follows:

The rational choice paradigm assumes that decision makers follow the systematic process which is discussed below:

Step-1: Identify the problem: The first step of decision-making begins with the identification of the problem which is a challenging task. A problem may define as the discrepancy between the current and the desired situation i.e., the gap between "what is" and "what ought to be." The efficiency of decision-making depends upon definition of the problem. Suppose, the management identified the problem that sales data is not readily available for evaluating whether sales target is achieved or not. It is found that sales representative who works in the field do not have digital mode of recording data. Further, it is noticed that sales representatives send a requisition for laptops which was not entertained by the department.

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Step-2: Identify Decision Criteria: Criteria that define what's relevant to resolving an identified problem. The relevant decision criteria, in regards to the purchase of a laptop may be such as price, display quality, and memory that will help guide the final decision that can be depicted as:

- Memory and Storage
- Battery life
- Warranty
- Display quality
- Price
- Carrying weight

Step-3: Allocating weight to the criteria: A simple way to assign weight is to give the most important criteria a weight of 10 and then assign weights to the rest using that standard, Such as:

Features	Desktop Weight
Memory and storage	10
CPU	8
Battery life	6
Warranty	2
Display quality	3
Carrying weight	0
Price	1

Step-4: Develop Alternatives: At this stage, the decision maker requires to list viable alternatives using creative thinking and innovativeness that could resolve the problem. Developing alternatives need to exercise cognitive flexibility.

Step-5: Analyse the alternatives: Once alternatives have been identified, a decision maker must evaluate each alternative with pros and cons in the light of the solution of the problems by giving due consideration to risk involved, time consumed, efficiency of the alternatives

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and resource position along with ethical and moral value. For this the management can take the help of some experts in regards to viable, scalable and worthy of investment.

Step-6: Selecting the best alternative: This step is concerned with choosing the best alternative or the one that generates the highest scores in solving the problem which is cost effectiveness and produce synergy effect. Selecting the best alternative does not mean that rest of the alternatives are worthless. Other alternatives are ranked as plan B, C and so on.

Step-7: Implementation of Decision: Decisions are implemented to achieve the desired outcome. It involves a series of actions and utilisation of resources. It must be noted that the lower level managers who have to implement a decision must participate in the process because they will help to re-evaluate. Before implementing a decision, necessary structural, administrative and logical arrangements are made.

Step-8: Reviewing Decisions: The last step in the decision making process involves reviewing the outcomes with regards to the resolved problems. We should access to what extent objectives are achieved. If the review shows that the problem still exists, then the manager needs to assess what went wrong.

9.5 DECISION MAKING MODELS

There are following popular models of decision-making:

(1) Rational Decision-Making Models:

This model is also known as Normative Model. This model assumes that a man is a rational human being who will apply quantitative techniques for decision-making to make precise and accurate decisions. While making decision, manager tries to become as much rational as possible. This is idealistic, rational and prescriptive in nature.

This approach implies the use of scientific and logical methods. The feature of this model is as follows:

(a) Being a rational man model, this approach is scientific, logical and full of reasoning.

(b) It calls for a scientific attitude on the part of managers backed by empirical verification.

(c) Under this model, managers should not allow his emotions, biases to interfere with decision-making.

(d) The managers must have clarity of action by which defined goals can be achieved.

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(e) This model also assumes that the manager have the ability to apply the criteria to analyse the collected information, develop alternatives and evaluate alternatives in the context of the defined goal.

(f) Every information is fully known and has no time or cost constraints.

(g) The manager must have a desire to optimise/ maximise benefits by selecting the best course of action.

2. **Bounded Rationality Model:**

This model is also known as Behavioural model or Administrative Man model.

In real-life situation, man cannot be always fully rational in his approach to make decision to solve all types of problems. This is the basis of developing behavioural approach of decision-making. This model is more pragmatic as it considers several factors that affect real-life decision-making in practice.

Herbert A. Simon propounded the theory 'bounded rationality' which states that the norm of rationality is bounded by information limitations or inadequacy of information which deviates from the rationality to solve the problems.

The major limitations that bound the managers are as follows:

(a) Uncertainties of environment: The future environment is full of complexities and uncertainties that cannot be predicted with a high degree of accuracy. Therefore, managers have to accommodate their choice accordingly.

(b) Conflicting Objectives: Generally organisations set multiple objectives such as primary objective and secondary objectives to serve the interest of organisation as well as to meet out social responsibility that may be conflicting to each other.

(c) Time Constraints: The concept of rationality is also bounded by time constraints because it is time consuming to process the whole steps involved in decision-making and the nature of complexity of problems.

(d) Organisational Constraints: The philosophy of the organisation, power structure, multiplicity of goals, existence of informal groups and set of organisational plans for which managers may be bounded to make decisions which are more practicable and feasible even by defying the norms of rationality.

3. Intuitive Decision Model:

When managers reach at a decision without conscious reasoning it is called intuitive decision. This is one of the most commonly used models for decision making. As per the Burke &

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Miller, 1999 survey, 89% of the managers sometimes used intuitive decisions and 59% used often. Intuitive decisions are not based on gut feelings. These are backed by experience and so not completely baseless.

9.6 DECISION MAKING AND ETHICS

Ethics generally refer as the set of moral ideology, shaped by social norms, cultural practices and religious influences that guide a human's behaviour about do's and don'ts. In decision-making only economic implication is not involved but their value and ethical dimensions are found to be equally important. The ethical behaviour of a decision maker plays an important role in those managerial decisions that directly involve the interests and objectives of society such as policies regarding recruitment, selection, dismissal, wages and salary etc.

For example, a decision to switch over to a new technology should be made by taking into account not only by economic implication but also ethical ones which require a high degree of honesty and integrity and depends on individual personality and organisational environment.

An individual or group can use the following three criteria to make such decision:

1. Utilitarian criterion: Under this criterion, managers evaluate the decisions and actions on the basis of their consequences. While taking a decision, they ensure that it will produce the greatest good for the large number of people.
2. Criterion of right: This criterion holds that all people have fundamental rights provided in the constitution of India particularly the right to property, freedom of expression, knowledge, privacy etc. It protects individuals from injury but hinders productivity and efficiency. So decision maker should respect and protect these rights.
3. Criterion of justice: It is said that justice delayed is justice denied. It urges upon decision maker to be fair, impartial and equitable with all class of people especially less powerful and unrepresented group of people while making decisions which ensure equitable distribution of cost and benefits among parties involved in it.

James Weber suggested the following guidelines to add an ethical dimension to decision making:

1. By formulating and implementing an appropriate policy and code of ethics.
2. By using a formal committee to ensure that a code of ethics is observed by the employees.

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3. By including techniques of ethical and moral value in training and development programmes.

Whereas Saul Gelleman suggested the following guidelines to encourage the use of ethical value in decision-making:

1. Provide clear guidelines for ethical behaviour.
2. Teach ethical guidelines and their importance.
3. In grey areas, where there are questions about the ethics of an action, refrain from it.
4. Set up auditing agency that checks on illegal and unethical deeds.
5. Conduct frequent and unpredictable audits.
6. Punish trespassers in a meaningful way and make it public so that it may deter others.
7. Emphasise regularly that loyalty to the organisation does not exercise improper behaviour or actions.

IN-TEXT QUESTIONS

Q7. Which of the following statement is True or False?

a) Decisions are always made to get them implemented.
b) Developing alternatives course of action requires to list viable alternative.
c) Rational decision-making model is also known as Normative Model.
d) Ethics requires a high degree of honesty and integrity and depends on individual personality and organisational environment.

Q8. Fill in the blanks:

a. Decision making process is concerned with the developing a .....that suits to .....problem.
b. The first step of decision making begins with the.....
c. Bounded Rationality model is also known as.....
d. In decision-making only .....implication is not involve but their.....and .....dimension is equally important.

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9.7 SUMMARY

Decision-making is an important managerial activity. Every manager has to make decision to solve problems and handle situations so that tasks could be performed effectively by others. Decision-making is not only a part of planning but is an integral part of management process. Decisions are also made either by manager at individual level or by using the authority delegated to him. Such decisions are known as individual decisions. As against this, some decisions are made by two or more managers or group of individuals who may be working in similar positions or may be in the relationship of superior and subordinate. These decisions are known as group decisions that are considered to be more qualitative and effective. The process of decision making involves many stages related to non- programmed decisions but for programmed decisions certain prescribed procedure, rules are to be used backed by managerial experience and creativity. Strategic decisions are made by upper level managers whereas operational decisions are made by lower level managers. In order to understand the decision-making behaviour of the manager, two important models such as rational model and behaviour mode can be used. Of late, in most modern organisation, the techniques of group decision making model such brainstorming, Delphi technique, nominal group technique, and fish bowl techniques are used. Modern organisation gives due consider to ethical value in decision making for which a code of conduct is framed and followed by managers.

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CASE STUDY 1

Mr. Vikas is a customer in an India public sector bank. Mr. Vikas enjoys internet banking facility with the bank. One day he visited the bank branch and requested with the concerned clerk to make a fixed deposit by debiting his saving bank account. Instead of honoring the request made by the Mr. Vikas, the clerk refused to do so and said to Mr. Vikas; since you have internet banking that why I could not help you. Please make online fixed deposit. Again, Mr. Vikas requested by saying that internet is not property working due to weak signal, but the clerk did not consider the problem and again repeated the same. Mr. Vikas made a complaint with the branch manager but in spite of helping him, the branch manager said do whatever the concerned clerk has said.

Q1. What should Mr. Vikas do? Who is at fault? Suggest a solution.

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CASE STUDY 2

The Managing Director's driver had been with the company for 25 years. He was very good at his job. One day he took the car home after dropping the Managing Director late at night. While driving back to his home, he met with an accident and kills a girl crossing the road. Although it was not his mistake, the court punishes him. The personnel officer in the company recommends dismissal of his appointment.

Q1. What should the company do? Retain him or fire him?

9.8 GLOSSARY

Brainstorming: A freewheel, face-to-face meeting where group members are not allowed to criticised but are encouraged to express freely, generate as many as possible, and build on the ideas of others.

Bounded rationality: The view that people are bounded in their decision-making capabilities, including access to limited information, limited information processing, and tendency toward satisfying rather than maximising when making choices.

Conflict: A process in which one party perceives that his or her interests are being opposed or negatively affected by another party.

Decision-making: The consensus process of making choices among alternatives with the intention of moving towards some desired state of affairs.

Ethics: The study of moral principles or values that determine whether actions are right or wrong and outcomes are good or bad.

Group decision-making: where the members or subordinates may share the authority of decision making with the chief executive.

Norms: The informal rules and shared expectations that groups establish to regulate the behaviour of their members.

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Nominal group techniques: A variation of brainstorming consisting of three stages in which Participants (1) silently and independently documents their ideas, (2) collectively describe these ideas to the other group members without critique, and then (3) silently and independently evaluate the ideas presented.

Strategy: Strategy is a deliberate search for a plan of action that will develop a business's competitive advantage and compound it.

9.9 ANSWERS TO IN-TEXT QUESTIONS

Q1.	All True			
Q2.	a- Solve, crisis, conflict	b- Concerned	c- authority	d- choice
	e- process	f- planning, organising , leading and controlling	g- through	h- accomplished
Q3.	All True			
Q4.	a-Programmed	b-minor to significant	c-application	d- statement
	e- routine, repetitive	f- short-term	g-Subordinates	
Q5.	All True			
Q6.	a-alternative; evaluating	b- not known	c-role rotation	d-highest
Q7.	All True			
Q8.	a-consensus; solving	b-identification of problem.	c-behavioural model	d-economic; value ; ethical

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9.10 SELF-ASSESSMENT QUESTIONS

1. What is a decision? What is meant by decision-making?
2. Decision-making involves choosing from among alternative solutions. Comment.
3. Discuss the various steps involves in decision-making process.
4. What are the main features of rationality models of decision making? What are their limitations?
5. What are the various individual decision-making styles?
6. Managers cannot be rational decision-maker in real life situations. Discuss
7. What are programmed decisions?
8. Define the term 'bounded rationality'.
9. Do you prefer to make decisions in a group or alone? What are the main reasons for your preference?
10. Differential between individual decision and group decision.
11. Differential between strategic decision and operational decision.

Classroom Exercise:

- How did you take the decision of joining your present education institution/organisation? Which model of decision-making suits your case?
- Discuss, in groups of four, two decisions recently taken in your institution. Critique the process.

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LESSON-10

STRESS AND WELL BEING AT WORK

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STRUCTURE

10.1 Learning Objectives
10.2 Introduction
10.3 Understanding Stress
  10.3.1 Understanding Stress and its Features
  10.3.2 Implication of Stress on Performance and Satisfaction
10.4 Sources of Stress
  10.4.1 Organisational Stressors
  10.4.2 Individual Stressors
  10.4.3 Environmental Stressors
10.5 Consequences of Stress
  10.5.1 Consequences for an individual
  10.5.2 Consequences for the organisation
10.6 Management of Stress
  10.6.1 Strategies to deal with stress at organisational level
  10.6.2 Strategies to deal with stress for individuals
10.7 Well-Being
  10.7.1 Understanding Well-Being

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10.8 Summary

10.9 Glossary

10.10 Answers to In-text Questions

10.11 Self-Assessment Questions

10.12 References

10.13 Suggested Readings

10.1 LEARNING OBJECTIVES

The objective of this chapter is to understand

- The concept of stress and its features
- Different sources of stress – organisational, individual, environmental
- The need for devising strategies to deal with stress both at organisation and individual level
- The concept and importance of well-being and PERMA model

10.2 INTRODUCTION

This chapter is designed to provide an understanding of the terms- stress and well-being which assume importance due to challenges and opportunities being faced by employees due to multiple role playing, work life imbalance, demanding nature of jobs, high competition, workforce diversity and flexible work schedules.

Humans in the organisation can stay committed, loyal and engaged if they experience optimum level of stress and are able to maintain a good standard of well-being. Often management of stress and maintenance of well-being are ignored by employees and the organisations. But the need for handling stress is increasing because of complexity of work, role conflict, task demand, life trauma and so on. Most of the time employees are unable to identify stress and get addicted to smoking or even drugs to provide the much needed relief from stress. Thus timely identification and management of stress is the need of the hour.

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Well-being is increasingly deliberated on various platforms to promote the idea of not only physical well-being but also emotional and mental well-being. The concern for holistic human health has gained importance as employees are burdened with tasks and forget to prioritise their well-being over other unimportant tasks. The understanding and importance of the concept of well-being is relevant to the organisations also as it helps increase productivity, reduce absenteeism and turnover. Organisations need to promote the idea of well-being among the employees.

10.3 UNDERSTANDING STRESS

10.3.1 Understanding Stress and its Features

Stress is the pressure or tension people experience in life. Pressure can be the result of constant demand exerted on the individual. For example, an employee may have to face work deadlines, a working mother may be required to maintain work life balance and a sales representative may be under constant pressure to get new clients to retain in their job. Stress is thus the natural and unavoidable feature of human life. But stress beyond a particular limit may cause psychological and physiological concerns which may affect the performance of employees at work. Thus stress is an experience of physiological and psychological imbalance within a person. It is the body's reaction to any change or demands made by internal or external environment. Today in a fast paced and highly competitive environment stress is a natural consequence.

According to Selye, "Stress is the non-specific response of the body to any demand made upon it."

R S Schuler described "Stress as a dynamic condition in which an individual is confronted with an opportunity, constraint and demand related to what he desires and for which the output is perceived to be both uncertain and important."

Stress is associated with opportunity, constraints and demand. Constraints prevent us from achieving what we desire whereas demand is something that we desire. For example, while confronting the annual performance evaluation at work we encounter opportunities, constraints and demand. Good performance will entail an opportunity for promotion and higher salary, while poor performance may result in loss of job. Clearly a rational human will

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demand and even aspire for a promotion. But performance at work is constrained by resources, time, politics and other conditions.

Stress is not necessarily bad in itself. It no doubt has a negative connotation attached but stress may also have a positive value. For example, the front line workers during covid were exposed to risk of virus transmission, uneven and long working hours and uncertainty due to non-availability of medical treatment. They were undergoing huge stress. But an optimum amount of stress is necessary to motivate them to undertake breakthrough research in medical treatment. Thus stress is not always negative but has positive value as well.

Stress is additive. New stressors may be added to previous stressors to create a high level of stress. A single incident of stress does not have the potential to create a feeling of stress or tension in an individual. In order to appreciate the stress level in a person, one needs to sum up his opportunity stress, constraint stress and demand stress.

From the discussion and understanding of stress, the following characteristics of stress are evident.

1. Stress is an experience of physiological and psychological imbalance within a person. Stress can have both positive and negative connotations. Stress is positive if experienced within limits, for example the pressure of deadline for completion of an assignment is important for employees to motivate them to meet the finish line. Stress experienced by a deserving employee who has lost an opportunity of promotion due to a biased performance appraisal is negative. Potential Stress can become actual stress if there is uncertainty associated with an important outcome.
2. Stress is additive and it accumulates in the mind of a person.
3. It is a dynamic condition which is associated with opportunity, constraints and demand.
4. It is natural and unavoidable. Everybody experiences stress irrespective of the hierarchy in the organisation, status or even personal conditions.

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IN-TEXT QUESTIONS

1. Stress can cause both ____ and ____imbalance in a person.
2. Stress is the specific response of the body to any demand. (a) true (b) false
3. Stress is the summation of (a) constraints, demand and opportunity (b) anthropologic and physiological imbalance (c) ill-feelings
4. In case of over-stress, a person may experience (a) anxiety (b) dull health (c) high performance

10.3.2. Implication of Stress on Performance and Satisfaction

Since stress has the potential to adversely affect performance, there have been studies investigating the relation between stress and performance. The most widely studied pattern of relationship is suggested by Selye. According to him optimum stress may be achieved at work and is reflected in performance when job provides adequate challenge, but not too little or much pressure. It is important to understand that optimum stress is different for different individuals and they can identify or even sense it and determine how much stress is functional to operate in a productive manner. In case of optimum stress there is high motivation and high energy. In case of under-stress, boredom creeps in.

10.4 SOURCES OF STRESS

The sources of stress can be categorised into two factors- organisational stressors and individual stressors.

10.4.1 Organisational Stressors: The organisational stressors are discussed below:

1. ***Task demands*** - They are the stressors associated with the job a person performs. Some jobs by nature are more stressful than others. For example, jobs of professionals like lawyers may need long hours of research to prepare case arguments. In some unusual cases they may be required to refer to judgments of foreign courts or writings of renowned jurists. Doctors and surgeons may be required to be available 24X7 for emergency cases and thus might need to make extra effort to maintain work life balance as their jobs are demanding. Similar holds true for defence personnel, airline staff, football/ cricket coaches. Even factory workers or non-managerial employees working in hazardous industries such as coal mines are exposed to health hazards causing them

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stress. The contractual nature of skilled jobs may make the workers vulnerable for want of job security.

2. ***Role demands*** - The source of stress in organisational role includes role ambiguity, role conflict, responsibility towards people and things and other stressors. Role ambiguity includes lack of clarity about work expectations, objectives, colleagues related to responsibilities of the job. For example, a new recruit at work might not fully understand the responsibilities due to a poor orientation program or due to lack of training. Role conflict arises when workers are exposed to conflicting job demands or required to do things which they do not want to do. For example, an employee performs multiple roles at the same time, a lady lawyer may be arguing cases in court, required to prepare for cases, may need to fulfil responsibilities as mother, wife, daughter and so on. Responsibility towards things may also cause stress, for example, a cashier in the bank might be entrusted with safe keeping and dealing in cash. The mismatch of cash balance may be a cause of stress for him. Similarly, a factory supervisor entrusted with keeping boilers at correct temperature, to avoid hazardous substances escaping the factory premises. Ensuring safety standards is stressful during natural calamities.

3. ***Interpersonal relations at work*** - Maintaining interpersonal relations with superiors, colleagues and subordinates is the prerequisite to avoiding stress. But sometimes superiors, colleagues or even subordinates are not cooperative, thereby increasing the chances of stress. Bad interpersonal relations may be due to different orientations, philosophy, personality, interest and so on. Stressful interpersonal relations among superior-subordinate may be due to task-oriented approach, autocratic leadership style or misunderstanding of motivational needs of subordinates. Whatever may be the reason, it has the effect of lowering the morale of the subordinate, increasing the absenteeism from work and even job hopping. Colleagues may be unable to maintain cordial relations because of difference of interest, opinion, unhealthy competition between them, desire for achieving higher goals in less time.

4. ***Organisation structure and climate*** - Stress can be generated because of employee organisation mismatch. For example, if the employee does not relate to the philosophy of the organisation or objectives of the organisation, the employee may find it difficult to adjust with the organisation. Lack of belongingness, poor communication, scarce opportunity in decision making, practice of politics by organisation members are other reasons for stress in employees.

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5. ***Organisation leadership*** - The leadership style can also be a cause of stress in some cases. For example, an employee needing support and guidance may not receive it as his leader shows no concern or even compassion for him. The employee would naturally feel demotivated and experience stress. Another employee, for instance, may want active participation in decision making but if disallowed an opportunity to participate in decision making process may experience stress. The mismatch of leadership style with the requirements of the employee may be cause of concern for the management.

6. ***Group pressures*** - Employees may feel stressed when there is group pressure to conform to the decided output or norms. For example, an employee may be willing to produce more than the output decided by the group for getting promotion or a raise in pay but may be restricted by the group. This may cause stress as his personal goals conflict with the group pressure. Acceptance and observance of group norms may also cause stress as an employee may not personally agree to the same. For example, during a strike the labourers may be expected to abandon work but a labourer may feel the need to work for his daily wage. Thus group norms can be a source of tension and stress among workers.

10.4.2 Individual stressors: Some individual factors in relation to personal or professional life may be a cause of stress among individuals. They are discussed as follows.

1. ***Career development*** - There are numerous stressors in relation to career development including job security and status incongruity. Individuals are keen on career development and would prefer job security. Situations like contractual nature of job or loss of job due to fear of obsolescence of skills, redundancy or even early retirement may cause potential tension for employees. Situations of status incongruity which include under or over promotion or even frustration from attainment of career ceiling may also cause stress.

2. ***Personality profiles*** - Individuals possess different personalities – type A and type B. While type A experience a chronic sense of urgency and a competitive drive and they aspire to achieve more and more in life in less and less time. Type B personality is totally opposite. Both personalities require a different environment to flourish and grow. Non-availability of such opportunity may be a cause of stress and tension in the individual.

3. ***Life change*** - Changes in life of an employee both professional and personal may be a source of stress. Different situations may have varying impacts. For example, divorce

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may be considered more traumatic for one whereas loss of livelihood may be more traumatic for others. Different situations represent different intensity of life change units (LCU) in a person's life. Negative events like trouble with the boss, turnover or biased evaluation of performance and positive events like marriage or change of house have a unique value or LCU. Major negative changes may cause stress, depression and even health issues. Thus it is essential that individuals handle only that threshold of LCU which doesn't set in and cause tension.

4. ***Life trauma*** - It is an upheaval in an individual's life that alters his or her attitude, emotions or even behaviour. For example, if an individual is experiencing a life change because of divorce, there is certainly stress and potential ground for health issues to surface. The individual also experiences emotional turmoil during the actual divorce process and the court proceedings. This turmoil may be in the form of life trauma and will cause stress which may creep in the work space.

Life trauma is similar to life change but a narrow term which has shorter term focus. Major life traumas which may cause stress include marital problems (like domestic violence, divorce, custody of children), family difficulties and health problems. For example, an individual having knee injury may have to restrict his physical activities, may even require giving up his hobbies of playing sports and may feel stressed. Similarly, an individual being a victim of domestic violence or dowry demand may be going through tough times which may affect their concentration at work and ultimately affect their performance at work.

10.4.3 Environmental Stressors: Environmental factors also influence the level of stress among the employees in an organisation. Some environmental factors causing stress are discussed below.

1. ***Economic uncertainty*** - Changes in business cycle create economic uncertainty. When economy experiences a contracting trend, people experience anxiety in relation to job security. Slowdown of business may reduce the profitability and have a spillover effect on the employment of employees, salary and other benefits.

2. ***Political uncertainty*** - A stable political environment would relatively be less stressful in comparison to an unstable political environment.

3. ***Technological uncertainty*** - Obsolescence of technology is another reason for tension and stress as it requires the employee to upgrade himself with the latest skills. New innovations in technology may render the present skill and experience redundant. The

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evolution of technology, robotics and automation are a threat to employee and can be a cause for stress.

4. ***Terrorism*** - Terrorism witnessed at the global level is another major source of stress. For example, employees in Israel have faced this threat for long and have learnt to deal with it. The instances such as 9/11, cyber threats and cyber-crime pose a challenge and risk to the health and well-being of the employees.

IN-TEXT QUESTIONS

5. Role ambiguity and role conflict are examples of (a) organizational stressors or (b) individual stressors.
6. Life change and life trauma are same thing (a) true (b) false
7. Employees demanding guidance and support from leaders should get leaders having (a) concern for them or (b) concern for results.
8. Which one of the following is not an individual stressor (a) breakdown of marriage (b) domestic violence (c) role demands (d) cultural difference because of inter-caste marriage?

10.5 CONSEQUENCES OF STRESS

Stress is indispensable in life. Everyone experiences stress for some or the other reason. With growing competition, complexity of life and commercialisation of activities, stress free life is a myth. Stress has an impact on the health of an individual and the life of an organisation.

10.5.1 Consequences for an Individual

1. ***Physical Consequences*** – Stress has the ability to cause unnecessary toxin in the body and harm the health and well-being of an individual. Minor ailments like headache, backache, stomach or intestinal issues, skin disorders like acne or hives are common. Major health issues like heart disease or stroke can be the harmful impacts of stress. Depending on the perception of stress, an individual may experience either minor or major health disorders.

2. ***Behaviour Consequences*** – An individual may experience a behavioural change because of stress. Stressed people may become aggressive easily or may even be violent at times. In stressful situations they seek support of drugs or alcohol. They might even

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be addicted to smoking. Studies show that people smoke in stressful circumstances and get so addicted to smoking that they smoke even in the absence of the stressful environment. Stress has the potential of making a stressor prone to accidents and can even cause appetite disorder.

3. ***Psychological Consequences*** – Extreme stress may impact the mental health and well-being of individuals. Stressed people may experience depression, lack of sleep, over eating, loss of appetite, etc. They may become restless in many situations and may even experience panic attacks.

IN-TEXT QUESTIONS

9. Which of the following is the change in behavior due to stress (a) addiction to drugs (b) aggressive nature (c) smoking (d) all of the above

10. The adverse effects of stress on the organization include (a) reduced productivity (b) heart disease (c) loss of popularity

11. Which of the following is a organizational consequence of stress (a) loss of commitment (b) depressive sleeping or eating.

12. Stress of an individual effects mind, body and behavior (a) true (b) false

10.5.2 Consequences for the Organisation

The degree of stress experienced by an employee in the organisation will have both direct and indirect effect on the organisation. Stress for whatever reason caused, organisational, individual or environmental, has a spill over effect on the organisation. Following are some such consequences that an organisation will encounter due to stress.

1. The performance of the employee will be affected due to stress. The employee might not be able to maintain the standard level of output and quality. This has the potential to affect the profitability of the organisation.

2. There may be withdrawal symptoms in an individual who is witnessing stress. In such cases there is a high level of absenteeism and labour turnover. Employee may also withdraw psychologically thereby ceasing to care about the organisation.

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3. The motivation, morale, commitment, attitude and job satisfaction might suffer. The employee may be unwilling to put his best at work and might look for options for job change. Stressed people may be prone to complain about unimportant matters.
4. Decision making may suffer as stressed individuals may lack the calm and patience to take the correct decision. Stressed individual may be inclined to make poor decisions.
5. Stress adversely affects the communication and human relations at work.

10.6 MANAGEMENT OF STRESS

Since each one of us experiences stress in different aspects of life. It becomes increasingly important to devise strategies to deal with stress both at organisational and individual level. Some strategies to deal with stress are discussed below.

10.6.1 Strategies to deal with stress at organisation level

1. ***Organisation Role Clarity*** – Employees experience stress when they are unaware of their role in the organisation. This could be due to role conflict or role ambiguity. For example, if a project manager is required to report to two bosses and if the instructions of the bosses contradict each other, the manager will feel the need for clarity. Thus the organisation needs to focus on clarifying the roles expected from employees. Role analysis is a technique that can be used to analyse what the job entails and what are the expectations. Breaking the job into various components will help clarify the job of the job holder for the entire system. This can help reduce stress because of unrealistic expectations.
2. ***Job Redesign*** **–** Job can be a source of tension among the employees. Designing the job properly by inserting appropriate tasks and preparing work schedules can help ease the stress and streamline the work.
3. ***Stress Reduction and Stress Management Programmes*** – Stress reduction programmes aim to identify the organisational stressors and reduce their effects by redesigning, reallocation, workloads, job variety or improving supervisory skills. Stress management programmes aim to train employees or their work groups to manage their stress symptoms effectively.
4. ***Collateral Programmes (Personal Wellness)*** – These are those programmes which are created for the well-being of the employees. Organisations adopt stress management

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programmes, health promotion programmes, career development programmes for this purpose.

5. ***Supportive Organisational Climate*** – Much of the organisational stress is due to faulty policies and practices. Stress can be controlled by creating a supportive organisational climate. Building a supportive organisational climate is dependent on organisational leadership rather than power and resources. Supportive organisational climate requires participation of employees in decision making to provide them the sense of belongingness and attachment which helps to reduce stress.

6. ***Counselling*** – Counselling involves discussion of the problem or issue with a counsellor. It helps to release emotional burden and stress. Talking to an expert about the pressures and tension helps not only in dealing with the stressful situation but also in obtaining expert advice. Counselling does assist in identifying stress, handling stress and recovering.

10.6.2 Strategies to deal with stress for Individuals

1. ***Relaxation*** – Dealing with stress requires adaptation and relaxation is an effective way to adapt. People can relax in a variety of ways. They can take regular breaks from work and go on vacation. Vacation may bring a change in attitude and behaviour towards different aspects of life. Employees can also relax and take breaks while on the job. For example, lunch break, tea breaks can enhance their energy and reduce stress.

2. ***Time Management–*** One way to reduce stress is to manage time well. Individuals can prepare a list of tasks/ activities to be done on a particular day in order of importance and concentrate on important tasks. Some not so important tasks can be delegated to others. Prioritising helps in concentrating on important and relevant tasks and avoids the unnecessary pressure and burden to complete all tasks.

3. ***Role Management –*** Individuals do perform multiple roles on a daily basis. Thus they should work towards avoiding situations of role overload, role ambiguity and role conflict. For example, an individual should not accept extra work when they are overburdened as it will adversely affect their health and well-being. Individuals should also seek clarification in situations where there is confusion or ignorance with respect to work expectations. Also individuals perform different roles at one time. For example, a doctor may be a father, son, dean in his department, colleague for other doctors, there is a possibility of role conflict. Managing different roles will help reduce the risk of stress and tension.

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4. ***Meditation*** – Meditation can help reduce stress and restore inner balance. It requires quiet, concentrated inner thought in order to rest the body physically and emotionally. It helps to calm in stressful situations temporarily.

5. ***Support Group*** – Any individual has primary and secondary groups. Primary groups are those with which a person relates very closely like family and close friends. Primary group can provide support during stress. Individuals can share their worries, stress and feelings with them. Support groups have the potential to boost the morale of the person and keep them going.

IN-TEXT QUESTIONS

13. Which of the following is a collateral programme undertaken to deal stress (a) career development programme (b) health promotion programme (c) stress management (d) all of the above

14. Which of the following needs to be managed to reduce stressful situations (a) role ambiguity (b) role conflict (c) role overload (d) all of the above?

15. Taking power naps or breaks in between work can help reduce stress (a) true (b) false

16. ____ helps in reducing stress by talking to expert thereby releasing tension and stress

10.7 WELL-BEING

10.7.1 Understanding Well-Being

According to Martin Seligman, Well Being is more than just feeling good and happy, it reflects the amount of flourishing and optimal psychosocial functioning. He suggested the PERMA model of well-being which consists of five pillars - positive emotion, engagement, relationship, meaning and accomplishment.

PERMA Model

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Positive emotion	It implies the ability to connect to happiness, stay optimistic and view past, present and future from a constructive perspective.
Engaged	An individual is engaged when he is fully absorbed and participates actively in activities which results in experiencing mastery, focus and joy.
Relationships	Relationships and connections are crucial to life. Relationships and bonds based on love, intimacy, emotional, physical bonds are important elements for well-being.
Meaning	It is the sense of purpose and direction in one's life.
Accomplishment	It is the sense of satisfaction and fulfilment as a result of achieving one's goal.

An employee possessing a good standard of well-being at work is likely to be more creative, more loyal and provide better customer satisfaction as compared to an employee having a low standard of well-being. Also a good standard of well-being would ensure high productivity, long term organisational success and employee engagement. Employee well-being is directly linked to organisational performance. Thus organisations should make a constructive effort so that employees achieve a good standard of well-being.

Well-being is not restricted to individual level factors but also extends to organisational and societal factors as individual well-being does not exist on its own or in the workplace but in the societal context. In addition to occupational hazards, the absence of work (whether unemployment or under-employment) is a major stressor and cause of ill-health. In some cases, such as the current economic slowdown post pandemic, unemployment is involuntary.

Waddell and Burton define well-being as "the subjective state of being happy, healthy, contented, comfortable and satisfied in one's life."

It includes physical, material, social, emotional (happiness) and development dimensions. Well-being at work is also influenced by mental and physical health, job security, work organisation, engagement at work, work life benefits and wages. Different authors have recognised different determinants of well-being. Some determinants are work related factors, life style and personality.

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IN-TEXT QUESTIONS

17. Which of the following is not one of the five pillars in the PERMA model (a) positive feeling (b) engagement (c) relationship (d) meaning (e) accomplishment.

18. Relationships include (a) connections (b) quality relations based on love, intimacy, emotional bonds (c) both (a) and (b) (d) none of the above.

19. The study of well-being requires study of (a) individual factors (b) organizational factors (c) societal factors (d) all of them

10.8 SUMMARY

This chapter focuses on employee health, well-being and managing stress. Understanding the importance of well-being, health and stress can help in organisational success, increasing productivity and performance of employees. At the same time it reduces chances of absenteeism, turnover and accidents at workplace. It also helps employee enhance their loyalty, commitment and satisfaction. Healthy and stress free employee can be an asset for organisations. Thus maintaining optimum level of stress and good standard of well-being should be one of the goals of an organisation.

10.9 GLOSSARY

Stress is a dynamic condition in which an individual is confronted with an opportunity, constraint and demand related to what they desire and for which the output is perceived to be both uncertain and important.

Life change is changes in the life of an employee both professional and personal.

Life trauma is an upheaval in an individual's life that alters his or her attitude, emotions or even behaviour.

Collateral Programmes are those programmes which are created for the well-being of the employees.

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Job redesign involves designing the job by inserting appropriate tasks and preparing work schedules.

Well Being is more than just feeling good and happy, it reflects the amount of flourishing and optimal psychosocial functioning.

10.10 ANSWERS TO IN-TEXT QUESTIONS

1. Psychological and physiological	11. Loss of Commitment
2. False	12. True
3. Constraint, demand and opportunity	13. All of the above
4. Anxiety	14. All of the above
5. Organisational stressor	15. True
6. False	16. Counselling
7. Concern for them	17. Positive feeling
8. Role demand	18. Both (a) and (b)
9. All of the above	19. All of them
10. Reduced Productivity	

10.11 SELF-ASSESSMENT QUESTIONS

1. Sam has been facing the issue of role ambiguity and is reporting to two bosses. Sometimes he gets contradictory instructions and orders to execute. In this situation he is unable to decide what to do, he feels pressured and is even thinking of quitting the job. Help him identify the source of stress and suggest ways in which he can deal with stress and workplace pressure.

2. Some stress is indispensable and necessary to make the job challenging and keep the motivation high. Comment on the statement.

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3. Discuss the organisational sources of stress. Can the organisation reduce the possibility of stress among the employees? Discuss.

4. The study of Well-Being is gaining significance today. Discuss the concept of well-being and its scope.

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LESSON-11

ORGANIZATION STRUCTURE AND DESIGN

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STRUCTURE

11.1 Learning Objectives

11.2 Introduction

11.3 Organization Structure

- 11.3.1 Purpose, Role and Nature of Organizational Structure
- 11.3.2 Determinants of Organization Structure

11.4 Organisational Designs

- 11.4.1 Simple, Bureaucracy, and Matrix Designs
- 11.4.2 Models of Organizational Structure: Mechanistic and Organic
- 11.4.3 Emerging Design Options
- 11.4.4 Strategy-Structural Relationship

11.5 Organisational Structure and Employee Behaviour

- 11.5.1 Consequences of Structural Deficiencies
- 11.5.2 Global Implications

11.6 Summary

11.7 Glossary

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11.8 Answers to In-text Questions

11.9 Self-Assessment Questions

11.10 References

11.11 Suggested Readings

11.1 LEARNING OBJECTIVES

After studying this lesson, you will be able to:

c) define organisational structure and its aims.

d) understand key elements of organisational designs.

e) demonstrate understanding of types of organisational structure.

f) evaluate different organisational structure.

11.2 INTRODUCTION

This is the last chapter in which we are going to learn about the organizational structure. Though this is the last chapter, but its importance cannot be undermined. It is difficult to imagine a business that has no organizational structure. The need of organizational structure arises as it helps in bringing role clarity and reporting structure, helping in making effective decisions. It also helps in ascertaining the accountability status of employees falling at different levels in the organizational structure. Organizational Structure is necessary for running a successful business because it improves workflow and efficiency, promotes communication, identifies company needs, and aligns employees with company goals. It provides leverage and can help enhance operating performance.

The structure supports the organizational objectives and implementation of the organizational strategy. Different organizational structures have their own advantages, disadvantages, characteristics and suitability.

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11.3 ORGANIZATIONAL STRUCTURE

In an organisation jobs and tasks are formally designed, coordinated, divided and grouped. The organisational structure narrates information flows from top to bottom and vice versa according to the roles, responsibilities and levels of authority within the enterprise. Most importantly, it identifies who supervises to whom and who reports to whom. It also provides for the appropriate position of superior and subordinate. It describes the organizational hierarchy in terms of different functions, roles, responsibilities, supervision, etc.

A good organizational structure and design is usually illustrated through an organisation chart which develops an environment where employees can work effectively with improved communication, increased productivity, and inspired innovation. Thus, an organizational structure has these elements – (1) task assigned in the organization to individuals; (2) line of authority, responsibility for the task, reporting requirements, span of control and hierarchical levels in the organization; and (3) develop systems across departments for efficient coordination among the employees.

11.3.1 Purpose, Role and Nature of Organizational Structure:

Purpose of organizational Structure:

The purpose of an organization structure is:

a) To help the organization to achieve its objectives,

b) To help the employees to complete their work effectively and efficiently.

c) To allocate employees designated work roles and responsibilities,

d) To help management to coordinate and control activities, and

e) To show how information flows throughout the organization.

Role of Structure: The role of structure is essentially to:

i. Clarify roles and responsibilities, and

ii. Determine who had power and authority to make certain decisions.

Nature of organizational structure:

The nature of organizational structure is to understand whether it is centralized or decentralized.

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(a) Centralized Structure: In this type of structure, decision-making is centralised and the decisions are taken by the top management. Under this structure, the top level management makes most of the decisions and has tight control over the different departments and divisions. It has a top-down approach which tells that employees and managers are responsible for the successful execution of decisions but the employees falling lower in the chain of command play a minimal role in the process of decision-making.

This structure could be useful when the environment is stable, the company is large, and the decisions are relatively minor.

This structure has following advantages:

(iii) Clear communication and chain of command

(iv) Cost reduction, i.e., administrative cost

(v) Fast implementation of decisions

(vi) Improved work quality and reduction in task replication

Centralised structure has following disadvantages:

Dictatorship in terms of leadership

(a) Work delays due to dependency on management.

(b) Employees feel disconnected in result reduce work efficiency.

(c) Lack of authority in managers.

(b) Decentralized Structure: In this structure, decision-making power regarding day-to-day tasks is distributed and various departments and divisions provide autonomy in varying degree to the supervisors at the middle level and/or lower level. It increases the responsibility and accountability of middle and lower level supervisors.

This structure has following advantages:

Better customer service

(a) Better staff motivation

(b) Quick decisions

(c) Effective communication

(d) Improved supervision and control

Decentralised structure has following advantages:

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Difficult to coordinate

(a) Expensive process

(b) Unnecessary cost increase due to benefits by external factors.

11.3.2 Determinants of Organizational Structure:

The primary determinants are:

g) Strategy: A strategy is defined as a long-term plan of action designed to achieve a particular goal which gives an edge over the competitors. The objectives are derived from the organization's strategy, hence, strategy and structure should be closely linked. The strategy focuses on innovation, cost minimization, and the structural design that best work with each other.

h) Technology: It refers to how an organization transfers its inputs (financial, human and physical resources) into outputs (products or services). Organizations with continuous technology have an organic structure at the top and mechanistic structure at lower levels. The relationship between technology and structure depends upon the degree of routineness of the activities. Routine technology leads to centralized control if there are minimum rules and regulations. If formalization is high, routine technology can be accompanied by decentralization. In general, the more routine the technology, the more mechanistic the structure can be, and organization with more non-routine technology are more likely to have organic structures.

i) Size: It refers to the capacity, the number of personnel, outputs (customers and sales) and resources in an organization. If the size of the employees is large, it tends to have more specialization, departmentalization, centralization and rules and regulations than do small organization. Once an organization grows up to a certain size, size as such starts having less influence on structure.

j) Environment: Every organization has to work and survive in an uncertain and dynamic environment which includes suppliers, customers, competitors, government regulatory agencies, public pressure groups etc. So, the structure is affected by its environment. Static environments create significantly less uncertainty for managers than do dynamic ones. Since, uncertainty is a threat to an organization's effectiveness; management tries to minimize it through adjustments in the organization's structure. It is advisable to use mechanistic structure in stable environment and organic structure in dynamic environment.

k) Differentiation-integration: Organizations should be structured differently suited in different environments to achieve the best 'fit' to their environment. It is the degree to

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which the various departments or sub-units within the organization specialize to perform different activities.

l) Power and Control: It is related to decision-making and allocation of resources. A more skilful manager can control a greater number of staff.

m) Chain and Span: It also determines organizational designs. The chain of command is the line along with orders and decisions are passed down from the top to the bottom of the hierarchy. In a hierarchy, span of control is the number of people who report to one manager. The more people under the control of one manager, it indicates the wider span of control and less people means a narrow span of control. A tall organization has a larger number of managers with a narrow span of control and vice-versa.

IN-TEXT QUESTIONS

Q1. Which of the following statement is TRUE or FALSE?

a) An organisational structure is usually illustrated through an organization chart.
b) Organizational structure describes the organizational hierarchy in terms of different functions, roles, responsibilities, supervision, etc.
c) Organizational structure show how information flows throughout the organization.
d) Centralize structure has a top-down approach.
e) Decentralize structure increases the responsibility and accountability of middle and lower level supervisors.

Q2. Fill in the blanks:

a) Organizational structure defines how……..are directed towards the achievement of organizational aims.
b) Organizational Structure ……. what employee's do, whom they report to, and how decisions are made across the business.
c) There are following …… key elements that management need to address while designing their organization's structure.
d) ……refers to how an organization transfers its inputs into outputs.
e) Environment may be ……..and external.

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11.4 ORGANIZATIONAL DESIGNS

Organizational Design provides the structure for business processes and the framework for an organization to deliver its core qualities. Choice of the organisation's structure is dependent on six elements as mentioned below:

a) Departmentalization: basis of grouping of the jobs together is described by the departmentalization.

b) Work Specialization: it describes the degree of subdivision of activities into jobs.

c) Span of Control: defines the number of subordinates which a manager can effectively and efficiently supervise.

d) Chain of Command: it describes to whom the subordinates will report either individually or in group.

e) Formalisation: the degree of rules and regulations at different levels of management which guides the employees.

f) Centralization and decentralization: it describes the degree of the authority to take a decision.

11.4.1 Simple, Bureaucratic, and Matrix Designs

The three organizational designs are mentioned below:

1. The Simple Structure: it is characterized by a low degree of departmentalization, little formalization, wide spans of control, and centralization of authority in a single person.

2. The Bureaucratic: This structure comes with highly routine operating tasks achieved through specialization, much formalized rules and regulations, tasks that are grouped into functional departments, centralized authority, narrow spans of control, and decision making that follows the chain of command.

3. The Matrix Structure: it creates dual lines of authority and combines functional and product departmentalization.

11.4.2 Models of Organizational Structure

It revolves around two organizational forms which are as follows:

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Mechanistic organizational structure (Bureaucratic Structure):

An organization design that's rigid and tightly controlled is called a Bureaucratic structure. This type of structure is the result of combining the following six elements of structure:

a) High degree of work specialisation created jobs that are simple, routine and standardised.

b) Rigid departmentalisation

c) Existence of a clear of chain of command ensures a formal hierarchy of authority. This principle ensures that each subordinate receives orders from one superior.

d) Narrow span of control at increasingly higher levels created tall, impersonal structure.

e) Decision-making power is highly centralise and ensure standard practices because the lower level activities can't be control by the top level.

f) Due to high formalisation, top management imposes rules and regulations if distance increases between the top and bottom level of management.

Organic Structure (Modern Organization Structures)

It is a highly adaptive form that is as loose and flexible structure as it allows changes operating in volatile and technology driven environments as compared to the mechanistic structure which is hierarchal, rigid and stable. The key elements of this structure are cross-functional teams, cross-hierarchical teams, free flow of information, and wide span of control, decentralization and low formalization.

11.4.3 Emerging Design Options

1. **Team Structures:** A team structure is one in which work teams are central to the entire organization and each team do the works towards a common goal. In this type of structure, no line of managerial authority flows from top to bottom. But, they design and do work in the way they think is best. The teams are held responsible for all work performance results in their respective areas. What type of team you have depends on its purpose, location, and organizational structure. A team is said to be the best if they possess the traits of psychological safety, dependability, structure and clarity, meaningful membership and purpose. An effective team would demonstrate:

   i. The willingness to teach one another,

   ii. Clear communication,

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iii. High morale to maintain inspiration,

iv. Fill in gaps for one another (skill, time, circumstance),

v. Strong as an individual, unstoppable as a group."

Advantages:

- Easy employment of experts
- A team can use the existing management structure
- No need for client training
- Disadvantages:
- Difficult assessment of project progress for the client
- Difficult to resolve political and organizational issues
- The client is the only judge of success

2. **Matrix Structure:**

The matrix structure utilizes functional as well as divisional chains of command simultaneously in the organization, commonly for one-of-a-kind projects. A key purpose of the matrix structure is to enhance horizontal coordination and the sharing of information.

Thus, matrix structure is a type of management system in which workers report to more than one person which means having two or more supervisors at the same time. Employees in the matrix have two bosses-their functional department managers and their product managers. Therefore, has a dual chain of command.

The project teams are created from the functional departments and are placed under the project manager for the duration of the project. The project manager has authority over the functional members who are part of his project team in areas related to the project's goals. However, any decision about promotions, annual reviews typically remains the functional manager's responsibility.

Advantages:

a. It achieves the economies of scale by providing the best resources and an effective way of ensuring their efficient deployment.

b. Working with the specialists in project enhances employees' knowledge and skills.

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c. Most suited and skilled employees can be picked by the supervisors for the projects.

d. The employees are sent back to their functional department once the project is completed.

e. Coordination and control is the key to success of project.

Disadvantages:

(d) Every employee has two bosses which violates the principle of unity of commands.

(e) Profitability and productivity are compromised if employees are indiscipline.

(f) Organizational relationships become very complex.

3. **Network Structures:**

A networking structure includes the linking of numerous, separate organizations to optimize their interaction in order to accomplish a common goal. Company with multiple locations with different functions uses this structure to share resources with another company to collaborate with each other. Networking requires synergy and a high level of collaboration.

Advantages:

a. The outsourcing nature of network structure provides companies with the advantages of lower costs, more focus, and increased flexibility.

b. Outsourcing allows saving money as they don't have to bear the expense of setting up a department for the same purpose.

c. It gives the flexibility to change their processes and the ability to focus on their core functions.

Disadvantages:

a. Creates lot of confusion when similar things are done by many offices or freelancers.

4. **Spaghetti Structure:**

It refers to a flat, flexible or lack of organisational structure characterised by ambiguous job boundaries and extensive delegation of task and project responsibilities to autonomous teams.

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Features:

i. Lack of structure of organisation

ii. No employee had a desk or office of their own, or a role except one they chose for themselves from a list of projects on a bulletin board.

iii. Project based organisation (staff initiate projects and assemble teams)

iv. Multiple roles

v. Transparency (knowledge is shared throughout the organisation)

The key characteristics of a spaghetti organization are choice (staff initiate projects and assemble teams; individuals invited to join a project can decline); multiple roles (the project approach creates multi-disciplined individuals); and transparency (knowledge is shared throughout the organization).

5. **Fishnet Structure:**

The fishnet organization is a new organizational form. It is a temporary flexible organization. It is dynamic and adaptable to situations, opportunities and influences from its environment.

Features:

9. Flexible
10. Form and reform varied patterns
11. Middle manager may be at one being at the apex, at another time in the middle.
12. Rearrange it quickly while retaining its inherent strength.
13. Allows any structure to be woven together electrically and altered as needed.

6. **Virtual Organisation:**

The members of the virtual organisation may never meet each other face to face and communicate through telecommunications. With the business going global, emergence of virtual organisations facilitate quick decision making. The organization may form virtual groups, who work together to achieve a common goal using video conferencing supported computer technology, to communicate and achieve results.

7. **Learning Organisation:**

Learning organisation has the ability to continually change structure. Accordingly, based on the feedback internals processes are also modified to suit the present need of the

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organisation. Success *mantra* of the organization depends on fast changing the structures to suit the specific need of the organization as per the changing environment.

IN-TEXT QUESTIONS

Q3. Which of the following statement is TRUE or FALSE?

a) Bureaucratic structure is also known as mechanistic organizational structure.
b) Organic organizational structure is also known as modern organizational structure.
c) The functional structure allows for a high degree of specialization for employees.
d) Product-based divisional structure is dedicated to a particular product line.
e) Market-based divisional structure is based around markets.
f) Geographical divisional structure is best suited to organizations that need to be near sources of supply and /or customers.

Q4. Fill in the blanks:

a) Functional structure is ……in nature.
b) Product-based divisional structure can help shorten …….. development cycles.
c) Geographical divisional structure is based on the differences in …….., culture and customs one would find across the world.
d) Process –based structure …….. intradepartmental and interdepartmental teamwork.
e) In a team structure, no line of managerial authority …….from top to bottom.
f) Matrix structure has a ……..chain of command.
g) The key characteristics of a ……organization are choice; multiple roles and transparency.
h) In …….. structure, middle manager may be at one being at the apex, at another time in the middle.

11.4.4 The Strategy-Structure Relationship

Organizational strategy and organizational structure has close relationship between them. Combination of certain strategy and structure is more suited. For different strategies different structures are well-matched. Relationship can be observed as follows:

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Strategy	Structural Option
Innovation	Organic structure: a loose structure, low specialization, low formalization, decentralization.
Cost minimization	Mechanistic structure: extensive work specialization, tight control, high formalization and high centralization
Imitation	Blend of organic and mechanistic structure.

11.5 ORGANIZATIONAL STRUCTURE AND EMPLOYEE BEHAVIOUR

Organisational structures play a vital role in determining the behaviour of employees specially when linked to performance and satisfaction as every individual is different with respect to personality, experience and the work tasks. Today, we are living in the world of uncertainty, competition, globalisation and dominance of technology. Technology permits organisation to stay close to the customer and to settle jobs where costs are lower. It helps in making decisions quickly and staying in decentralised structured organisation where decisions can also be taken at lower level of management.

(a) Mechanistic Structure vs. Organic Structure and Employees behaviour: People who want autonomy would want to serve in an organic structured organisation as they are more productive and satisfied and those who prefer predictability structure and standardisation would seek out and take employment in mechanist structured organisation as they are more productive and satisfied because it clearly defines roles and responsibility.

(b) Centralised vs. Decentralised structure and employees behaviour: In centralisation, vital decision-making authority is at one place which greatly influences employees' performance and satisfaction. On the other hand, centralisation leads to frustration and lower job satisfaction. But when the degree of centralisation is low, higher is the participative decision-making which leads to positive job satisfaction as decision is taken by those who actually are responsible for the results.

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(c) Functional organisational structure and employees' behaviour: It is characterised by a top-down hierarchy in which practically possible decision-making authority rests at the top-level management to keep things running according to a predicable order. Employees are confined to a particular function with proficiency at their job.

(d) Team structure and employees' behaviour: This structure is very popular in terms of their effectiveness as authority is decentralised and distributed among employees and employees get the opportunity to take initiative and use creativity and enthusiasm resulting in improved job satisfaction level as teams generate positive synergy. Due to standardised work, it may affect the moral of the employees.

(e) Matrix structure and employees' behaviour: It is combination of both functional and divisional structures in which workers reports to more than one person which means avoiding the principle of unity of command resulting conflict between product and functional interests.

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11.5.1 Consequences of Structural Deficiencies

Structural deficiencies can be miserable for any organization. It can hinder the growth and can become most prominent deficiency to obstruct the functioning of the organization. It may waste the resources, efforts and can lead to inefficient use of managerial abilities.

Urwick has very well said "Lack of design is illogical, cruel, wasteful and inefficient".

According to Child, the consequences of structural deficiencies are:

1. Low motivation and morale
2. Late and inappropriate decisions
3. Conflict and lack of co-ordination
4. Conflict and lack of co-ordination
5. Rising costs

11.5.2 Global implications:

In fact, the organisational structure gets affected due to the influence of the national culture.

a) Culture and Organisational structure:

Culture and organizational structure are interdependent to the success of a business. Organizational structure defines the rules and policies which ultimately creates the work/organizational culture. The organizational structure and culture has a vast impact

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on the performance level of the employees. So, the structure and culture must be open, innovative and creative in which the employees can easily adjust and gain satisfaction from the work environment. If the structure and culture is rigid or centralized, the performance will be average and normal because the rigid structures do not allow freedom. On the other hand, the decentralized structure allows the employees to participate in the business and decision-making process which motivates them to perform better and stay loyal to the organization.

b) Culture and Employees Structure Preference:

The national culture greatly influences the preference for structure. Organizations that operate with people of diverse culture, find employees much more accepting of mechanistic structures than where employees come from low power distance countries. So, organizations need to consider cultural differences along with individual differences.

c) Culture and Boundaryless Organization:

In Boundaryless organisation there is very little face to face communication between employees. Employees mainly communicate using technology, such as text, email, social media, and various other virtual methods of communication. The key features of this organization are participative decision-making, cross-hierarchical teams and 360 degree performance appraisals with minimal practice of ranks and status.

Boundaryless organizations play a significant role in eliminating cultural barriers, as people from different cultures and backgrounds can work at the same organization under a harmonious work environment.

Employees do not have to come to the office all the time, there are usually flexible working schedules which allow employees to work at the time that is most convenient for them, especially when they're working from a different country in an entirely different time zone. This makes it easier for the employees to achieve work-life balance. It also develops a very strong work ethic in them.

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IN-TEXT QUESTIONS

Q5. Fill in the blanks:

a) Organisational structure play a .....in determining the behaviour of employees.

b) People who want autonomy prefer an.....

c) People who preferring predictable and standardisation would take employment in .....

d) When decision-making authority is at one place, it .....influences employees' performance and satisfaction.

e) In team structure, ...are more initiative, creativity and enthusiasm which display a high level of job satisfaction.

Q6. Which of the following statement is TRUE or FALSE?

a) Culture and organizational structure are interdependent to the success of a business.

b) If the structure and culture is rigid or centralized, the performance of the employees will be average and normal.

c) Decentralize structure motivates the employees to perform better and stay loyal to the organization.

d) Organizations that operate with people of diverse culture, find employees much more accepting of mechanistic structures.

e) Status and rank are minimized in boundary less organization.

f) Boundary less organisation develops a very strong work ethic in them.

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CASE STUDY

Nucor pioneered the mini-mill concept, built new plants from scratch, promoted from within, and remained a domestic company. Management practices of Nucor have been successful and effective for more than five decades in spite of Nucor doesn't appear to have mastered—how to structure itself.

The organizational structure at Nucor is flat to an extreme. There are three layers of decentralized management separating the CEO from factory workers. With Nucor's structure, headquarters receives weekly performance reports from each operating division which is then circulated to other divisions. As Nucor continue to grow through, CEO is finding difficult to maintain this simple structure.

The operating principles of Nucor allow pushing decision-making authority down into the organization, thereby reducing the need for staff organizations and middle management levels, with only four management layers, with key decisions for the daily operations made by the line managers. The management hierarchy is composed of four layers as follows:

In 2006, Nucor added another layer of management creating a new layer of five executive vice- presidents; Nucor is surprisingly lean and simple.

Nucor employs 22 employees at its corporate headquarters. The main channel is its direct sales team. The company promotes its offering through its website, social media pages. Nucor's customer relationship is primarily of a self-service nature. These indicate that management still answers their phone calls and e-mails and the company has no corporate jet.

Toyota Company, even comparatively, looks lean but appear fat as compared to Nucor. "You are going to get at least 10 layers at Toyota before you get to the president, "says a former Toyota engineer.

Questions:

1. How does the Nucor case illustrate the limitations of the simple organizational structure?
2. Do you think other organizations should attempt to replicate Nucor's structure?
3. Why do you think other organizations have developed much more complex structure than Nucor?
4. Generally organization structures tend to reflect the view of the CEO. As more "new blood" comes into Nucor, do you think the structure will begin to look like that of other organization?
5. What are the pros and cons of Nucor's structure?
6. What are the most important elements of Nucor's organizational structure?

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11.6 SUMMARY

Organizational Structure is necessary for running a successful business because it improves workflow and efficiency, promotes communication, identifies company needs, and aligns employees with company goals. Organizational structure provides leverage and can help enhance your operating performance. The organization structure is the system which describes the organizational hierarchy in terms of different functions, roles, responsibilities, supervision, etc. It demonstrates different concerns including different roles of the employees, job descriptions, job functions, decision-making authorities, reporting structure, allocation of tasks in the department, individuals, project team, branch, etc.

Organizational Design' encompasses restructuring and restructuring roles, hierarchy level, terms, and conditions as per business or organizational needs. The six key elements of organizational structure are job design, departmentalization, and delegation, span of control, chain of command and centralization. Organizational structure positively affects the employees' behaviour as to job satisfaction and productivity. In fact, organizational designs also have global affect in terms of culture.

11.7 GLOSSARY

Boundaryless organization: is a newly found concept of creating an organization free from structural and cultural barriers.

Divisional structure: an organisational structure made up of separate, semiautonomous units or divisions.

Functional Structure: An organisational design that groups together similar or related occupational specialists.

Mechanistic structure: it is based on the arrangement of activities and rigid and tightly controlled.

Matrix structure: A structure in which specialists from different functional departments are assigned to work on projects led by a project manager.

Network structure: linking of numerous, separate organisations to optimise their interaction in order to accomplish a common, overall goals.

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Organic structure: is a highly adaptive form that is as loose and flexible structure as it allows changing rapidly operating in volatile and technology driven environments.

Organisational structure: the way in which the inter-related groups of an organisation are constructed.

Power distance: describes how different countries handle the fact that people are unequal.

Spaghetti Structure: Lack of structure of organisation in which no employee had a desk or office of their own.

Team structure: in which the entire organisation is made up of work teams.

11.8 ANSWERS TO IN-TEXT QUESTIONS

Q1.	All true				
Q2.	(a) Activities.	(b) describe	(c) six	(d) technology	(e) internal
Q3.	All true				
Q4.	(a) mechanistic	(b) products	(c) Language	(d) Promotes	(e) flows
	(f) dual	(g) spaghetti	(h) fishnet		
Q5.	(a)Vital role	(b) Organic structure	(c) Mechanist	(d) greatly	(e) employees
Q6.	All True				

11.9 SELF-ASSESSMENT QUESTIONS

1. What do you mean by organizational structure and design?
2. What is purpose of designing organizational structure?
3. What is importance of organizational structure in business?
4. What are the six key elements that define an organizational structure?

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5. What is a matrix organization? What are the main characteristics of a matrix organization?
6. How does globalization affect organizational structure?
7. XYZ Limited is manufacturing chemicals and textiles. What type of organisational structure would suit the requirements of such an organization?
8. What is meant by the functional structure of organization?
9. What is the key difference between a tall hierarchy structure and a flat structure?
10. What are the different types of Matrix structures?
11. Draw the organizational structure of your educational institution and list the internal and external factors that could affect the structure.
12. Assume that your educational institution is in a location that has experienced a significant growth in families with children who are eligible to attend your institution. Note the factors that the director may need to consider in order to ensure that they have the most appropriate structure in place.
13. Explain the relationship between organizational structure and employees' behaviour.
14. Discuss is the global implication of organizational design?

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Master of Business Administration (MBA)

Semester - I

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LESSON-1

INTRODUCTION TO STATISTICS

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STRUCTURE

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1.1 LEARNING OBJECTIVES

After studying this lesson, you will be able to:

- Explain the purpose of this lesson is to teach students about the various statistical approaches and how to effectively apply them to statistical problems.
- Understand how to think statistically and will summaries or describe statistics and its aspects.
- Gain a better understanding of a range of frequently used statistical and graphical tools for data analysis.
- Describe the significance of statistics for managers and how to apply these techniques in a range of management-related situations.
- Identify the center of the data set and measures of central tendency (mean, median, mode)

1.2 INTRODUCTION

This chapter explains the idea of grasping the various statistical methods and using them effectively to address statistical problems. The various skewness classes and accompanying coefficient changes will be able to be named. To understand the current trends and place an emphasis on running ANOVA and other non-parametric tests, it is important to analyse the data set using statistical measures of both central tendency and dispersion when utilising time series analysis and trend analysis on your data. Additionally, you need to be aware of how useful these tests are for addressing any potential issues. You can also learn more about how

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computers are utilised in statistics and learn about the various managerial applications of statistics that are applied in a variety of industries. Understanding data tabulation and classification will help you come up with useful solutions to issues. Multi-dimensional diagrams can be used to illustrate the diagrammatical and graphical representation of data. Discovering numerous numerical values that illustrate the fundamental properties of a frequency distribution and how crucial they are for management are among statistics' key goals.

1.3 INTRODUCTION TO STATISTICS

The Latin term "Status" or the Italian word “Statista,” which either mean “Political State” or “Government,” is the origins of the word statistics. Shakespeare's play Hamlet contains the word "statist" (1602). Government officials used data in the past. Although statistics were rarely used, monarchs and kings needed knowledge about their states' territories, agriculture, commerce, and population in order to evaluate their military might, riches, taxation, and other governmental functions.

In 1749, Gottfried Ache wall used the term "statistik" at a German university to refer to the political science of various nations. Elements of Universal Erudition, published by Baron B.F. Biddeford in 1771, was translated into English by Englishman W. Hooper. In his book, statistics is defined as the science that tells us what the political structure of all modern governments on the globe is. Although there is a significant difference between old and new statistics, historical statistics are still used in the current statistics.

The term "statistics" was first employed by English writers in the 18th century, and since then it has slowly evolved over the past few centuries. The latter part of the nineteenth century saw a lot of progress. The techniques for generating decisions based on a small collection of data were created by William S. Gosset at the start of the 20th century. Many statisticians

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were engaged in the development of novel statistical techniques, ideas, and applications during the 20th century. The availability of electronics and computers today unquestionably plays a significant role in the growth of statistics today.

Different authors have defined statistics differently, and each author has given the field new boundaries that should be covered in its scope. At present, a few definitions of statistics from various authors before drawing a conclusion regarding the subject's scope.

A.L. Bowley defines, "Statistics may be called the science of counting." In another place he writes, "Statistics may be called the science of averages." Both these definitions are narrow and throw light only on one aspect of statistics.

According to King, "The science of statistics is the method of judging collective, natural or social, phenomena from the results obtained from the analysis or enumeration or collection of estimates."

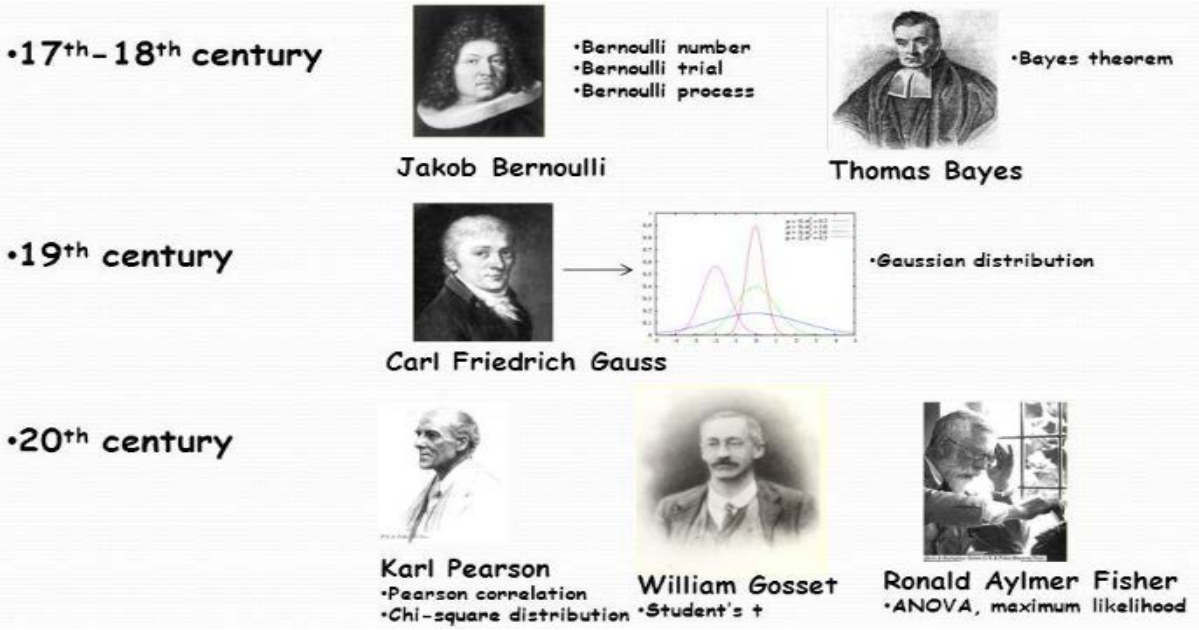

Fig:1.1 History of statistics

https://medicalexecutivepost.com/2019/08/24/the-history-of-statistics/

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1.3.1 Characteristics of Statistics:

- Facts are collected into statistics.
- Numbers are used to express statistics.
- Multiple factors have a significant impact on statistics.
- An acceptable accuracy criterion is used to enumerate or estimate statistics.
- Statistics are gathered with a specific goal in mind.
- Systematic methods are used to collect statistics.

1.3.2 Advantages of Statistics

- A natural event can be more clearly understood and described using statistics.
- Statistics aid in the correct and effective planning of any subject of study's statistical research.
- Statistics aid in gathering relevant quantitative data.
- Statistics aids in the presentation of complex data in an appropriate tabular, diagrammatic, and graphic format for a simple and unambiguous understanding of the data.
- Through quantitative observations, statistics aid in comprehending a phenomenon's nature and pattern of variability.
- Statistics facilitates the process of deriving reliable inferences about the characteristics of the population from sample data.

1.3.3 Limitations of Statistics

- On average, statistical rules hold true. Facts are collected into statistics. Thus, a single observation is not a statistic; rather, statistics only consider groups and aggregates.
- Quantitative data lend themselves to statistical methods the best.
- Data that are diverse cannot be statistically analysed.
- If adequate care is not taken in gathering, evaluating, and interpreting the data, statistical findings may be deceptive.

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- Only someone with in-depth statistical understanding is capable of handling statistical data effectively

1.4 IMPORTANCE OF STATISTICS FOR MANAGERS

Modern administration of businesses is more of a science than an art. Business managers must use scientific approaches to resolve uncertainty and be objective decision-makers due to the ever-increasing global competitiveness. Forecasting, planning, organizing, and decision-making are some of a manager's major tasks that aim to improve the future of the company. Future unpredictability is the only thing that is certain. Although uncertainty cannot be completely eliminated, it is possible to assess uncertainty using statistics, which allows managers to make well-informed decisions. This necessitates revealing statistics' managerial power.

In general, having an understanding of statistics aids a manager in defining the issue, identifying and assessing potential solutions, estimating errors, monitoring processes, and implementing the right corrective measures to get the best results.

1.4.1 Applications of statistics for Managers

In business management, descriptive and inferential statistical tools are both crucial. To give just a few examples of the numerous applications,

- An extensive amount of market dynamics and target consumer data must be gathered and analysed by a marketing manager. Marketing strategy should ideally be based on the findings of market research, which includes the use of sampling techniques, statistical methods for data collection, and evaluation of the impact of various marketing initiatives.
- To increase output and quality, a production manager should preferably employ statistical process control methods. Better processes and products are ensured by understanding and using Control Charts, sampling methods, and probability distributions. Additionally, this results in lower production costs and increased profitability.
- The ideal method for training personnel and measuring the results of training would be of interest to an HR manager. Attrition must be measured in order to identify the underlying causes.

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- Crunching financial data and applying financial strategies are essential tasks for a finance manager. Knowing statistics improves a manager's capacity and expertise as a researcher, giving them an advantage.

Fig :1.2 Applications of statistics for Managers

arcumllp.com

In order to succeed, one must cultivate "Creative and Statistical thinking." With the help of quantitative analysis, events and actions can be supported objectively and factually. Data and analysis work together to quantify the size of issues and potential fixes in ways that other types of information rarely can. Simple tools like tables, graphs, and measurements of central tendency, dispersion, and association for data analysis have found their way into corporate boardrooms, as have more complicated methods like multivariate techniques, big data analysis, structural equation modelling, and statistical approaches. This demonstrates how crucial statistics are to managerial choices.

1.5 MEASURES OF CENTRAL TENDENCY

When we need to evaluate a dataset that contains a large number of records (such as airline passengers, the weight and GPA of every student at an institution, and share prices). We start by searching for a summary of the dataset, such as a list of all the features' qualities (variables). The dataset's many records have a tendency to cluster around a single value. These numbers are known as Measure of Central Tendency since they pinpoint where the dataset's Central Value is located.

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A summary statistic known as a measure of central tendency makes an effort to summarise an entire collection of data using a single number that corresponds to the middle or centre of its distribution.

The following are the top three central tendency measures:

- **Mean (Arithmetic Mean)**
- **Median**
- **Mode**

A series' centrality can be determined by using central tendency measures like Mean, Median, and Mode. They show the overall size of the data but don't fully disclose all the quirks and traits of the series. In other words, they don't show how widely distributed or how variable the distribution's individual elements are. Other measurements, also referred to as "Measures of Dispersion" or "Measures of Variation," can explain this.

The study of statistics does not seem to be particularly interested in constants. A person who is interested in research may not find the size of the planet to be particularly significant, but the space occupied by various types of vegetation, woods, and buildings—both residential and commercial—is significant since these areas are always shifting. The study of evolving phenomena is a popular field of research.

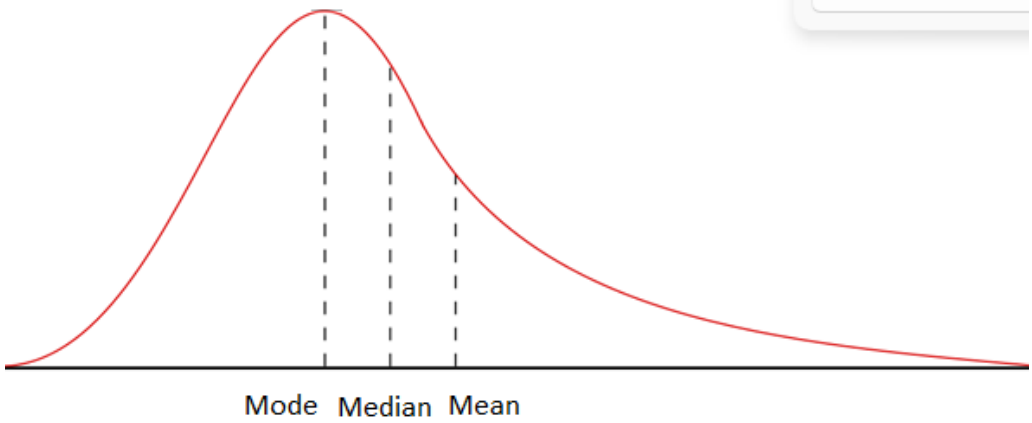

Fig 1.3: Measures of Central Tendency

- The primary goal of computing averages and assessing central tendencies is to provide a single number that can be used to symbolize a whole series of magnitudes for the same variable.

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- The second point is that an average depicts the data from the empire and makes it easier to **compare data within a group or across groups. As a result, it is possible to compare a group's performance to the average performance of other groups.**
- **The third point is that** computing an average can help with other statistical measures like dispersion, skewness, kurtosis, etc.

1.5.1 Mean , Median and Mode

Different methods of measuring "Central Tendency" provide us with different kinds of averages.

The following are the main types of averages that are commonly used**:**

1. **Mean**
2. **Median**
3. **Mode**

Arithmetic Mean

The most widely used average or gauge of central tendency, solely applicable to quantitative data, is the arithmetic mean, usually known as the "mean." "Arithmetic mean is a quotient of sum of the supplied values and number of the given values," is how the term is defined.

Both ungrouped data (raw data: data that have not undergone any statistical processing) and grouped data can have their arithmetic means calculated (data arranged in tabular form containing different groups).

Mean is the average value.

Mean = (150+160+175+190+200)/5=875/5=175

Mean Height = 175 cm

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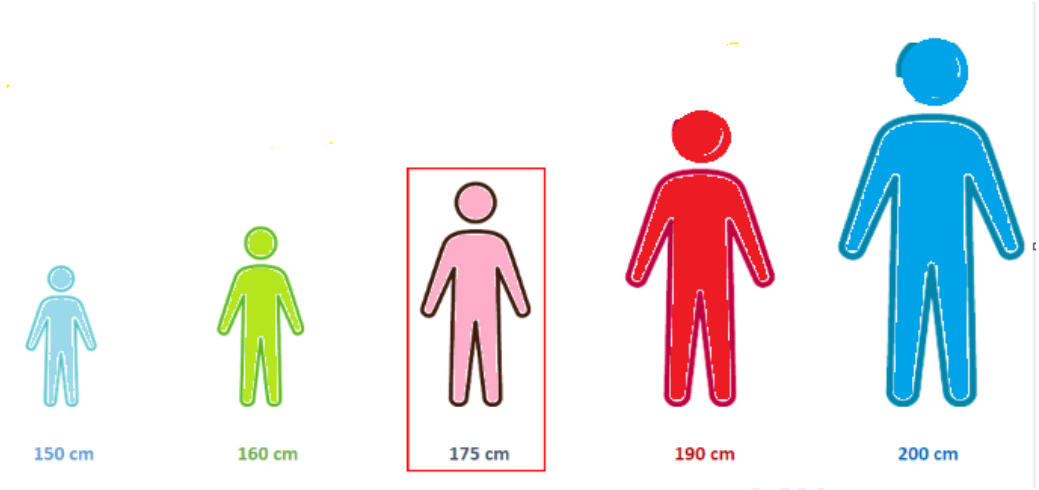

Fig:1.4 : Arithmetic Mean

The sum of the observations divided by the total number of observations is the arithmetic mean.

firmly established

Considering all the evidence

If there are n observations, with x1, x2, x3,..., xn, then

$$\text{Mean } (\bar{x}) = \frac{1}{n}(X_1 + X_2 + X_3 + X_4 \ldots\ldots + X_n)$$

or

$$\bar{X} = \frac{\Sigma X}{n}$$

Illustration 1.1 For the frequency distribution of seed yield of plot given in table, calculate the mean yield per plot.

Yields per plot in (ing)	**64.5-84.5**	**84.5-104.5**	**104.5-124.5**	**124.5-144.5**
No of Plots	**3**	**5**	**7**	**20**

Solution:

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Yield (in g)	No of Plots (f)	Mid X	d = x-A/c	Fd
64.5-84.5	3	74.5	-1	-3
84.5-104.5	5	94.5	0	0
104.5-124.5	7	114.5	1	7
124.5-144.5	20	134.5	2	40
Total	**35**			**44**

A= 94.5

The mean yield per plot is

Direct method:

$$\bar{x} = \frac{\sum fx}{n} = \frac{(74.5\times 3)+(94.5\times 5)+(114.5\times 7)+(134.5\times 20)}{35}$$

$$= \frac{4187.5}{35} = 119.64 \text{ gms}$$

Shortcut method

$$\bar{x} = A + \frac{\sum fd}{n} x\ c$$

$$\bar{x} = 94.5 + \frac{44}{35} x\ 20 = 119.64\ g$$

Types of Data

Data can be present in **raw form** or **tabular form**. Let's find the mean in both cases.

Raw Data

Let $x_1, x_2, x_3, \ldots, x_n$ be n observations.

We can find the arithmetic mean using the mean formula.

Mean, $\bar{x} = (x_1 + x_2 + \ldots + x_n)/n$

Illustration 1.2: If the heights of 5 people are 142 cm, 150 cm, 149 cm, 156 cm, and 153 cm.

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Find the mean height.

Mean height, $\bar{x}$ = (142 + 150 + 149 + 156 + 153)/5
= 750/5
= 150

Mean, $\bar{x}$ = 150 cm

Thus, the mean height is 150 cm.

Frequency Distribution (Tabular) Form

When the data is present in tabular form, we use the following formula:

Mean, $\bar{x} = (x_1f_1 + x_2f_2 + ... + x_nf_n)/(f_1 + f_2 + ... + f_n)$

Consider the following example.

Illustration 1.3: Find the mean of the following distribution:

X	4	6	9	10	15
F	5	10	10	7	8

Solution:

Calculation table for arithmetic mean:

x_i	f_i	x_if_i
4	5	20
6	10	60
9	10	90
10	7	70
15	8	120
	$\sum f_i = 40$	$\sum x_i f_i = 360$

x_i	f_i	x_if_i

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4	5	20
6	10	60
9	10	90
10	7	70
15	8	120
	$\sum f_i = 40$	$\sum x_i f_i = 360$

Mean, $\bar{x} = (\sum x_i f_i)/(\sum f_i)$
$= 360/40$
$= 9$

Thus, Mean = 9

1.5.2 Advantage of Mean

- It is firmly established
- It is straightforward to compute and understand.
- It is founded on every observation.
- It is established for practically all types of data.
- It is limited and not endless.
- It is easily applied to algebraic treatment, and sample fluctuations have the least impact on it.

1.5.3 Disadvantage of Mean

- Extreme values significantly alter the arithmetic mean.
- It is impossible to reliably compute if any item is missing.

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- the mean occasionally does not agree with any of the observed values.
- It is impossible to reliably compute if any item is missing, and the mean occasionally does not agree with any of the observed values.

1.6 MEDIAN

The variable's median value is the point at which the group is divided into two equal sections. The values larger than and less than the median is split into two parts, respectively. The value of a variable that surpasses and is exceeded by the same number of observations is the median of a distribution. It is the value at which there are exactly as many observations above it as there are below it. So, although the median is a positional average, meaning it depends on the location a value occupies in the frequency distribution, the arithmetic mean is based on all elements of the distribution. In the case of an individual observation, the value of the series' middle item is known as the median whether the items are organized in ascending or descending order of magnitude.

Median is a symbol for the size of the n-th item.

If the number of elements is even, the series' middle value is not exactly known. The median is arbitrary chosen in this case to be midway between the two centre elements.

Raw data, or ungrouped data

Sort the values provided in ascending order. The median is the middle value when the number of values is odd. The median is the mean of the middle two values when the number of values is even.

Median = size of $\{\frac{N+1}{2}\}$th item. (when n is odd)

Median = [size of $\frac{N}{2}$ th item + size of $\{\frac{N+1}{2}\}$th item]/2 (when n is even)

Illustration 1.4 If the weights of sorghum ear heads are 45, 60, 48,100,65 gms, calculate the median

Solution: Here n = 5 First arrange it in ascending order 45, 48, 60, 65, 100,

Median =

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$$=\left(\frac{n+1}{2}\right)^{th} value$$

$$=\left(\frac{5+1}{2}\right)=3^{rd} \quad value=60$$

Illustration 1.5 If the morgum ear- heads are 5,48, 60, 65, 65, 100 gms, calculate the median.

Solution: Here n = 6

$$\text{Meadian} = \text{Average of}\left(\frac{n}{2}\right) and \left(\frac{n}{2}+1\right)^{th} value$$

$$\left(\frac{n}{2}\right)=\frac{6}{2}=3^{rd} value = 60 \quad \text{and}\left(\frac{n}{2}+1\right)=\frac{6}{2}+1=4^{th} value = 65$$

$$\text{Median} = \frac{60+65}{2} = 62.5\,g$$

Grouped data

A clustered distribution has values and frequencies attached to them. A discrete frequency distribution or a continuous frequency distribution might be used for grouping. Regardless of the distribution style, cumulative frequencies must be calculated to get the overall number of items.

Cumulative frequency (cf)

Cumulative frequency of each class is the sum of the frequency of the class and the frequencies of the pervious classes, i.e., adding the frequencies successively, so that the last cumulative frequency gives the total number of items.

Discrete Series

Step1: Find cumulative frequencies.

Step2: Find (n/2+1)

Step3: See in the cumulative frequencies the value just greater than (n/2+1)

Step4: Then the corresponding value of x is median.

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Illustrations 1.6: The following data pertaining to the number of insects per plant. Find median number of insects per plant. Number of insects per plant (x) 1 2 3 4 5 6 7 8 9 10 11 12 No. of plants(f) 1 3 5 6 10 13 9 5 3 2 2 1 Solution Form the cumulative frequency table.

Solution Form the cumulative frequency table

X	f	Cf
1	1	1
2	3	4
3	5	9
4	6	15
5	10	25
6	13	38
7	9	47
8	5	52
9	3	55
10	2	57
11	2	59
12	1	60
	60	

Median = size of $(n+1/2)^{th}$ item

Here the number of observations is even. Therefore median = average of $(n/2)^{th}$ item and $(n/2+1)^{th}$ item. = (30th item +31st item) / 2 = (6+6)/2 = 6

Hence the median size is 6 insects per plant.

Continuous Series

For the purpose of calculating the median in a continuous series,

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The steps listed below are used.

1. Arrange the data set in either descending or ascending order.
2. The confidence interval must be exclusive (if not then convert into exclusive)
3. Calculate the cumulative frequencies
4. Use Median = size of (N)/2 th item to ascertain median class
5. Apply formula of interpolation to ascertain the value of median

Median = $l + \frac{\frac{n}{2} - m}{f} \times c$

where l is the lower limit of the median class, m is the cumulative frequency before the median class, c is the class width, and f is the frequency in the median class.

n = Total frequency

Illustration 1.7 For the frequency distribution of weights of sorghum ear-heads given in table below. Calculate the median.

Weights of ear heads (in g)	**No of ear heads (f)**	**Less than class**	**Cumulative frequency (m)**
60-80	22	80	22
80-100	38	100	60
100-120	45	120	105
120-140	35	140	140
140-160	24	160	164
Total	164		

Solution =

Median = $l + \frac{\frac{n}{2} - m}{f} \times c$

(n/2) =164/2 =82

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It ranges from 60 to 105. The lower class, which corresponds to 60, is 100, and the lower class, which corresponds to 105, is 120. The median class is therefore 100–120. Its minimum value is 100.

In this instance, 100, n=164, f=45, c=20, m=60, and n=Total frequency.

Median = 100 + 82-60/45 *20 = 109.78gms

1.6.1 Advantage of Median

1. It is quite straightforward to comprehend and compute. Sometimes it can be acquired by simple inspection.
2. Because the median is in the middle of the range, extreme values have no impact on it.
3. It is a unique average that is used to rank qualitative things like intelligence or beauty that cannot be quantified. This enables us to identify the individual whose intelligence or beauty is average.
4. By drawing provides, it is possible to locate it graphically in a grouped frequency distribution.
5. It is especially helpful in open-ended distributions since the median considers item location rather than item value.

1.6.2 Disadvantage of Median

(1) The item values in a simple series must be ordered. The technique gets tiresome if there are many items in the sequence.

(2) Because it does not depend on every item in the series, it is a less representative average.

(3) It cannot be subjected to additional algebraic analysis. For instance, if the medians of various groups are provided, we cannot find the combined median of two or more groups.

(4) Because it only considers one item, the centre item, it is more impacted by sample changes than the mean.

(5) It is not a strict definition. The median cannot be calculated in simple series with even numbers of entries precisely located additionally, the continuous series interpolation

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formula is based on the erroneous assumption that the frequency of the median class is distributed evenly across the size of the median group's class interval.

1.7 MODE

The value in a distribution that occurs the most frequently is referred to as the mode. The most goods are found in and around it, and it is an actual value. It displays the frequency's primary focus at a particular value. Therefore, it is chosen when the goal is to identify the location of greatest concentration. Consequently, it is a positional measure.

Finding the average height of a crop variety, the largest irrigation source in a region, and the largest variety of paddy that is susceptible to disease are just a few examples of its usefulness in agriculture. In the case of qualitative data, the mode is a crucial measurement.

Illustration 1.8. Find the mode for the following frequency table:

x	f
1	5
20	9
25	8
30	1
40	10
50	7

By observing the given data set, the number 40 occurs more often. That is 10 times.

Hence the mode is 40.

Mean = 29.125

Mode = 25 and

Mode = 40.

Illustration 1.9: Find the mode of the given data:

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Marks Obtained	0-20	20-40	40-60	60-80	80-100
Number of students	5	10	12	6	3

Solution:

The highest frequency = 12, so the modal class is 40-60.

l = lower limit of modal class = 40

fm = frequency of modal class = 12

f1 = frequency of class preceding modal class = 10

f2 = frequency of class succeeding modal class = 6

h = class width = 20

Using the mode formula,

Mode = l+[fm−f12fm−f1−f2] ×hl+[fm−f12fm−f1−f2] ×h

= 40 + [12−102×12−10−6] ×20[12−102×12−10−6] ×20

= 40 + (2/8) × 20

= 45

∴ Mode = 45

Determining the mode Individual or Raw Data

Mode is frequently determined by simple visual inspection for ungrouped data or a collection of individual observations.

Graphic Location of Mode

Since mode is a positional average, the following procedure can be used to locate it graphically:

1. A frequency distribution histogram is created.
2. The model class is represented by the highest rectangle in the histogram.

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3. The top left and top right corners of the topmost rectangle are connected to the top left and top right corners of the preceding and following rectangles, respectively.

4. A perpendicular is drawn on the X-axis from the intersection of the two lines, and that point is checked on the X-axis. This will be the mode's necessary value.

1.7.1 Advantage of Mode

- It is straightforward to compute and understand.
- It is unaffected by values that are incredibly high or low.
- It can be found simply by looking at the discrete frequency distribution and ungrouped data.
- It is applicable to qualitative data.
- An open-end frequency table can be used to calculate it.
- It is shown graphically.

1.7.2 Disadvantage of Mode

- It lacks a clear definition.
- It isn't founded on all values.
- It is stable for large numbers, thus if the data only contains a few values, it won't be properly defined.
- It cannot be subjected to more mathematical processing.
- The data can occasionally have one mode, multiple modes, or no modes at all.

1.8 RELATION BETWEEN MEAN, MEDIAN AND MODE

The relationships between the mean, median, and mode, the three measures of centre values, are as follows (called an empirical relationship).

3Median = 2Mean + Mode

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For instance, if we are requested to find the mean, median, and mode of continuously grouped data, we can do so by first finding the mean and median using the formulas from the preceding sections, and then the mode by utilizing the empirical relation.

As an illustration, we have data with a median of 61.6 and a mode of 65.

Using the aforementioned mean, median, and mode relation, we can then calculate the mean.

Median = 2Mean + Mode

2Mean = 3 × 61.6 - 65 ∴

Mean = 59.9 when divided by 2Mean = 119.8.

Mean = 59.9/2

Mean = 119.8

1.9 SUMMARY

Data Facts or figures, numerical or otherwise, collected for a definite purpose are called data. The number of times a particular instance occurs is called the frequency in statistics. Raw data needs to be sorted in order to carry out operations. -Sorting ascending order or descending order. The size of the class into which a particular data set is divided. Divisions on a histogram or bar graph. Upper class limit minus lower class limit equals class width. When the class intervals vary in size, A frequency table or distribution shows the occurrence of a particular variable in a tabular form. The average is the sum of the values of all the observations divided by the total number of observations. If n (number of observations) is odd, the median is the mean or average of the $(n/2)^{th}$ and $[(n+1)/2]^{th}$ observations. The class interval with the highest frequency is the modal class, where the term modal is used to refer to a period of time during which observation occurs at least once in a billionth of a millionth of a trillionth of Hertzmann's time.

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1.10 GLOSSARY

Term	Full Form/Formulae/Meaning
Descriptive Statistics	Through graphs or tables, or numerical calculations, descriptive statistics uses the data to provide descriptions of the population.
Inferential Statistics	Based on the data sample taken from the population, inferential statistics makes the predictions and inferences
Statista	which both mean "Political State" or "Government
Average	a number that describes the central tendency of the data;
Data	facts and statistics collected together for reference or analysis.
Central tendency	the tendency for the values of a random variable to cluster round its mean, mode, or median
Mode	a way or manner in which something occurs or is experienced, expressed, or done
Survey	look closely at or examine (someone or something).
Observation	the action or process of closely observing or monitoring something or someone.
Raw Data	is the collection of information as gathered by the source before it has been further processed, cleaned or analyzed.
Grouped Data	Grouped data means the data (or information) given in the form of class intervals such as 0-20, 20-40 and so on.
Sampling	the action or process of taking samples of

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	something for analysis.
Ungrouped Data	Ungrouped data is the data you first gather from an experiment or study

1.11 SELF-ASSESSMENT QUESTIONS

(I) MCQ/ Objective

1. The mean of two samples of the sizes 250 and 320 were found to be 20,12 respectively. Their standard deviations were 2 & 5, respectively. Find the variance of combined sample of size 650.

(a) 10.23

(b) 32.5

(c) 65

(d) 26.17

2. Which of the following is a branch of statistics?

a) Descriptive statistics

b) Inferential statistics

c) Industry statistics

d) Both A and B

3. To which of the following options do individual respondents, focus groups, and panels of respondents belong?

(a) Primary data sources

(b) Secondary data sources

(c) Itemized data sources

(d) Pointed data sources

4. The positive square root of the mean of the squares of the deviations of observations from their mean is called:

(a) Variance

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(b) Range

(c) Standard deviation

(d) Coefficient of variation

5. The sum of absolute deviations is minimum if these deviations are taken from the:

a) Mean

b) Mode

c) Median

d)Upper quartile

Answers: 1. 26.17, 2. Both A and B, 3. Primary data sources, 4.Standard deviation, 5. Median

(I) Short Answer Questions:

1. How is an insight's statistical significance determined?
2. What do qualitative and quantitative data mean?
3. How significant are the statistical concepts of mean, median, and mode?
4. How do managers benefit from statistics?
5. Which is more crucial, the mean, the median, or the mode?
6. Do managers use data while making decisions?
7. What kinds of statistics are there?
8. What makes the median crucial to business?
9. What are statistics' primary purposes?
10. What are the formulae for mean, median and mode?

(II) Long Answer Questions:

1. In what situations in actual life are statistics useful?
2. Why are statistics crucial for making decisions?
3. Describe statistical thinking and explain why it is a crucial managerial ability.
4. What exactly are mean, median, and mode? using instances

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5. A statistical survey is a methodical procedure for gathering and examining numerical data. Describe the phases of a statistical study. Describe the many techniques used to gather data for a statistical survey.

6. A normal distribution for the weekly earnings of 1000 workers has a mean of Rs. 70 and a standard deviation of Rs. 5. Calculate the approximate number of employees whose weekly pay will be:

   a. around 70 to 72

   b. Between 69 and 72

   c. Less than 75 More

   d. Less than 63

7. a). Determine the I median value and (ii) arithmetic mean of the following set of values: 40, 32, 24, 36, 42, 18, 10. 8.

   b) What is the median of the next set of statistics?

   32, 6, 21, 10, 8, 11, 12, 36, 17, 16, 15, 18, 40, 24, 21, 23, 24, 24, 29, 16, 32, 31, 10, 30, 35, 32, 18, 39, 12, 20

8. Consider the following frequency distribution. Calculate the mean weight of students.

Weight (in kg)	**31-35**	**36-40**	**41-45**	**46-50**	**51-55**	**56-60**	**61-65**	**66-70**	**71-75**
	9	**6**	**15**	**3**	**1**	**2**	**2**	**1**	**1**

9. Calculate the median marks of students from the following distribution**.**

Marks	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**
Number of Students	**7**	**10**	**10**	**20**	**20**	**15**	**8**

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10. The given distribution shows the number of runs scored by some top batsmen of the world in one-day international cricket matches.

Run Scored	Number of Batsman
3000-4000	4
4000-5000	18
5000-6000	9
6000-7000	7
7000-8000	6
8000-9000	3
9000-10000	1
10000-11000	1

Find the mode of the above distribution.

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LESSON-2

PROBABILITY and PROBABILITY DISTRIBUTION

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STRUCTURE

1.1 Learning Objectives

1.2 Introduction

1.3 Probability and Probability Distribution

- 1.3.1 Terminologies
- 1.3.2 The Classical Definition of Probability
- 1.3.3 Statistical or Empirical Definition of Probability
- 1.3.4 Axiomatic Definition of Probability
- 1.3.5 Some Important Results on Probability

1.4 Probability Rules

1.5 Joint and Conditional Probability

- 1.5.1 Theorem of Multiplication
- 1.5.2 Independent Events and Baye's Theorem

1.6 Summary

1.7 Glossary

1.8 Answers to In-text Questions

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1.9 Self-Assessment Questions

1.10 References

1.11 Suggested Readings

2.1 LEARNING OBJECTIVES

After going through this unit, you should be able to:

- Understand the difference between deterministic and random experiments.
- Define sample space, events and use of different algebraic operations for events.
- Define probability using classical, empirical and axiomatic approach.
- Understand the concept of joint and conditional probability and able to solve problem based on it.
- Prove and apply Baye's theorem

2.2 INTRODUCTION

The history of probability theory can be traced back to chance games and gambling. It owes a lot to the inquisitiveness of gamblers who constantly barraged their mathematical buddies with inquiries. Unfortunately, this link to gambling has caused probability theory's development as a branch of mathematics to be extraordinarily sluggish and erratic. The first attempt to give quantitative measure of probability was made by, an Italian mathematician Galileo (1564-1642). This course is design to provide you with a basic, intuitive, and practical introduction into Probability Theory. In this unit topic covered are Probability and Probability distribution, different definition of probability, joint and conditional probability, Baye's theorem.

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HISTORY

The earliest game of chance that we can still play today originated in Mesopotamia. Early in the 20th century, archaeologists working at Ur discovered a board game that had been interred alongside its owner. The exquisitely made board game dates back nearly 4,500 years. Ancient allusions to the game have also been discovered, therefore we are certain that it is a board game and that we even know the rules. The Game of 20 Squares is the name of this game. Each player relies on a combination of luck and a little ingenuity to win this game of two players. Rolling dice to determine how many squares each player can move his or her piece involves the element of luck.

We value a game's development that is random since each player's ability to jump a certain number of spaces is determined by the outcome of a dice roll. The Game of 20 Squares has been played for thousands of years throughout much of the world, including Egypt, India, and Mesopotamia. Despite being one of the most popular board games ever, it did not lead to the development of a probability theory. There is no evidence that anyone sought to come up with a winning plan of action based

The Game of 20 Squares was played for 3,000 years—until the first millennium of the common era. This particular board dates from about 2500 B.C.E. (© Copyright The British Museum)

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2.3 PROBABILITY AND PROBABILITY DISTRIBUTION

The use of statistical methodology is indispensable in modern era. It has a wide application in every discipline, be it physical sciences, engineering and technology, economics, or social sciences. For their advance research they are applying statistical tools. It is essential for the students to get acquainted with the subject of probability and statistics at an early stage. The probability can be defined as the "Mathematics of Chance". We frequently encounter the words probability or chance in our daily lives. We usually say that it is very probable that it will rain today or it is expected that today is a sunny day. It is obvious that these expectations are comes from our personal view.

2.3.1 Terminologies

We will define the various terms used in the definition of probability.

(i) *Deterministic and Random Experiments*:

Every experiment consists of three major steps:

- Input: It relates to the equipment, material, input data etc. which involves in any experiment.
- Action: Any experiment is performed using the input.
- Output: The results or outcome of the action, called the output of the experiment.

Definition: A **deterministic experiments** are those experiments in which fixed input and action yields fixed output. We can predict the output of the experiment. For example; distance covered by a car travelling at a constant speed, ohm's law, determining gravitational constant at a place, *etc*.

In all the above-mentioned examples for a fixed input and action, we get a fixed output.

Definition: A **random or non-deterministic experiments** are those experiments in which fixed input and action does not yield the fixed output. For example; tossing a coin or throwing a dice, *etc*. In these examples we do not predict the exact outcome beforehand.

In probability theory we are mainly concerned with the random experiments.

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(ii) *Sample Space*:

It is the set of all possible outcomes of a random experiment. Usually it is denoted by the Ω and a point belonging to Ω by $\omega \in \Omega$. Some examples of sample space are:

- In tossing a coin the sample space is $\Omega = \{H, T\}$
- In throwing a dice the sample space is $\Omega = \{1, 2, 3, 4, 5, 6\}$
- In a coin tossing experiment if we toss a coin three times then the sample space is

  $\Omega = \{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$.
- In observing the queue size at a college fee counter, the sample space is given by $\Omega = \{0,1,2,3, \dots, \dots\}$.
- The sample space for the time taken (in minutes) to download a website is observed as $\Omega = \{t: 0 < t < \infty\}$.

(iii) *Events*: It is the set of possible outcomes of a random experiment or An event A is a set of specific outcomes we are interested in. It is obvious that an event is a subset of sample space Ω. If we denote an event associated with a random experiment by A and Ω is the corresponding sample space then $A \subseteq \Omega$. For example:

- Toss a coin and we define event A that outcome is "H" then

  $A = \{H\}$
- Throw a dice. Let A be the event that outcome is an odd number

  A={1,3,5}
- Toss a coin until we obtain an "H". A be the event that number of tosses is more than 3

  A={TTTH, TTTTH…}
- No customer in the queue at the college fee counter

  A={0}

Firstly, we have to define about random experiment and sample space then only we can talk about event. Otherwise, it makes no sense. In throwing a dice (random experiment), $\Omega = \{1, 2, 3, 4, 5, 6\}$ (sample space), and define A be the event that outcome is an odd number then, A={1,3,5}, and if outcome is 3, then A occurs whereas if outcome is 4 then A does not occur.

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An event is said to be a **sure event** if it is occurred in a single trial. In other word sample space Ω is sure to occur. Further, the **null or impossible event** is denoted by ϕ.

(iv) ***Algebra of Events*:**

Since an event is a subset of the sample space, it is also a set and we can perform different algebraic operations like union, intersection, complement *etc.* on events.

Let A and B be two events on the sample space Ω. Then we have different algebraic operations are as follows:

- **Union:** $A \cup B$ is an event which occurs when either A or B (or both) occur.
- **Intersection:** $A \cap B$ is an event which occurs when both A and B occur.
- **Complement:** An event which occurs whenever A does not occur is called the complement of event A and is denoted by A^c *or* $\bar{A}$.
- **Difference**: $A \sim B = A \cap B^c$ be an event which occurs when A occurs and B does not occur. It is obvious that $A^c = \Omega \sim A$.

(v) ***Exhaustive events*:** The total number of possible outcomes in a random experiment is called exhaustive events. In tossing a coin experiment, there are two exhaustive cases, *viz.*, head and tail and in throwing a dice experiment, there are six exhaustive cases, *viz.*, 1, 2, 3, 4, 5, 6.

(vi) ***Mutually exclusive events*:** Two events A and B are said to be mutually exclusive if $A \cap B = \phi$ *i.e.* If the occurrence of one does not precludes the occurrence of other. In throwing a dice experiment "2 occurs" and "5 occurs" are mutually exclusive events.

(vii) ***Equally likely events*:** Two events A and B are said to be equally likely if P(A)=P(B). In a pack of well-shuffled 52 cards, all the cards are equally likely to appear at the time of experiment of drawing a card at random.

2.3.2 The Classical Definition of probability

Let us assume that, N is the total number of elementary events in the sample space and is finite. We also assume that all the elementary events are equally likely to occur. Under this assumption the classical (or mathematical or a priori) definition of probability is:

***Definition*:** If a random experiment can result in N mutually exclusive, exhaustive and equally likely outcomes, out of which n are favourable to occurrence of an event A, then the probability 'p' of occurrence of A is given by:

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$p = P(A) = \frac{n}{N} = \frac{\textit{total number of favourable cases}}{\textit{total number of exhaustive cases}}$.

Illustration 2.1: An unbiased (all faces of the dice are equally likely) dice is thrown. Let A be the event that we obtain an odd number. Then

$$\Omega = \{1, 2, 3, 4, 5, 6\}; A = \{1,3,5\}$$

so that, $P(A) = \frac{3}{6} = \frac{1}{2}$.

Illustration 2.2: Two unbiased coins are tossed. Let us define an event A that getting at least one head. Then

$$\Omega = \{HH, HT, TH, TT\}; A = \{HH, HT, TH\}$$

so that, $P(A) = \frac{3}{4}$.

Illustration 3: Among the digits 1, 2, 3, 4, 5 at first one is chosen and then a second selection is made among the remaining four digits. If all twenty possible outcomes have equal probabilities, then the probability of selecting an even digit both times is

There are two cases in which both the digits drawn are even, *viz*., $(2,4), (4,2)$.

∴ the probability that both the digits drawn are even = $\frac{2}{20} = \frac{1}{10}$.

Remark: The classical definition of probability, however suffers from some serious drawbacks.

i. When outcomes of the random experiments are not equally likely then this definition fails.

ii. It is a circular definition means the term equally likely is defined in terms of probability and the term equally likely is used in defining probability.

iii. When the total number of elementary events in the sample space is infinite.

ACTIVITY

Take a coin and spin it 5000 times. Note down the value, *n*, the number of times spins made and *m*, the number of heads in the spins. Now find out the proportion between these two values and see their fluctuations and draw it on a graph.

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2.3.3 Empirical or Statistical Definition of Probability

Relative Frequency Ratio: Let an event A occurs n times in m repetitions of a random experiment. Relative frequency ratio of event A is defined as

$$f_A = \frac{n}{m}.$$

Obviously,

i. $0 \leq f_A \leq 1$

ii. $f_A = 1$, if, A occurs every time in m repetitions of the experiments;

iii. $f_A = 0$, if, A never occurs in m repetitions;

iv. For two mutually exclusive events A and B

$$f_{A \cup B} = f_A + f_B.$$

As $m \to \infty$, f_A converges to P(A) in certain probabilistic sense. This property gives the empirical or statistical definition of probability.

The only assumption for this definition is that the experiments must be conducted under identical conditions and the number of trials must be large.

Remark: The disadvantage of this definition is that if an experiment is repeated a large number of times, the experimental conditions may not remain identical and homogeneous.

2.3.4 Axiomatic Definition of Probability

Axiomatic definition of probability was formulated by Russian Mathematician A.N. Kolmogorov. There are three simple axioms on which the whole field of probability theory for finite sample space is based, is given below:

***Definition*:** Probability Function, P(A) is the probability function defined on a $\sigma - field$ B of events if the following axioms hold.

1. *Axiom of non-negativity*: $0 \leq P(A) \leq 1$.
2. *Axiom of certainty*: $P(\Omega) = 1$.
3. *Axiom of additivity*: For pair wise mutually exclusive events $A_1, A_2, \dots, \dots$

   $(A_i \cap A_j = \emptyset) \quad \forall i \neq j,$

   $P(\cup_i A_i) = \sum_i P(A_i).$

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Remark:

i. $\sigma - field$: A $\sigma - field$ B is a non-empty class of sets that is closed under the formation of 'countable unions and complementation's, *i.e.*,

(i) $A_i \in B, i = 1,2, \ldots \Rightarrow \bigcup_{i=1}^{\infty} A_i \in B$. (ii) $A \in B \Rightarrow \bar{A} \in B$

ii. The above axiomatic definition of probability has an obvious advantage, that is, it does not concern with assigning numerical values to the probabilities of events.

2.3.5 Some Important Results on Probability

Some important results as below:

(i) $P(A^c) = 1 - P(A)$

Proof: We have

$$A \cap A^c = \emptyset$$

Thus A and A^c are mutually exclusive. Further

$$A \cup A^c = \Omega$$

Hence,

$$P(A \cup A^c) = P(\Omega)$$

$$P(A) + P(A^c) = 1, \quad \text{(by axiom 2 and 3)}$$

or, $P(A) = 1 - P(A^c)$

(ii) $P(A \cap B^c) + P(A \cap B) = P(A)$

Proof: We observe that

$$(A \cap B) \cap (A \cap B^c) = A \cap (B \cap B^c)$$

$$= A \cap \emptyset = \emptyset$$

So that $(A \cap B)$ *and* $(A \cap B^c)$ are mutually exclusive. Further

$$(A \cap B) \cup (A \cap B^c) = A \cap (B \cap B^c)$$

$$= A \cap \Omega = A$$

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Hence

$$P[(A \cap B) \cup (A \cap B^c)] = P(A)$$

or, $P(A \cap B) + P(A \cap B^c) = P(A)$ (using axiom 3)

(iii)**Theorem of Addition**

***Statement*:** If A and B are any two events (subsets of sample space Ω) and are not disjoint, then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

***Proof*:** We can write

$$A \cup B = A \cup (A^c \cap B)$$

Again $A \cap (A^c \cap B) = \emptyset$, so that A and $A^c \cap B$ are mutually exclusive.

Hence

$$P(A \cup B) = P(A \cup (A^c \cap B))$$

$$= P(A) + P(A^c \cap B) \qquad \text{[By Axiom 3]}$$

Further, using result (ii), we have

$$P(A^c \cap B) = P(B) - P(A \cap B)$$

Hence we obtain

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

Illustration 2.3. A fair coin is flipped successively at random until heads is observed on two successive flips. Write down the sample space Ω.

Solution. Let x denote the number of flips of the coin that are required, then

$\Omega = \{x : x = 2, 3, 4, \ldots\}$.

Illustration 2.4 If a pair of dice is thrown, what is the event of

(i) getting a sum less than 6

(ii) getting a sum greater than 6

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(iii)getting a number multiple of 2 on the first die

(iv)getting a number multiple of 3 on the first die and a multiple of 2 on the second die

(v) getting a doublet

(vi)getting sum as 10

Solution. If a die is thrown twice or a pair of dice is thrown simultaneously, then sample space is

Ω = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}.

Hence, $n(\Omega)$ = 36.

(i) Let A_1 be the event of getting a sum less than 6.

$\therefore A_1$= {(1, 1), (1, 2), (1, 3), (1, 4), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (4, 1)}.

(ii) Let A_2 be the event of getting a sum greater than 6.

$\therefore A_2$= {(1, 6), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 3), (4, 4), (4, 5), (4, 6), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}.

(iii) Let A_3 be the event of getting a number multiple of 2 on the first die.

$\therefore A_3$= {(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}.

(iv) Let A_4 be the event of getting a number multiple of 3 on the first die and a multiple of 2 on the second die.

$\therefore A_4$= {(3, 2), (3, 4), (3, 6), (6, 2), (6, 4), (6, 6)}.

(v) Let A_5 be the event of getting a doublet

$\therefore A_5$= {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}.

(vi) Let A_6 be the event of getting a sum as 10

$\therefore A_6$= {(4, 6), (5, 5), (6, 4)}.

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Illustration 2.5. A letter of the English alphabet is chosen at random, write the event that the letter so chosen

(i) is a vowel

(ii) precedes S (in alphabetical order)

(iii)follows K and precedes T and is a vowel

Solution. A letter of the English alphabet is chosen then the sample space is Ω is

Ω = {A, B, C, …, X, Y, Z}, $n(\Omega) = 26$

(i) Let A_1 be the event that letter chosen at random be a vowel

$\therefore A_1$= {A, E, I, O, U}

(ii) Let A_2 be the event that letter chosen at random be precedes 's'

$\therefore A_2$= {A, B, C, D, …, P, Q, R}

(iii) Let A_3 be the event that letter chosen follows K and precedes T and is a vowel

$\therefore A_3$= {O}

Illustration 2.6 A card is selected at random from a pack of 52 cards. Let *A* = 'the card is a club' and *B* = 'the card is a queen'. Find *P*(*A*), *P*(*B*).

Solution. $p=\frac{n}{N} = \frac{total\ number\ of\ favourable\ cases}{total\ number\ of\ exhaustive\ cases}$.

For event *A*, *n* = 13 (there are 13 club in a pack of card), and for event *B*, *n* = 4 (there are 4 queens in a pack of card). Therefore

$P(A) = \frac{13}{52}\ and\ P(B) = \frac{4}{52} = \frac{1}{13}$.

Illustration 2.6 An urn contains 6 white, 4 red and 9 green balls. If 1 ball is drawn at random, find the probability that:

(i) it is white

(ii) it is not green

(iii)it green or red

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Solution. Total number of balls in the urn is 6 + 4 + 9 = 19 (total number of exhaustive cases). Since one ball is drawn at random then

(i) Let E_1 be the event that it is a white ball

$$P(E_1) = \frac{total\ number\ of\ favourable\ cases}{total\ number\ of\ exhaustive\ cases} = \frac{6}{19}$$

(ii) Let E_2 be the event that it is not a green ball

$$P(E_2) = \frac{total\ number\ of\ favourable\ cases}{total\ number\ of\ exhaustive\ cases} = \frac{10}{19}$$

(iii)Let E_3 be the event that it is a green or a red ball

$$P(E_3) = \frac{total\ number\ of\ favourable\ cases}{total\ number\ of\ exhaustive\ cases} = \frac{13}{19}$$

Illustration 2.7. What is the probability of getting 53 Sundays in a randomly selected leap year?

Solution. We know that there are 366 days (52 complete weeks and 2 days over) in a leap year. The following are the possible outcomes for these 2 over days:

(i)	Sunday and Monday	(ii)	Monday and Tuesday
(iii)	Tuesday and Wednesday	(iv)	Wednesday and Thursday
(v)	Thursday and Friday	(vi)	Friday and Saturday
(vii)	Saturday and Sunday		

Let A be the event of getting 53 Sundays. There will be 53 Sundays in a leap year, when one of the two over days must be Sunday. Since out of 7 possibilities, only 2, *viz.*, (i) and (vii) are favorable to the event.

Therefore, $P(A) = \frac{2}{7}$.

Illustration 2.8. Two coins are tossed. Let *A* be the event 'two heads are obtained', and, *B* be the event 'one head and one tail are obtained'. Find *P*(*A*), *P*(*B*).

Solution. The sample space Ω in this case is

$$\Omega = \{HH, HT, TH, TT\}$$

For event *A*, number of favorable cases is 1 *i.e.*, {HH}.

$$P(A) = \frac{total\ number\ of\ favourable\ cases}{total\ number\ of\ exhaustive\ cases} = \frac{1}{4}$$

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For event *B*, number of favourable cases is 2 *i.e.*, {HT, TH}.

$$P(B) = \frac{total\ number\ of\ favourable\ cases}{total\ number\ of\ exhaustive\ cases} = \frac{2}{4} = \frac{1}{2}.$$

Illustration 2.9 If the letters of the word MANAGEMENT are arranged randomly then find the probability that all vowels come together.

Solution. Let A be the event that selected word contains all vowels together. There are 10 letters in 'MANAGEMENT' and in this word vowels are 4 *i.e.*, 2 A, 2 E. If we consider these vowels as a single letter then we have 7 letters i.e. AAEE, 2 M, 2 N, 1 G, 1 T.

Number of possible arrangements with 4 vowels coming together is = $\frac{7!}{2!.2!}$

Number of favourable cases for event A is = $\frac{7!}{2!.2!}$

Number of exhaustive cases = Total number of permutations of 10 letters in the word MANAGEMENT is = $\frac{10!}{4!.2!.2!}$ [out of 10 letters, 4 vowel, 2 M and 2 N]

$$P(A) = \frac{\frac{7!}{2!.2!}}{\frac{10!}{4!.2!.2!}} = \frac{1}{30}.$$

IN-TEXT QUESTIONS

1. The probability of drawing any one club card from a pack of card is
   (a) $\frac{1}{52}$ (b) $\frac{1}{13}$ (c) $\frac{4}{13}$ (d) $\frac{1}{4}$
2. If A and B are mutually exclusive events, then
   (a) $P(A \cup B) = P(A).P(B)$ (b) $P(A \cup B) = P(A) + P(B)$
   (c) $P(A \cup B) = 0$

2.4 PROBABILITY RULES

For two events A and B,

(i) $A \subset B \Rightarrow for\ every\ \Omega \in A, \Omega \in B.$

(ii) $B \supset A \Rightarrow A \subset B.$

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(iii) $A = B$ if and only if A *and* B have same elements, i.e., if $A \subset B$ and $B \subset A$.

(iv) A *and* B disjoint (mutually exclusive) $\Rightarrow A \cap B = \phi$ (*null set*).

(v) $A \cup B$ can be denoted by $A + B$ if A and B are disjoint.

(vi) $A \triangle B$ denotes those Ω belonging to exactly one of A and B, i.e.,

$$A \triangle B = \bar{A}B \cup A\bar{B} = \bar{A}B + A\bar{B} \ (disjoint\ events).$$

(vii) At least one of the events A or B occurs = $\Omega \in A \cup B$.

(viii) Both the events A and B occurs = $\Omega \in A \cap B$.

(ix) Neither A nor B occurs = $\Omega \in \bar{A} \cap \bar{B}$.

(x) Event A occurs and B does not occur = $\Omega \in A \cap \bar{B}$.

(xi) Exactly one of the events A or B occurs = $\Omega \in A \triangle B$.

(xii) Not more than one of the events A or B occurs = $\Omega \in (A \cap \bar{B}) \cup (\bar{A} \cap B) \cup (\bar{A} \cap \bar{B})$.

(xiii) If event A occurs, so does B = $A \subset B$

(xiv) If $B \subset A$, then

(i) $P(A \cap \bar{B}) = P(A) - P(B)$, (ii) $P(B) \leq P(A)$

2.5 JOINT AND CONDITIONAL PROBABILITY

The possibility of two or more events occurs at once is known as joint probability. It is the probability of intersection of two or more events. The probability of occurrence of any event may be influenced by the information about the occurrence of an event which already occurred, then this probability is termed as conditional probability.

Let's start with an example to better understand the idea of joint probability.

Illustration 1: Consider a hand of five cards in a game of poker. If the cards are selected at random, there are $\binom{52}{5}$ possible hands of five cards each. Let A = {at least three cards are hearts}, B = {all five cards are hearts}. Then, the joint probability of events A and B is

$$P(A \cap B) = P\{all\ five\ cards\ are\ hearts\}$$

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$$= \frac{\binom{18}{5}}{\binom{52}{5}}$$

***Definition*:** Let A and B are two events defined on the sample space Ω. Then the joint probability of event A and B is denoted by $P(A \cap B)$ is

$$P(A \cap B) = P\{both\ the\ events\ occurs\ at\ once\}.$$

Now, we are going to discuss the concept of conditional probability. Let's begin with an example:

Example 2: Consider a bag containing 100 balls out of which 60 are red balls. Two balls are selected randomly (i) with replacement; (ii) without replacement. Let

A = {first ball is red}

B = {second ball is red}

In with replacement case P(A) = P(B) = 60/100 = 3/5.

In without replacement case P(A) = 3/5. If A has already occurred, probability of occurrence of B is 59/99. If A has not occurred, probability of occurrence of event B is 60/99. Hence the information about the occurrence of event A influence the probability of occurrence of event B.

***Definition*:** Let A and B are two events defined on the sample space Ω. Then conditional probability of B, given A (means A already occur) and is denoted by $P(A|B)$, is defined as

$$P(A|B) = \frac{P(A \cap B)}{P(A)}, provided\ P(A) \neq 0.$$

Further, let us suppose that in the sample space of a random experiment there are N exhaustive, mutually exclusive and equally likely outcomes. Out of which N_A outcomes are favourable to event A and N_B outcomes are favourable to event B and $N_{A \cap B}$ outcomes are favourable to $A \cap B$. Then

$$P(A|B) = \frac{N_{A \cap B}}{N_A} = \frac{N_{A \cap B}/N}{N_A/N} = \frac{P(A \cap B)}{P(A)}.$$

Remark:

i. For the conditional probability $P(A|B)$, A behaves like a new sample space.

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ii. The unconditional probability of an event A, P(A) may be viewed as a conditional probability of event A given Ω.

2.5.1 Theorem of Multiplication

***Statement*:** From the definition of conditional probability, for two event A and B,

$$P(A \cap B) = P(A).P(B|A), P(A) > 0$$

$$= P(B).P(A|B), P(B) > 0$$

where, $P(B|A)$ represents conditional probability of happening of B when the event A has already occurred and $P(B|A)$ represents conditional probability of occurrence of B when the event A has already happened.

***Proof*:** In the usual notation we have

$$P(A) = \frac{N_A}{N};\ P(B) = \frac{N_B}{N}\ and\ P(A \cap B) = \frac{N_{A \cap B}}{N} \qquad (*)$$

For the event A|B, the sample space is B and out of N_B sample points, $N_{A \cap B}$ pertain to be happen of the event A. Hence

$$P(A|B) = \frac{N_{A \cap B}}{N_B}$$

Rewriting (*), we get: $P(A \cap B) = \frac{N_B}{N} \times \frac{N_{A \cap B}}{N_B} = P(B).P(A|B)$ (**)

Similarly, we get from (*) $P(A \cap B) = \frac{N_A}{N} \times \frac{N_{A \cap B}}{N_A} = P(A).P(B|A)$ (***)

From (**) and (***), we get the result.

2.5.2 Independent Events and Baye's Theorem

***Independent Events*:**

Let us consider the concept of conditional probability with an example. Suppose from a well shuffled pack of 52 card, a card is draw at random, then the probability of drawing a club is $13/52$. If the draw was done without replacement, then for the next draw, the probability of drawing the second card 'a card of club' is $12/51$ and it is the conditional probability. Now, if the first draw was done with replacement, then the conditional probability would have been $13/52$. This implies that if it is done with replacement, then the probability of second draw

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and subsequent draws was remains unaltered. So, the happening or non-happening of any draw does not affected by the preceding draws. This example helps you in better understanding of the concept of independent event.

Let us now define independent event:

***Definition*:** Two events are said to be independent whenever

$$P(A \cap B) = P(A).P(B).$$

If two events are independent then

$$P(B|A) = P(B) \text{ and } P(A|B) = P(A), \text{provided } P(A) > 0, P(B) > 0.$$

Law of Total Probability

***Statement*:** Let Ω be the sample space and $E_1, E_2, \dots, E_n$ are n exhaustive and mutually exclusive events with $P(E_i) \neq 0; i = 1,2, \dots, n$. Let A be any event which is a subset of $\bigcup E_i$ (means at least one of the events $E_1, E_2, \dots, E_n$) with $P(A) > 0$, then

$$P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + \cdots + P(E_n)P(A|E_n)$$

$$= \sum_{i=1}^{n} P(E_i)P(A|E_i)$$

***Proof*:** As a is a subset of $E_1 \cup E_2 \cup \dots \cup E_n$. Therefore,

$$A = A \cap (E_1 \cup E_2 \cup \dots \cup E_n) \qquad [\because \text{if } A \text{ is subset of } B, \text{then } A = A \cap B]$$

$\Rightarrow A = (A \cap E_1) \cup (A \cap E_2) \cup \dots \cup (A \cap E_n)$ [Distributive property of set theory]

$$=(E_1 \cap A) \cup (E_2 \cap A) \cup \dots \cup (E_n \cap A)$$

$$\Rightarrow P(A) = P[(E_1 \cap A) \cup (E_2 \cap A) \cup \dots \cup (E_n \cap A)]$$

$$= P(E_1 \cap A) + P(E_2 \cap A) + \cdots + P(E_n \cap A)$$

$[\because E_1, E_2, \dots, E_n \text{ and hence } (E_1 \cap A), (E_2 \cap A), \dots, (E_n \cap A) \text{ are mutually exclusive}]$

$$= P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + \cdots + P(E_n)P(A|E_n)$$

[Using multiplicative theorem for dependent events]

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$= \sum_{i=1}^{n} P(E_i)P(A|E_i)$.

***Bayes' Theorem*:**

- Bayes theorem was given by Thomas Bayes (1701-1761).
- Knowing the outcome of a particular situation, Bayes theorem enables us to find the probability that the outcome occurred as a result of a particular previous event.

The British mathematician Thomas Bayes created a method to calculate conditional probability in the 18th century to give people a way to re-evaluate their existing expectations. The Bayes Theorem, Bayes' Rule, or Bayes' Law are common names for this mathematical theorem. It serves as the basis for the entire statistical field known as Bayesian Statistics.

For example, In a certain assembly plant, three machines, B1, B2, and B3, make 30%, 45%, and 25%, respectively, of the products. It is known from past experience that 2%, 3%, and 2% of the products made by each machine, respectively, are defective. Now, suppose that a finished product is randomly selected and found to be defective, what is the probability that it was made by machine B3?

- This theorem is also known as 'Inverse probability theorem', because here moving from first stage to second stage, we again find the probabilities (revised) of the events of first stage i.e. we move inversely.

***Statement*:**

Let Ω be the sample space and $E_1, E_2, \dots, E_n$ are n exhaustive and mutually exclusive events with $P(E_i) \neq 0; i = 1,2, \dots, n$. Let A be any event which is a subset of $\bigcup E_i$ (means at least one of the events $E_1, E_2, \dots, E_n$) with $P(A) > 0$, then

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$$P(E_i|A) = \frac{P(E_i)\,P(A|E_i)}{P(A)}; i = 1,2,\dots,n$$

***Proof*:** From the theorem of total probability, we have

$P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + \cdots + P(E_n)P(A|E_n)$ [you have to prove it]

Also we have

$P(A \cap E_i) = P(A)P(E_i|A)$

$\Rightarrow P(E_i|A) = \frac{P(A \cap E_i)}{P(A)} = \frac{P(E_i)\,P(A|E_i)}{\sum_{i=1}^{n} P(E_i)P(A|E_i)}$.

Remarks:

$P(E_i)$*'s are known as "a priori (or prior) probabilities". They exist before we gain any information about A (the result of an experiment).*

$P(A|E_i)$'s are known as "likelihoods". They indicate how likely event A to occur under the information that $E_i$occurs.

$P(E_i|A)$'s are known as 'a posteriori (or posterior) probabilities". They are determined after the results of the experiment are known.

Illustration 2.10. A fair die is thrown, what is the probability of getting either a number multiple of 3 or a prime number.

Solution. A fair die is thrown then sample space is

$\Omega = \{1, 2, 3, 4, 5, 6\}$.

Let A be the event of getting a number multiple of 3 and B be the event of getting a prime number.

∴ A = {3, 6} and B = {2, 3, 5}, A∩B = {3} [a non empty set]

Hence required probability is

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{2}{6} + \frac{3}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}.$$

Illustration 2.11 A box contains three red cards and three green cards numbered as follows:

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Red			***Green***		
1	1	2	1	2	2

One card is picked out of the box at random. If *A* is the event 'the card is green' and *B* is the event 'the card is marked 2', are *A* and *B* independent?

Solution. $P(A) = \frac{3}{6} = \frac{1}{2}$ since 3 cards are green.

$P(B) = \frac{3}{6} = \frac{1}{2}$ since 3 cards are marked 2.

$P(A \cap B) = P(card\ is\ green\ and\ marked\ 2) = \frac{2}{6} = \frac{1}{3}$ since 2 cards satisfies this condition.

Now $\frac{1}{3} \neq \frac{1}{2}.\frac{1}{2}$, so A and B are not independent.

Illustration 2.12 Three cards are drawn at random one by one without replacement from a well shuffled pack of 52 playing cards. What is the probability that first card is ace, second is queen and the third is again a j a c k .

Solution. Let A_1 be the event of drawing ace in the first draw, A_2 be the event of drawing queen in the second draw and A_3 be the event of drawing jack in the third draw.

Therefore, required probability is

$$P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2|A_1)P(A_3|A_1 \cap A_2)$$

$$= \frac{4}{52}\frac{4}{51}\frac{4}{50} = \frac{1}{13}\frac{4}{51}\frac{2}{25} = \frac{8}{33150}.$$

Illustration 2.13. Let A and B are independent events,

(i) If P(A) = 0.4 and P(A∪B) = 0.16 then find P(B).

(ii) If P(A) = 0.5 and P(B) = 0.4, then find P(A|B) and P(B|A).

(iii)If P(A) = 0.4 and P(B) = 0.2, then find P($\bar{A} \cap B$), $P(A \cap \bar{B})$, $P(\bar{A} \cap \bar{B})$.

Solution. (i) Given that, P(A) = 0.4 and P(A∪B) = 0.16,

We know that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= P(A) + P(B) - P(A).P(B)$$

$$0.16 = 0.4 + P(B) - 0.4.P(B)$$

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$$0.16 = 0.4 + (1 - 0.4.)P(B)$$

$$0.12 = 0.6.P(B)$$

$$\Rightarrow P(B) = \frac{1}{2} = 0.5$$

(ii) Given that, P(A) = 0.5 and P(B) = 0.4

Since A and B are independent, then $P(A \cap B) = P(A).P(B) = 0.5 \times 0.4 = 0.20$

$$P(A|B) = \frac{P(A \cap B)}{P(A)} = \frac{0.20}{0.5} = \frac{2}{5} = 0.4$$

$$P(B|A) = \frac{P(A \cap B)}{P(B)} = \frac{0.20}{0.4} = \frac{2}{4} = 0.5$$

(iii) Given that, P(A) = 0.4 and P(B) = 0.2

We know that if two events A and B are independent then $\bar{A}$ *and* B, A *and* $\bar{B}$ and $\bar{A}$ *and* $\bar{B}$ are also independent.

$$P(\bar{A} \cap B) = P(\bar{A})P(B) = (1 - P(A))P(B) = 0.6 \times 0.2 = 0.12$$

$$P(A \cap \bar{B}) = P(A)P(\bar{B}) = P(A)(1 - P(B)) = 0.4 \times 0.8 = 0.32$$

$$P(\bar{A} \cap \bar{B}) = P(\bar{A})P(\bar{B}) = (1 - P(A)).(1 - P(B)) = 0.6 \times 0.8 = 0.48.$$

Illustration 2.14. A bag contains 4 white r and 5 black w balls. Another bag contains 2 white and 3 black balls. A ball is drawn from the first bag and is transferred to the second bag. A ball is then drawn from the second bag and is found to be white, what is the probability that white ball was transferred from first to second bag?

Solution. Let E_1 be the event that a white ball is drawn from the first bag and E_2 bethe event that the drawn ball from the first bag is black. Let A be the event of drawing a white ball from the second bag after transferring the ball drawn from first bag into it.

Therefore, $P(E_1) = \frac{4}{9}, P(E_2) = \frac{5}{9}$

$$P(A|E_1) = \frac{3}{6}, P(A|E_2) = \frac{2}{6}$$

∴ by law of total probability,

$$P(A) = P(E_1).P(A|E_1) + P(E_2).P(A|E_2)$$

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$$= \frac{4}{9} \times \frac{3}{6} + \frac{5}{9} \times \frac{2}{6} = \frac{11}{27}$$

Thus, By Bayes' theorem

$$P(E_1|A) = \frac{P(E_1).P(A|E_1)}{P(A)} = \frac{\frac{4}{9} \times \frac{3}{6}}{\frac{11}{27}} = \frac{6}{11}.$$

Illustration 2.15. In a bolt manufacturing company, three machines manufacture 20%, 30% and 50% of its total output and of these 6% and 3% and 2% are found defective respectively. A bolt is drawn at random and is found defective. Find the probability that the defective bolt is manufactured by machine 1.

Solution. Let A_1, A_2 *and* A_3 be the event that the defective bolts are manufactured by machine 1, 2 and 3 respectively. Therefore,

$$P(A_1) = \frac{20}{100} = \frac{1}{5}, P(A_2) = \frac{30}{100} = \frac{3}{10} \text{ and } P(A_3) = \frac{50}{100} = \frac{1}{2}.$$

Let A denotes the event that the bolt drawn at random is defective. Then, using conditional probability

$$P(A|A_1) = \frac{6}{100} = 0.06, P(A|A_2) = \frac{3}{100} = 0.03 \text{ and } P(A|A_3) = \frac{2}{100} = 0.02$$

∴ by law of total probability,

$$P(A) = P(A_1).P(A|A_1) + P(A_2).P(A|A_2) + P(A_3).P(A|A_3)$$

$$= \frac{1}{5} \times 0.06 + \frac{3}{10} \times 0.03 + \frac{1}{2} \times 0.02 = 0.031$$

By Bayes' theorem,

The probability that the defective bolt is from machine 1is,

$$P(A_1|A) = \frac{P(A_1)P(A|A_1)}{P(A)} = \frac{\frac{1}{5} \times 0.06}{0.031} = \frac{0.012}{0.031} = \frac{12}{31}$$

Illustration 2.16. The prior probabilities for events E_1 and E_2 are $P(E_1) = 0.60$ and $P(E_2) = 0.40$. It is also given that $P(E_1 \cap E_2) = 0, P(E|E_1) = 0.20$ *and* $P(E|E_2) = 0.05$. Find the following:

(i) Are E_1 and E_2 are mutually exclusive?

(ii) Compute $P(E), P(E_1 \cap E)$ *and* $P(E_2 \cap E)$.

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(iii)Use Bayes' theorem to compute $P(E_1|E)$ and $P(E_2|E)$.

Solution. (i) it is given that $P(E_1 \cap E_2) = 0$, the events E_1 and E_2 are mutually exclusive.

(ii) $P(E_1 \cap E) = P(E_1).P(E|E_1) = 0.60 \times 0.20 = 0.12$

$P(E_2 \cap E) = P(E_2).P(E|E_2) = 0.40 \times 0.05 = 0.02$

The event E can be defined in the following mutually disjoint ways:

i.e., $E = (E \cap E_1) \cup (E \cap E_2)$

$\Rightarrow\ P(E) = P(E \cap E_1) + P\,(E \cap E_2) = 0.12 + 0.02 = 0.14$

(iii) using Bayes' theorem

$$P(E_1|E) = \frac{P(E \cap E_1)}{P(E)} = \frac{0.12}{0.14} = \frac{6}{7}$$

$$P(E_2|E) = \frac{P(E \cap E_2)}{P(E)} = \frac{0.02}{0.14} = \frac{1}{7}.$$

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IN-TEXT QUESTIONS

3. For any event A in Ω, then A and Ω are independent. (T/F)
4. If A and B are independent events, then $\bar{A}$ and $\bar{B}$ are also independent. (T/F)
5. There are two urns with parts of same type. The first contains 'a' goods parts and 'b' defective parts and the second contains 'c' goods parts and 'd' defective parts. An urn is selected at random and one part is drawn from it and is found to be good. Probability that urn I is selected is

   (a) $\frac{p_1}{p_1+p_2}$ (b) $\frac{p_2}{p_1+p_2}$ (a) $\frac{p_1}{p_2}$, where $p_1 = \frac{a}{a+b}$ and $p_2 = \frac{c}{c+d}$

2.6 SUMMARY

- Those experiments in which we cannot predict the outcome, even we have the knowledge of all possible outcomes is called Random experiment.

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- The set of all possible outcome of a random experiment is known as sample space and its subset is event.
- Different definitions of probability of occurrence of event are given.
- In classical definition of probability, the outcomes in the sample space must be exhaustive, equally likely, and mutually exclusive and it's defined as the ratio of total number of favorable outcomes to the total number of outcomes.
- In axiomatic definition, it is defined as areal number lying between 0 and 1 provided all the three axioms are satisfied *i.e.*, (i) axiom of non-negativity, (ii) axiom of certainty, (iii) axiom of additivity.
- The conditional probability is defined as when occurrence of one event gets affected by certain condition and the numeric value of probability of occurrence of an event varies as per this condition.
- Baye's theorem revises the initial probabilities of occurrence of events.

2.7 GLOSSARY

Axiom: A statement accepted as true to serve as a basis for deductive reasoning. Today the words *axiom* and *postulate* are synonyms.

Bayesian: of or relating to that part of the theory of probability concerned with estimating probabilities using prior knowledge.

Bayes' Theorem: the first theorem on conditional probabilities. If one knows the probability of event A given that event B has already occurred and certain auxiliary information. Bayes' theorem allows one to compute the probability of event B given that event A is known to have occurred.

Inverse Probability: the concept of probability that arose out of Baye's theorem.

2.8 ANSWERS TO IN-TEXT QUESTIONS

1. d 2. b	4. True 5. a

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3. True	

2.9 SELF-ASSESSMENT QUESTIONS

1. If a die and a coin are tossed simultaneously, write the event of getting

   (i) tail and an odd number

   (ii) head and a multiple of 2

   (iii)tail and prime number

   (iv)head and a multiple of 3

2. What is the probability of drawing a club or diamond from a pack of 52 cards when one card is drawn at random?

3. Out of 52 well shuffled playing cards, two cards are drawn atrandom. Find the probability of getting.

   (i) One red and one black

   (ii) Both cards of the same suit

   (iii) One jack and other king

   (iv) One red and the other of club

4. A single letter selected at random from the word 'STATISTICS'. What is the probability that it is a vowel?

5. A Card is drawn from a well shuffled pack of 52 playing cards, find the probability that the drawn card is a jack or a black colour card.

6. If the probabilities are, respectively, 0.23,0.24 and 0.38 that a car stopped at a roadblock will have faulty brakes, badly worn tires, faulty brakes and/or badly worn tires, what is the probability that such a car will have both faulty brakes and badly worn tires.

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7. A biology professor has two graduate assistants helping him with his research. The probability that the older of the two assistants will be absent on any given day is 0.08, the probability that the younger of the two will be absent on a given day is 0.05 and the probability that both of them will be absent on a given day is 0.02. Find the probabilities that

   i) Either or both of the assistants will be absent on a given day;

   ii) At least one of the assistants will not be absent on a given day;

   iii) Only one of the assistants will be absent on a given day.

8. A box of fuses contains 20 fuses, of which 5 are defective. If three fuses are selected randomly and removed from the box randomly (without replacement), what are the probabilities that

   i) All the three are defective?

   ii) At most two are defective?

   iii) At least two are defective?

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LESSON-3

PROBABILITY DISTRIBUTION

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STRUCTURE

3.1 Learning Objectives

3.2 Introduction

3.3 Random Variables

3.3.1 Discrete Random Variables

3.3.2 Continuous Random Variable

3.4 Discrete probability distribution

3.4.1 Binomial Distribution

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3.1 LEARNING OBJECTIVES

This lesson extends the concepts of probability theory further to demonstrate random variables and its distribution. After reading this lesson;

- The learner will be able to identify random variables and can construct the probability distribution for them.
- Understand the concept of mean and standard deviation has been discussed to find the solution of the real-life problems.
- Understand the characteristics and procedure of computing probabilities using binomial and Poisson distribution
- Comprehend the difference between discrete and continuous probability distribution.
- Understand normal distribution, properties of a normal curve and computation of probabilities using z-values.
- To understand other distribution such as exponential, lognormal, Weibull, hypergeometric distribution.

3.2 INTRODUCTION

The statistical data are summarised and used for presentation by means of frequency distribution. A frequency distribution table is prepared by listing possible values of the variable individually or in small groups called class intervals and then the observed frequency of each one. It is called observed frequency distribution. A probability distribution deals with

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probability, the expectation of an event based upon sample. Such distribution is useful in situations where actual observations or experiments are not possible. The probability distribution users (individual/businesses) provide different models which helps managers in taking decisions based upon limited data and theoretical consideration during the period of uncertainty.

Example of probability distributions:

1. Consider tossing a six-face fair die. Since the die is fair the outcome probability of all six face will be equal.

Outcome (x):	1	2	3	4	5	6	Total
Probability (p):	1/6	1/6	1/6	1/6	1/6	1/6	1

   If the same fair die is tossed 60 times, then the probability of appearing of each face will be $60 \times (\frac{1}{6})$ = 10 times.

2. A coin has two sides; head and tail. If a fair coin is tossed then the probability of getting head and tail is equal. Thus, the probability of getting head = 1/2 and tails =1/2. Supposed the coin is tossed 10 times then the probability of getting head and tail will be 5 times each.

The above two example illustrates that to get the probability distribution we have to find all the possible outcomes (x) and then calculate the respective probability (p). The desired expected frequencies can be calculated by multiplying each of the probability values by the number of times the experiment is performed (N).

3.3 RANDOM VARIABLE

Let us perform an experiment of tossing two coins. The sample space for the experiment will be

S= {HH, HT, TH, TT}

The number of heads (tails) in the experiment will be 0,1,2. We associate a variable *X* which denotes the number of heads (tails) on the coin. This implies that *X* may take values 0,1,2.

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Thus, X is a **random variable** which is a real number associated with the outcome of a random experiment. Similarly, we may say Y is a random variable denotes the number of tails in the above experiment and so on.

Now if we are interested in the probability of getting at least one head, then we should find

P{$X \leq 1$}= P{ TT, HT, TH}=3/4

Think about P{X=1}, P{$X \leq 2$}.

The random variable will be denoted by capital letters and the real numbers associated with random variable is denoted by lower case letters. Thus if we denote random variable by X, Y, Z,…etc then the values of r.v can be denoted as x,y,z,…etc.

ACTIVITY

Consider another experiment of rolling two dice and define a r.v. X which denotes number of even numbers on the dice. You may find the outcomes and construct the probability as well.

A random variable is of two types: discrete random variable and continuous random variable.

3.3.1 Discrete random variable

A random variable is called discrete when it takes at most a countable number of values. This implies that for every outcome of the experiment there corresponds a real number which can be finitely counted.

Probability Mass function (pmf) of a discrete random variable.

Let X be a discrete random variable taking at most a countably infinite number of values x_1, x_2, x_3,…For each x_i we associate a number p_i which is the probability of x_i. Thus,

$$p_i = p(x_i) = P(X = x_i)$$

If the number $p(x_i)$, i =1,2,3,…satisfy the following conditions,

(i) $p(xi) \geq 0 \quad \forall i$, (ii) $\sum_{i=1}^{\infty} p(xi) = 1$

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then we say that p_i is called the probability mass function of the random variable X. The set

$\{ x_i, p(x_i)\}$ is known as the probability distribution of the random variable X.

Let us revisit our example of tossing two coins and getting number of heads. The probability distribution of X will be given as [{0,1/4},{1,2/4},{2,1/4}]. You will agree that this a p.m.f as all probabilities are greater than zero and the sum of all probabilities is equal to 1.

Distribution Function for random variable X.

For a discrete random variable X , the distribution function denoted as $F(X)$ is defined as $F(X) = P(X \leq x) = \sum_{(i:x_i \leq x)} p_i$

For the above example of tossing of two coins the distribution function $F(X)$ can easily be defined.

Illustration 3.1: Consider whether the next customer buying a car at a certain show room buys a SUV or Non-SUV model. The past data shows 20% of customer purchases SUVs

Solution:

Let x =1 (if the customer purchases a SUV model)

x = 0 (if the customer purchases a Non-SUV model)

p(0) = P(x=0) = P(next customer purchases a Non-SUV model) = 0.8

p(1) = P(x=1) = P(next customer purchases a SUV model) = 0.2

p(x) = P(x=1) = 0 for x ≠ 0 or 1

3.3.2 Continuous Random Variable

A random variable X is said to be continuous if it can take all possible values between certain limits. In other words , we may say that for a continuous random variable , different values cannot be put in 1-1 correspondence with a set of positive integers.

Probability Density function (p.d.f) for a continuous random variable

Consider a small interval $(x, x+dx)$. Let $f(x)$ be a continuous function of x. Then the probability that X lies in the interval $(x, x+dx)$ is given as

$$P(x \leq X \leq x + dx) = f(x)dx$$

$$f(x) = \lim_{dx \to 0} \frac{P(x \leq X \leq x + dx)}{dx}$$

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The function *f(x)* defined as above is known as probability density x function (p.d.f) of random variable *X* .

The probability for a variate to lie in the finite interval [α,β] is:

$$P(\alpha \leq X \leq \beta) = \int_{\alpha}^{\beta} f(x)\, dx$$

The p.d.f. *f(x)* of a random variable *X* has the following properties:

(i) $f(x) \geq 0, -\infty < x < \infty$

(ii) $\int_{-\infty}^{\infty} f(x)dx = 1$

In Case of continuous random variable, theoretically probability at a fixed point is always zero.

3.4 DISCRETE PROBABILITY DISTRIBUTION

In the above section, we have discussed the discrete random variables and how we can associate a probability distribution with it. In this section, we will discuss various discrete distributions in which the random variables are defined according to a definite probability law which can be expressed mathematically.

3.4.1 Binomial Distribution

Let us consider an experiment having only two outcomes viz. success or failure. We define a random variable X associated with the outcomes of the experiment , which takes two values 0 and 1 with probability *q* and *p*. i.e., *P(X=0)= q* and *P(X=1) =p* .

Now let us assume that this random experiment will be repeated *n* times , *n* being finite, in which the probability *'p'* of success in any trial is constant for each trial . Also,

q=1-p is the probability of failure in any trial.

The probability of *x* successes and consequently *(n-x)* failures in *n* independent trials can be written as $p^x q^{n-x}$. There are $\binom{n}{x}$ ways to get *x* successes in *n* trials. Hence the probability of *x* successes in *n* trials in any order is given as

$$\binom{n}{x} p^x q^{n-x}$$

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The probability distribution of the number of successes, so obtained is called *Binomial probability distribution* because the probabilities of 0,1,2,…*n* successes are the successive terms of binomial expansion $(q+p)^n$.

Thus, a random variable *X* is said to follow binomial distribution if its probability mass function is given by

$$P(X=x)=p(x)=\begin{cases}\binom{n}{x}p^x q^{n-x} & ;x=0,1,2,\ldots n;\ q=1-p\\ 0, & otherwise\end{cases}$$

The two independent constants *n* and *p* in the distribution are called parameters of the distribution. For a binomial variate, we use the notation $X \sim B(n,p)$.

The entire probability distribution of *x* = 0, 1, 2,....*n* can also be written as follows

Binomial Probability Distribution

Number of success x	Probability $P(x)$
0	${}^nC_0 p^0 q^n$
1	${}^nC_1 p^1 q^{n-1}$
2	${}^nC_2 p^2 q^{n-2}$
:	:
x	${}^nC_x p^x q^{n-x}$
:	:
n	${}^nC_n p^n q^{n-n}$

We should note that the variable x (number of successes) is discrete. It can take integer values

0, 1, 2, ..., *n*. The probabilities specified in the above table are in fact successes terms of the Binomial

Expansion of $(p + q)_n$, which is

$$(q+p)^n = {}^nC_0 q^n p^0 + {}^nC_1 q^{n-1} p^1 + {}^nC_2 q^{n-2} p^2 + {}^nC_3 q^{n-3} p^3 + \ldots {}^nC_n q^{n-n} p^n$$

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The mean of the binomial distribution is np and the variance is npq.

Illustration 3.2: A Mr. X has tossed the coin eight times. What is probability of obtaining 0, 1, 2, 3, 4, 5, 6, 7 and all heads?

Solution

Let assume the occurrence of head as success by *p*.

So that $p = ½$

 $q = 1 – p = ½$ and $n = 8$ (given)

The various probabilities are calculated by expanding the binomial theorem.

$(q + p)^8 = {}^8C_0\, q^8\, p^0 + {}^8C_1 q^7 p^1 + {}^7C2_2 q^6 p^2 + {}^8C_3 q^5 p^3 + {}^8C_4 q^4 p^4 + {}^8C_5 q^3 p^5 + {}^8C_6 q^2 p^6 +$

$\quad {}^8C_7\, q^1 p^7 + {}^8C_n\, q^0 p^8$

1. The probability of obtaining zero (0) head:

   $P(X=0) = {}^8C_0\, q^8 p^0 = \frac{8!}{8! \times 0!} \times \left(\frac{1}{2}\right)^8 \times \left(\frac{1}{2}\right)^0 = 1/256$

2. The probability of obtaining one (1) head:

   $P(X=1) = {}^8C_1\, q^7 p^1 = \frac{8!}{7! \times 1!} \times \left(\frac{1}{2}\right)^7 \times \left(\frac{1}{2}\right)^1 = 8/256$

3. The probability of obtaining two (2) head:

   $P(X=2) = {}^8C_2\, q^6 p^2 = \frac{8!}{6! \times 2!} \times \left(\frac{1}{2}\right)^6 \times \left(\frac{1}{2}\right)^2 = 28/256$

4. The probability of obtaining three (3) heads:

   $P(X=3) = {}^8C_3\, q^5 p^3 = \frac{8!}{5! \times 3!} \times \left(\frac{1}{2}\right)^5 \times \left(\frac{1}{2}\right)^3 = 56/256$

5. The probability of obtaining four (4) heads:

   $P(X=4) = {}^8C_4\, q^4 p^4 = \frac{8!}{4! \times 4!} \times \left(\frac{1}{2}\right)^4 \times \left(\frac{1}{2}\right)^4 = 70/256$

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6. The probability of obtaining five (5) heads:

$$P(X=5) = {}^8C_5\, q^3p^5 = \frac{8!}{3!\times 5!} \times \left(\frac{1}{2}\right)^3 \times \left(\frac{1}{2}\right)^5 = 8/256$$

7. The probability of obtaining Six (6) heads:

$$P(X=6) = {}^8C_6\, q^2p^6 = \frac{8!}{2!\times 6!} \times \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{2}\right)^6 = 28/256$$

8. The probability of obtaining seven (7) heads:

$$P(X=7) = {}^8C_7\, q^1p^7 = \frac{8!}{1!\times 7!} \times \left(\frac{1}{2}\right)^1 \times \left(\frac{1}{2}\right)^7 = 8/256$$

9. The probability of obtaining eight (8) heads:

$$P(X=8) = {}^8C_8\, q^0p^8 = \frac{8!}{0!\times 8!} \times \left(\frac{1}{2}\right)^0 \times \left(\frac{1}{2}\right)^8 = 1/256$$

Similarly, we can calculate the probability of

1. *5 or more heads* $= {}^8C_5q^3p^5 + {}^8C_6q^2p^6 + {}^8C_7\, q^1p^7 + {}^8C_n\, q^0p^8$

   $= 56/256 + 28/256 + 8/256 + 1/256 = 93/256$

2. *7 or more heads* $= {}^8C_7\, q^1p^7 + {}^8C_n\, q^0p^8$

   $= 8/256 + 1/256 = 9/256$

Illustration 3.3: State bank of India is considering opening of teller window for only female customer. Study in the past has shown that 40% of customer were female. Assuming that conditions for binominal distribution are satisfied determine the probability distribution that describes the next ten (10) customers. What is the expected number of female clients? What is the standard deviation of this distribution?

Solution

n = 10

p = 0.4

q = 1- p = 1- 0.4 = 0.6

The probability distribution of next 8 customers is given in the table below:

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Probability distribution of Female Customer

Number of Female (x)	Probability	Probability (p)
0	${}^{10}C_0\, q^{10}p^0 =$	0.006
1	${}^{10}C_1\, q^{9}p^1 =$	0.0403
2	${}^{10}C_2\, q^{8}p^2 =$	0.1209
3	${}^{10}C_3\, q^{7}p^3 =$	0.215
4	${}^{10}C_4\, q^{6}p^4 =$	0.2508
5	${}^{10}C_5\, q^{5}p^5 =$	0.2007
6	${}^{10}C_6\, q^{4}p^6 =$	0.1115
7	${}^{10}C_7\, q^{3}p^7 =$	0.0425
8	${}^{10}C_8\, q^{2}p^8 =$	0.0106
9	${}^{10}C_9\, q^{1}p^9 =$	0.0016
10	${}^{10}C_{10}\, q^{0}p^{10} =$	0.0001
Total		**1.0000**

Expected number of female clients : np = 10 $\times$ 0.4 = 4

Standard deviation = $\sqrt{npq} = \sqrt{(10 \times 0.4 \times 0.6)}$ = 1.549

3.4.2 Poisson Distribution

Poisson distribution is a limiting case of the binomial distribution under the following conditions:

(i) *n*, the number of trials are indefinitely large i.e., $n \to \infty$

(ii) *p*, the constant probability of success for each trial is indefinitely small, i.e. $p \to 0$.

(iii) $np=\lambda$, (say), is finite. Thus $p=\lambda/n$, $q= 1- \lambda/n$ where λ is a positive real number.

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A random variable X is said to follow a Poisson Distribution, if it assumes only non-negative values and its probability mass function is given by

$$p(x,\lambda) = P(X = x) = \frac{e^{-\lambda}\lambda^{x}}{x!}; x = 0,1,2, \ldots; \lambda > 0$$

$$= 0, \textit{ otherwise}$$

Where λ is known parameter of the distribution.

The mean and variance of Poisson Distribution are equal and is equal to λ.

Illustration 3.4: If one shop in 1000 has a fire in a city every year. What is the probability that out of 2000 shops exactly 5 shops will be on fire during the year.

Solution:

λ = np where n = 2000, p = 1/1000

$\lambda = 2000 \times \frac{1}{1000} = 2$

$$P(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$$

$$P(x) = \frac{e^{-2}2^{5}}{5!} \text{ (e = 2.7183)}$$

$$= \frac{2.7183^{-2} \times (2\times 2\times 2\times 2\times 2)}{(5\times 4\times 3\times 2\times 1)}$$

$$= 2.7183^{-2} \times \frac{4}{15}$$

$$= \text{Reciprocal (AL(2log. 2.7183))} \frac{4}{15}$$

$$= \text{Reciprocal (7.389)} \times \frac{4}{15}$$

$$= 0.1352 \times \frac{4}{15} = \mathbf{0.036}$$

Illustration 3.5: If 3% of the smartphone manufactured by ABC ltd are defective, calculate the probability that a sample of 100 smartphones-will contain zero defective and one defective smartphone using Poisson distribution.

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Solution : Given number of defective smartphones are 3% (3/100).

λ = np where n = 100, p = 3/100

$$\lambda = 100 \times \frac{3}{100} = 3$$

$$P(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$$

$$P(x=0) = \frac{e^{-3}3^{0}}{0!} = 2.7183^{-3} = 0.05 \textbf{ Ans}$$

$$P(x=1) = \frac{e^{-3}3^{1}}{1!} = 2.7183^{-3} \times 3 = 0.15 \textbf{ Ans}$$

3.4.3 Negative Binomial Distribution

Consider an experiment of having n successive Bernoulli trials. Let us assume that the trials are independent and probability of success '*p*' in a trial remains constant from trial to trial. Let *f(x;r,p)* denote the probability that there are *x* failures preceding the *rth* success in *x+r* trials. Since the last trial must be a success with probability *p* so in the remaining *(x+r-1)* trials we must have *(r-1)* successes whose probability is given by

$$\binom{x+r-1}{r-1} p^{r-1} q^{x}$$

Therefore,

$$f(x;r,p) = \binom{x+r-1}{r-1} p^{r-1} q^{x}.p = \binom{x+r-1}{r-1} p^{r} q^{x}$$

Thus, a random variable *X* is said to follow a negative binomial distribution if its probability mass function is given by

$$p(x) = P(X=x) = \binom{x+r-1}{r-1} p^{r-1} q^{x}.p = \binom{x+r-1}{r-1} p^{r} q^{x}; x = 0,1,2,\ldots$$

$$= 0\ , otherwise$$

Illustration 3.6: A survey is done by a TV channel at a polling booth by asking them if they have voted Republican. The data shows the probability (p) that a person voted Republican is

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30% What is the probability that 20 people must be asked before you can find 10 people who voted Republican?

Solution : Given p = 30% or (0.3), r = 10

The number of failures X is 20 -10 = 10

$$p(x) = \binom{x+r-1}{r-1} p^r q^x$$

$$p(x) = \binom{10+10-1}{10-1} .3^{10}.7^{10}$$

$$p(x) = \binom{19}{9} .3^{10}.7^{10}$$

$$p(x) = 91378 \times (.3^{10}.7^{10})$$

$$p(x) = 0.0154 = 1.54\%$$

The probability you will have to ask 20 people to get 10 votes for Republican is 1.54%

3.4.4 Hypergeometric Distribution

For a finite population when the sampling is done without replacement which means that the events are stochastically dependent though random, we obtain the hypergeometric distribution. A discrete random variable *X* is said to follow the hypergeometric distribution if it assumes only nonnegative values and its probability mass function is given by

$$p(x) = P(X = k) = \frac{\binom{M}{k}\binom{N-M}{n-k}}{\binom{N}{n}}; k = 0,1,2, \ldots \min\ (n, M)$$

$$= 0\ , otherwise$$

N, M and n are known as the three parameters of hypergeometric distribution.

or

$$P(x) = ({}^{n1}C_x \times {}^{n2}C_{n-x}) / {}^{N}C_n$$

Where $N = n_1+n_2$, $n = (x+(n-x))$

n_1 = Success, n_2 = Failure

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The assumption of Hypergeometric Distribution

1. The population or set to be sampled consist of N individuals, elements, objects (a finite population)
2. Each individuals / objects are characterized as a success (S) or a failure (F), and there are M successes in the population.
3. A sample of n individual is randomly selected without replacement such that each subset of size n is equally likely to be selected.

Illustration 3.7: XYZ Ltd received 20 service orders in respect of issues related to computer. Out of this 8 are related to PC and 12 are related to laptops. A sample of 5 of these service orders was taken randomly. What is the probability that (a) all the 5 selected samples are related to laptops, (b) 2 samples are related to laptop?

Solution

Population size (N) = 20

The sample size (n) = 5

$N_1 = 12$

$N_2 = (N- N_1) = (20-12) = 8$

$$P(x) = ({}^{n1}C_x \times {}^{n2}C_{n-x})/ {}^{N}C_n$$

(a). $P(5) = ({}^{12}C_5 \times {}^{8}C_{5-5})/ {}^{20}C_5 = 0.05108$

(b). $P(3) = ({}^{12}C_2 \times {}^{8}C_{5-2})/ {}^{20}C_5 = 0.23839$

Illustration 3.8: X ltd manufactured 30 bulbs, out of this 10 are defectives. If a sample of 12 bulbs were taken randomly, calculate the probability that the sample consist of:

1. Six good bulbs
2. All are good bulbs.

Solution

Population size (N) = 30

The sample size (n) = 30

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$N_1 = (30-10) = 20$

$N_2 = 10$

$$P(x) = ({}^{n1}C_x \times {}^{n2}C_{n-x}) / {}^{N}C_n$$

(a). $P(6) = ({}^{20}C_6 \times {}^{10}C_{12-6}) / {}^{30}C_{12} = 0.0941$

(b). $P(12) = ({}^{20}C_{12} \times {}^{10}C_{12-12}) / {}^{30}C_{12} = 0.00146$

Illustration 3.9: In a shipment of 25 hard disks, six are defective. If five of the disks are selected at random, what is the probability that:

a) Exactly one is defective?

b) At least one is defective?

c) Not less than two are defective?

What is the average number of defective hard disks that you would expect to find in the sample of five hard disk drives? What is the standard deviation?

Solution:

Population size (N) = 25

The sample size (n) = 5

$N_1 = 6$

$N_2 = (N- N_1) = 25 - 6 = 19$

$$P(x) = ({}^{n1}C_x \times {}^{n2}C_{n-x}) / {}^{N}C_n$$

a) $P(x=1) = ({}^{6}C_1 \times {}^{19}C_4) / {}^{25}C_5 = \frac{23,256}{53,130} = 0.4377$

b) $P(x>=1) = 1- P(0)$

$= 1- {}^{19}C_5 / {}^{25}C_5 = 1- \frac{11628}{53,130} = 0.7811$

c) $P(x>=2) = 1- [P(0)+ P(1)]$

$= 1- [0.2189 + 0.4377] = 0.3434$

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Expected value = $\frac{n(N1)}{N} = \frac{5(6)}{25}$ =1.2

Variance = $n(\frac{N1)}{N})(\frac{N2)}{N})(\frac{N-n)}{N-1})$

= $5(\frac{6)}{25})(\frac{19)}{25})(\frac{25-5)}{25-1})$ = 0.76

Standard deviation = $\sqrt{0.76}$ = 0.872

3.5 NORMAL DISTRIBUTION

Normal distribution is one of the most important continuous distributions in statistical theory. There are several phenomena which seems to follow normal distribution very closely or can be approximated by it. The application of normal distribution allows calculating probabilities in such cases. It is further used as an approximation to other probability distributions. An important application of the normal distribution is in the theory of sampling.

The Normal Curve: A variable X has normal distribution if its curve is given by the following equation:

$$y(x)= \frac{1}{\mu\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

where e = a mathematical constant equal to 2.7183 app.

π = mathematical constant equal to 3. 1416 app.

μ = Expected value or mean

σ = Standard deviation

x = a particular value of the random variable and - $\propto$ < x < + $\propto$

y(x) = the height of normal curve at x

The equation explain that if μ and σ are known then the height of the curve corresponding to any value of x can be obtained.

3.5.1 Properties of Normal Distribution

A normal distribution has the following properties:

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i) It is a uni-model, bell-shaped and symmetrical curve. The mean, median, mode of normal distribution is equal.

ii) For any value of x, the y(x) would always have a positive value. The value could be close to zero in case of very large or very small value of x.

iii) A normal distribution is defined by two parameters :- mean (μ) and standard deviation (σ). For every combination of mean and standard deviation a unique normal curve exists.

A change in standard deviation causes a change in relative position and a change in mean displaces the normal curve

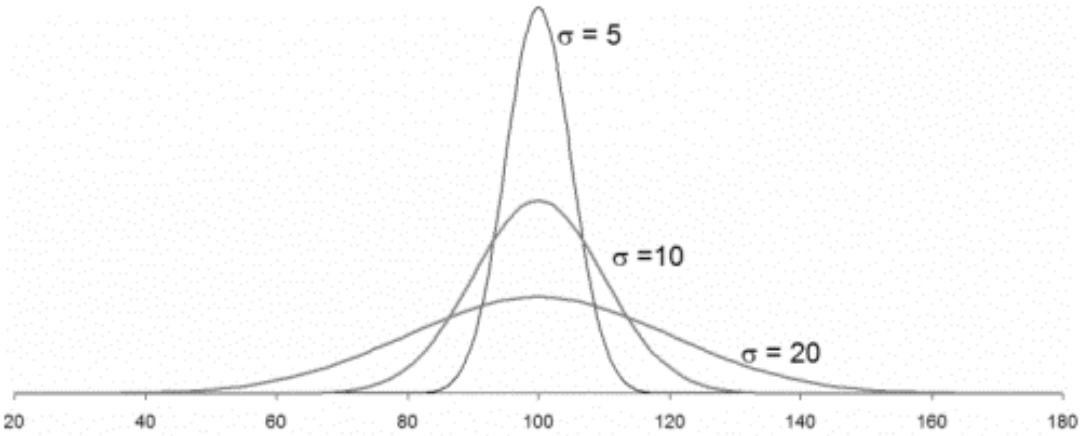

Figure 3.1: Normal Curves: Equal Means, Unequal Standard Deviations

iv) The height of the normal curve is maximum at x= μ. Hence the mode of the normal curve is x = μ.

v) A normal curve has two points of inflection, where the curve changes its curvature. They are situated at one-sigma (1σ) distance from mean on either side of it.

vi) If we assume $x_1, x_2, x_3 \ldots\ldots x_n$ are independent variables and each is normally distributed then their sum $x_1 + x_2 + x_3 + \ldots\ldots + x_n = x$ is also normally distributed. The μ of the x variable is equal to $\mu_1 + \mu_2 + \mu_3 + \ldots\ldots\ldots\ldots\ldots\ldots \mu_n$. and the variance σ^2 1 are equal to $\sigma^2_1 + \sigma^2_2 + \sigma^2_3 + \ldots\ldots\ldots\ldots\ldots \sigma^2_n$

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vii) Under normal curve, $\mu \pm 1\sigma$ covers 68.27 % of the area under the curve; $\mu \pm 2\sigma$ covers 95.45 % of the area under the curve; $\mu \pm 3\sigma$ covers 99.73 % of the area under the curve.

viii) The mean deviation about mean s 4/5 standard deviation or MD = 0.7979 standard deviation.

ix) The inter-quartile range is contained within an interval of the 2/3 of a standard deviation below the mean to 2/3 of a standard deviation above the means.

x) Then normal distribution is formed with a continuous variable.

3.5.2 Relationship between Standard Deviation, Mean Deviation, Quartile Deviation for Normal Distribution

Measure of Variation	Percentage of area included within a given range of mean			Size of measure standard deviation
	± One deviation	± Two deviation	± Three deviations	
Standard Deviation	68.3	95.5	99.7	1
Mean Deviation	57.5	88.9	98.3	0.7979
Quartile Deviation	50	82.3	95.7	0.6748

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3.5.3 Standard Normal Distribution

The standard normal distribution has $\mu = 0$ and $\sigma = 1$. Through z-transformation, a normal random variable x can be converted into standardised normal variable z. The transformation from x to z is done by the following formula:

$$z = \frac{x-\mu}{\sigma}$$

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Where x = variable

μ = Population mean

σ = population standard deviation

The z-transformation has the effect of expressing a value of x in terms of the number of standard deviation units it is situated away from mean. For example, if μ = 50 σ = 5 and x = 60 , then z = $\frac{60-50}{5}$ = 2, we can conclude that x is situated 2σ from μ.

y(z) = $\frac{1}{\sqrt{2\pi}} e^{-(z^2)/2}$

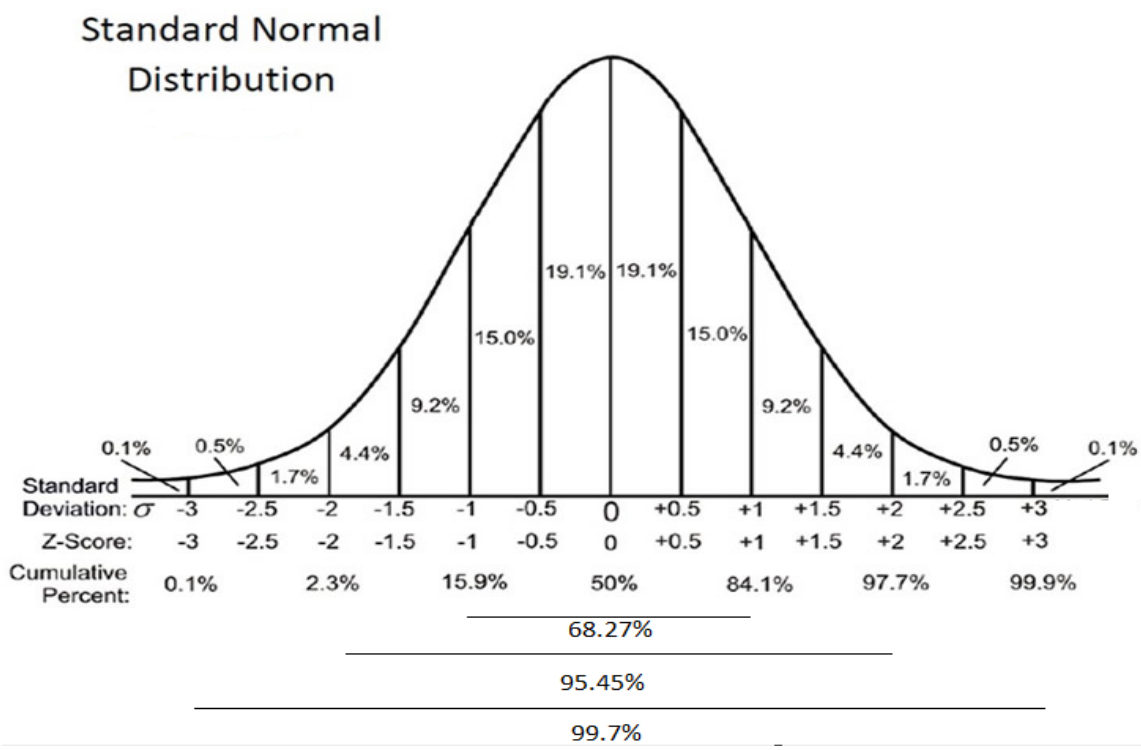

Figure 3.2: Normal distribution

Calculation of probabilities

By using the above formula we calculate the value of z, then with the help of normal table we calculate the area covered under the normal distribution as the probability. In standard normal distribution table (z table) the first column contains the values of z starting from 0.0 while the top row of the table gives values starting from 0.00 up to 0.09. To find the area to a specific

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value of z, we check in the first column for z-value up to its first decimal place while its second decimal place is read in respect with top row.

Standard Normal Distribution Table

Z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0	0.004	0.008	0.012	0.016	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.091	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.148	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.17	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.195	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.219	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.258	0.2611	0.2642	0.2673	0.2703	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.291	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.334	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3642	0.3665	0.3686	0.3708	0.3729	0.3749	0.377	0.379	0.381	0.383
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.398	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.437	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.475	0.4756	0.4761	0.4767

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2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.483	0.4834	0.4838	0.4842	0.4846	0.485	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.489
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.492	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.494	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.496	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4669	0.497	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4779	0.4979	0.498	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.499	0.499

For example if we want to find the area between mean and z = 1.33, then we look for 1.3 in the first column and 0.03 in the column corresponding to the top row of standard normal distribution table. The value in the table reads is 0.4082 (two tail z table).

Some other examples are:

Range	Area
Between mean and z =1.00	0.3413
Between mean and z = 1.45	0.4265
Between z = 1.2 and z = 2.8	0.4974 – 0.3849 = 0.1125
Between z = -1.2 and z = 2.8	0.3849 + 0.4974 = 0.8823
Beyond z = 1.2	0.5-0.3849 = 0.1151

Since the normal curve is symmetry the area between mean μ and z = -1.2 is the same as the area between mean μ and z = 1.2.

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Illustration 3.10:

A variable x is normally distributed with μ = 100 and σ =10. Find the (i) P (x > 125) and (ii) P (90 < x < 120).

Solution

(i) To find P (x > 125), we have to find the area to the right of x = 125

For x = 125, $z = \frac{125-100}{10} = 2.5$

From the normal area table, the area corresponding to z = 2.5 is 0.4938. Thus, the area to the right of this value is 0.5 – 0.4938 = 0.0062.

Therefore P(x> 125) = 0.0062.

(ii) To find P (90 < x < 120), The relevant area is marked in part (b) of the figure

For x = 90, $z = \frac{90-100}{10} = -1$

For x = 120, $z = \frac{120-100}{10} = 2$

From the normal area table, the area corresponding to z = -1 is 0.3413 while the corresponding to z = 2 is 0.4772. Accordingly, the total area between x = 90 and x = 120 is 0.3413 + 0.4772 = 0.8185.

Therefore, the P(90 < x < 120) = 0.8185.

Illustration: 3.11

The average income of doctors is Rs 1,85,000 and standard deviation is Rs 10,000. If the tax authorities decided to impose tax on the highest 70 percent bracket and exempt the other 30%. What should be minimum taxable income? Assume incomes to be normally distributed.

Solution:

Here μ = 1,85,000 and σ = 10,000. To find the required income level is to find the value of the variable x above which there is 70% or 0.70 of the area under the normal curve.

$Z = \frac{x-1,85,000}{10,000}$ …….equation 1

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To obtain the value of z, we can refer to normal area table for an area equal to 0.20. This is because the table gives areas between mean and a particular value of z. Since the area to the right of the desired value x is 0.7 and area between x and mean = 0.2 (0.7- 0.5 =0.2). As the x- value is smaller than the mean, the corresponding z value must be negative.

From the z-table we get the area values closest to 0.20 are .1985 corresponding to z = 0.52 and 0.2019 corresponding to z = 0.53. So we can take the average of the two z-score i.e. (0.52+0.53)/2 = 0.525. The value of z will be negative -0.525.

By using the z-score in equation 1 we get the value of x.

$$Z = \frac{x-1,85,000}{10,000}$$

$$-0.525 = \frac{x-1,85,000}{10,000}$$

x-1,85,000 = -5250

x = -5250 + 1,85,500 = 1,79,750

Thus the minimum taxable amount would be Rs 1,79,750.

Illustration 3.12: The performance (marks) of students of XYZ institute are known to approximately normally distributed with mean = 118 and standard deviation = 12

a. If student securing minimum of 100 is declared successful, then what is the probability that a student randomly chosen will be successful.

b. If the institute desire to pass the 70% of students what should be the minimum passing marks?

c. Calculate the lowest score at the top 25% of the students.

Solution

a. $\mu = 118$, $\sigma = 12$

x = 100

$$z = \frac{x-\mu}{\sigma}$$

$$z = \frac{100-118}{12} = -1.50$$

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From the normal distribution table, we find that for z = 1.50 the area is 0.4332

Thus, the total area to the right of (x = 100) is 0.5 + 0.4332 = 0.9332

b. To ensure 70% of student passed the examination, we calculate the x value to the right of which 0.70 area under the normal curve is included.

Let the passing mark = x

$$z = \frac{x-\mu}{\sigma}$$

$$z = \frac{x-118}{12}$$

The area between x and μ is 0.20, we locate the z-value corresponding to this area. We observe that area 0.1985 corresponds to z = 0.52 while area 0.2019 corresponds to z = 0.53.

Thus, we take either of these values of z, but a better estimate would be an average of 0.52 and0.53 since the area value 0.20 lies between the two area values observed, thus we take z = 0.525. Further, this z-value will be taken to be negative since x lies to the left of μ.

Thus,

$$-0.525 = \frac{x-118}{12}$$

Or x = 118-12*(0.525) =112 app.

c. Let assume the lowest marks of the top 25% of students is given by x, since the area to the left of x up to μ is 0.5 – 0.25 = 0.25, we locate z value corresponding to this.

From the normal distribution table, the z-value corresponding to the area 0.25 may be taken be equal to 0.675 ((0.67+0.68)/2)

Thus,

$$-0.675 = \frac{x-118}{12}$$

Or x = 118+12*(0.675) =126.1 app.

Thus, the minimum mark of the top 25% of students is 126.1

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3.6 EXPONENTIAL DISTRIBUTION

Exponential Distribution is a continuous probability distribution which is effective in explaining the completion time of a project or the number of times between occurrences of random events. Example include the number of hours taken by a mechanic to repair a vehicle, time taken by bank cashier per customer, the amount of time taken until volcano erupt, the number of months a car battery lasts, the time between consecutive breakdown of a machine, etc.

The exponential probability density function, where μ is the mean of the distribution is given below:

$$f(x) = \frac{1}{\mu} e^{-\left(\frac{x}{\mu}\right)}$$

$$\text{where } x \geq 0$$

$$\mu > 0$$

For example, let's assume that the time taken by car mechanic to repair a car follows an exponential distribution with a mean of 5 hours, then the probability density function is

$$f(x) = \frac{1}{5} e^{-\left(\frac{x}{5}\right)}$$

The graph of density function of exponential distribution is given below

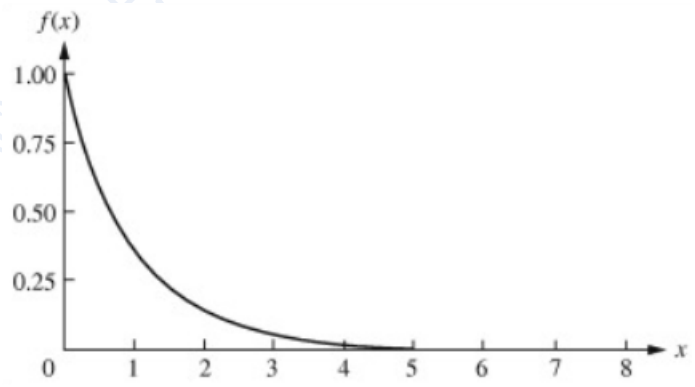

Figure 3.3: Exponential Distribution

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Calculation of probabilities: The probability of the variable to take values in a certain range is given by the area under the graph of the density function. To explain in the context of above example, the probability that the car machinic will take 4 hours or less to repair a car will be equal to the area between $x = 0$ and $x = 4$. Similar, the probability that it will take between 4 and 6 hours for the car mechanic to repair a car will be given by the area between $x = 4$ and $x = 6$. The following formula yields the probability that the time taken will be x or less than it:

$$P(x \leq x_0) = 1 - e^{-x/u}$$

The Standard Deviation of an exponential distribution is equal to its mean.

Illustration 3.13: The average time a bank teller takes to serve a customer is 6 minutes. The service time follows an exponential probability distribution. Calculate the probability that :

a) A bank teller will take less than 2 minutes to complete the service.

b) A bank teller will take between 4 and 5 minutes to get the service.

c) A bank teller will take more than 10 minutes for the service.

Solution:

The average time: $\mu = 6$

a) $P(x \leq x_0) = 1 - e^{-x/u}$

P(service time <2 minute) = $1 - e^{-2/6} = 0.2835$

b) $P(x \leq x_0) = 1 - e^{-x/u}$

P(4 minutes <service time < 5 minute)

= P(service time < 5 minute) – P (service time < 4 minute)

$= (1 - e^{-5/6}) - (1 - e^{-4/6})$

= 0.5654 – 0.4866

= 0.0788

c) $P(x \leq x_0) = 1 - e^{-x/u}$

P(service time >10 minute) = $e^{-10/6} = 0.1889$

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Illustration 3.14: The length of particular telemarketing call x has an exponential distribution with mean equal to 4.4 minutes.

a) Write the formula for exponential probability cure of x

b) Find the probability that the length of a randomly selected call be

   a. More than 4 minutes

   b. Between 2 and 4 minutes

c) What is the probability that the length of call will be within two standard deviations of mean.

Solution:

a) $P(x \leq x_0) = 1- e^{-x/u}$

b) (a) P(call time > 4 minutes) = $e^{-4/4.4} = 0.40289$

   (b) P(4 minutes >call time > 2 minutes)

   = P(call time < 4 minute) – P (call time < 2 minute)

   = $(1- e^{-4/4.4}) - (1- e^{-2/4.4})$

   = (0.5971) – (0.3653)

   = 0.2318

c) Since $\sigma = \mu = 4.4$, The 2σ interval is given by $4.4 \pm 2 \times 4.4$ or 0 - 13.2. Thus, the required probability may be obtained as

   P (call time <= 13.2) = $1- e^{-x/u} = 1- e^{-13.2/4.4} = 0.9502$

3.7 LOGNORMAL DISTRIBUTION

The lognormal distribution plays an vital role in probabilistic design because negative values of engineering phenomena are sometimes physically impossible. It is a continuous probability distribution of a random variable in which logarithm is normally distributed. A non-negative random variable X is said to have the lognormal distribution with parameters μ and σ > 0 if ln(X) has the normal distribution with mean μ and standard deviation σ. The lognormal distribution is used to

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model continuous random quantities when the distribution is believed to be skewed, such as certain income and lifetime variables.

The probability density function of the log-normal distribution is defined by two parameters μ and σ

$$f(x) = \frac{1}{\sqrt{2\pi\sigma x}} \exp\left(-\frac{(\ln(x)-\mu)^2}{2\sigma^2}\right), \; x > 0$$

μ is the location parameter and σ is the scale parameter of the distribution. Note the parameters μ and σ are not the mean and standard deviation of x but of ln(x). The name of the "log-normal" distribution reveals that it relates to logarithms as well as the normal distribution. Let's assume that the data fits a log-normal distribution, then if we take the logarithm of all your data points then the newly transformed points will now fit a normal distribution. In simple words when you take the log of you log-normal data, it would result into a normal distribution.

The lognormal distribution is unimodal and skewed right. Specifically, let m = exp(μ − σ 2) and show that

a. f x is increasing on 0( ), and decreasing on m m ∞( ), , so that the mode occurs at x = m.

b. f (x) → 0 as x → ∞.

c. f (x) → 0 as x ↓0

Estimate μ & σ from data

By using maximum likelihood (MLE) estimation we can estimate our log-normal parameters μ and σ. The maximum likelihood estimators for the normal distribution are:

$$\hat{\mu} = \frac{\sum_i x_i}{n} \text{ and } \hat{\sigma}^2 = \frac{\sum_i (x_i - \hat{\mu})^2}{n}$$

The maximum likelihood estimators for the log normal distribution are:

$$\hat{\mu} = \frac{\sum_k \ln x_k}{n} \text{ and } \hat{\sigma}^2 = \frac{\sum_k (\ln x_k - \hat{\mu})^2}{n}$$

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The maximum likelihood estimators for the normal distribution are:

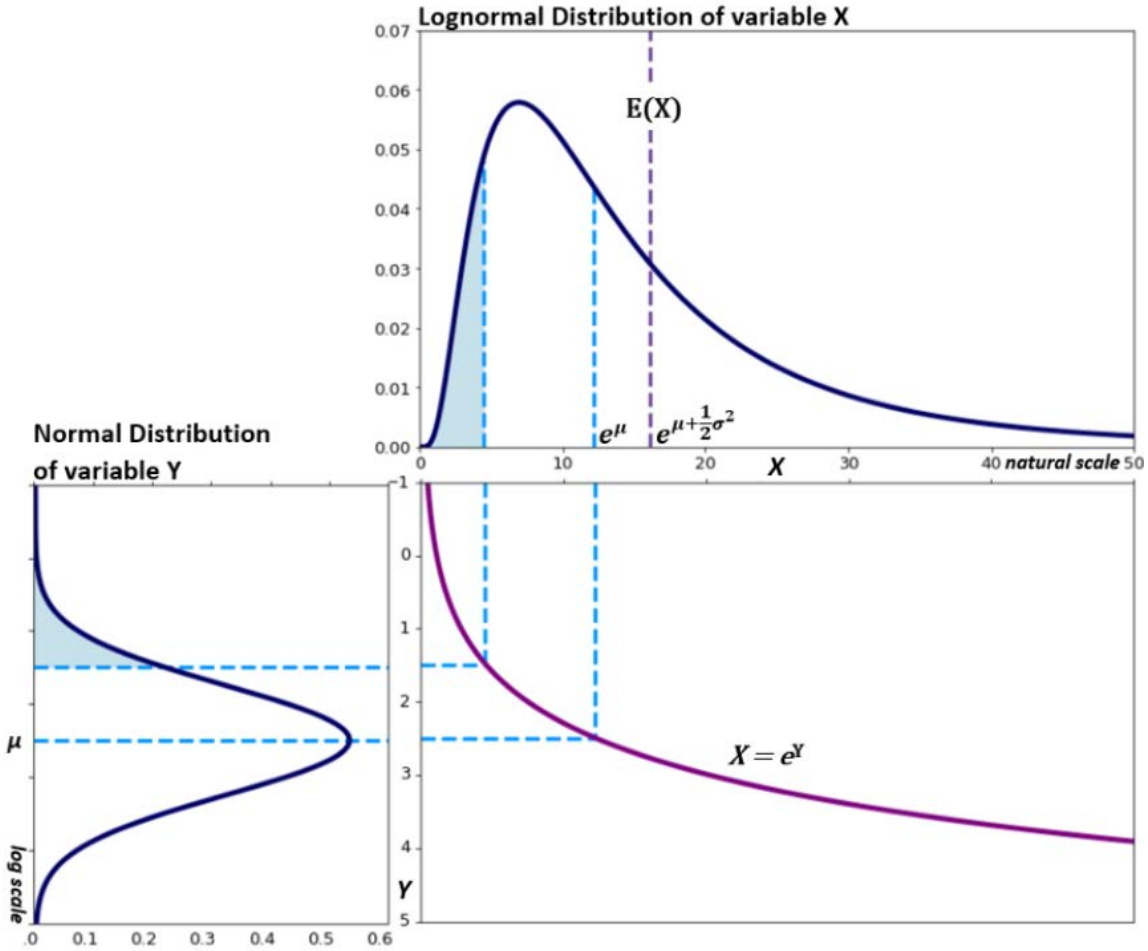

Figure 3.4: Log Normal Distribution

Applications of the lognormal distribution

1. Lognormal distribution help to analyse the time spent by individuals on social media platform.
2. It also helps in the income analysis of a certain population
3. It also helps to understand the fluctuations in stock market.
4. The maximum value of annual rainfall is also calculated using a lognormal distribution.
5. It also helps us to solve a Rubik's Cube.

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IN-TEXT QUESTIONS (True of False)

1. A variable is said to be a random variable if it takes different values as a result of the outcomes of a random experiment.
2. A probability distribution can also be obtained using historical data
3. A discrete random variable can assume any value in a given range whereas a continuous random variable can assume only isolated values (
4. The two parameters of a binomial distribution are *n* and *p*. (True / False)
5. A binomial distribution involves infinite number of trials
6. A binomial distribution can be completely identified by *n* and *p*.
7. A binomial distribution is positively skewed when $p > q$ and negatively skewed when $p < q$.
8. A Poisson distribution is positively skewed and the skewness decreases when *m* increases.
9. The standard normal distribution has $\mu = 1$ and $\sigma = 0$.
10. The curve of normal distribution is symmetrical and mesokurtic.
11. The Exponential distribution involves discrete variable like Poisson distribution
12. A hypergeometric distribution can be usefully approximated by a normal distribution when n(N1/N) and n(N2/N) are both at least equal to 5
13. Probability distribution are obtained primarily on theoretical consideration
14. A probability distribution may involve a _____and _____ random variables
15. In the case of Poisson distribution $P(0) = 1-e^{-\lambda}$

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3.8 THE WEIBULL DISTRIBUTION

The Weibull distribution is a continuous probability distribution. The Weibull distributions was introduced by the Swedish physicist and mathematician Waloddi Weibull in 1939. It is commonly used to assess product reliability, analyse life data and model failure times.

The probability density function of a Weibull random variable is :

$$f(x) = \frac{\gamma}{\alpha}\left(\frac{(x-\mu)}{\alpha}\right)^{(\gamma-1)}\exp(-((x^{\gamma}))$$

$$x \geq 0;\ \gamma > 0$$

where γ is the shape parameter; μ is the location parameter and α is the scale parameter. The situation where $\mu = 0$ and $\alpha = 1$ is called the standard Weibull distribution. The situation where $\mu = 0$ is called the 2-parameter Weibull distribution. The equation for the standard Weibull distribution reduces to : $f(x) = \gamma x^{(\gamma-1)} \exp(-(x^{\gamma}))$

$$x \geq 0;\ \gamma > 0$$

The Weibull probability density function is graphically shown in the below diagram

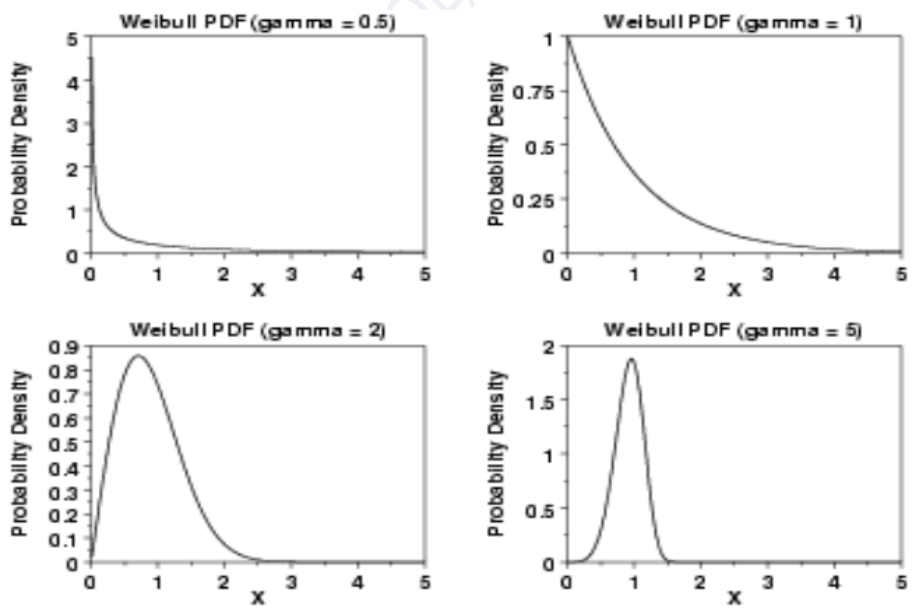

Figure 3.5 : Weibull probability density function

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The Formula for the **cumulative distribution function** of the Weibull distribution is:

$$F(x) = 1 - e^{-\left(\frac{(x-\gamma)}{\beta}\right)^{\alpha}}$$

$$x \geq 0;\ \gamma > 0$$

The plot of cumulative distribution function is given below:

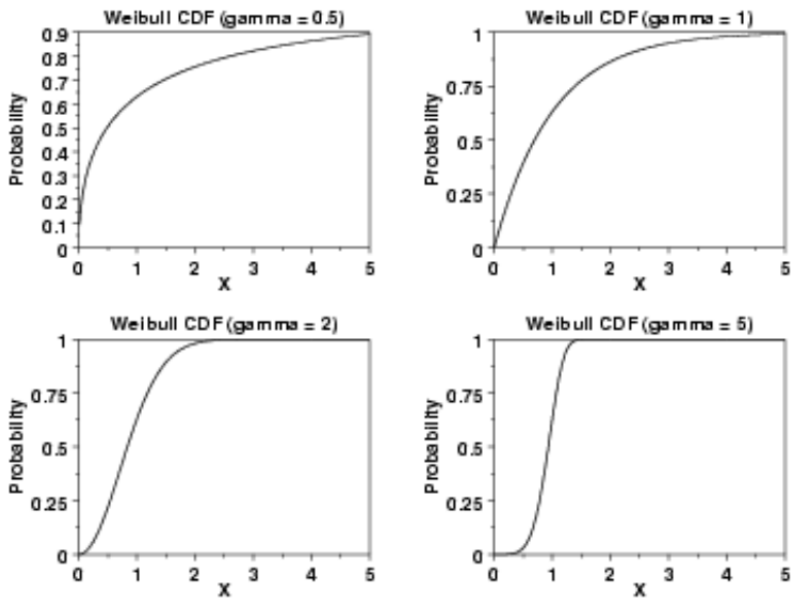

Figure 3.6 CDF Weibull

Illustration 3.15:

An understanding of the volumetric properties of asphalt is important in designing mixtures which will result in high-durability pavement. The article "Is a normal Distribution the most appropriate statistical distribution for volumetric properties in Asphalt Mixture?" (J. of Testing and Evaluation, Sept. 2009; 1-11) used the analysis of some sample data to recommend that for a particular mixture, X = air void volume (%) be modelled with a three-parameter Weibull distribution. Suppose the values of the parameters are $\gamma = 4$, α

$= 1.3$ and $\beta = .8$

For x>4 the cumulative distribution function is

$$F(x) = 1 - e^{-\left(\frac{(x-\gamma)}{\beta}\right)^{\alpha}}$$

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$$F(x) = 1 - e^{-\left(\frac{(x-4)}{0.8}\right)^{1.3}}$$

The probability that the air void volume of a specimen is between 5% and 6% is

$$P(5 \leq X \leq 6) = F(6; 1.3, 0.8, 4) - F(5; 1.3, 0.8, 4)$$

$$= e^{-\left(\frac{(5-4)}{0.8}\right)^{1.3}} - e^{-\left(\frac{(5-4)}{0.8}\right)^{1.3}}$$

$$= .263 - 0.037 = 0.226$$

3.9 SUMMARY

- Probability distribution are calculated essentially on the theoretical consideration and provide how outcomes of an experiment are expected to change.
- The probability distribution may involve a discrete or a continuous random variable
- The binomial, hypergeometric and Poisson distribution involve discrete random variables while normal and exponential distributions involve continuous random variable. Uniform distribution involving both of them.
- The mean and standard deviation of a binomial distribution are given by np and $\sqrt{npq}$, respectively. The distribution is symmetrical if $p = q$ and skewed if $p \neq q$. For a given number of trials, the greater the difference between p and q, more the skewness
- The normal distribution has two parameters – mean and standard deviation. For every pair of values, there is a distinct normal distribution. The distribution with mean $\mu = 0$ and standard deviation $\sigma = 1$ is called standardized normal distribution.
- The proportion of area lying in a given interval to the total area under the normal curve gives the probability that the variable in question will take a value within that interval.
- The exponential distribution is a continuous probability distribution which is usefully employed in describing the completion time of a task or the number of times between occurrences of random events.

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- The Poisson and exponential distribution are related to each other: while the former provides description of the number of occurrences per interval, the latter gives a description of the length of interval between successive occurrences.

3.10 ANSWERS TO IN-TEXT QUESTIONS

1. True	9. False
2. True	10. True
3. False	11. False
4. True	12. True
5. False	13. True
6. True	14. Discrete, Continuous
7. False	15. False
8. True	

3.11 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of probability distributions. Distinguish between discrete and continuous probability distributions.
2. Calculate the probabilities of 0, 1. 2, 3, 4 and 5 heads on the toss of a set of five balanced coins. Also, obtain the mean and standard deviation of the distribution
3. Write a short note on Binomial, Poisson and Normal distribution.
4. The probability that a candidate will pass the examination is 0.4. Determine the probability that out of 8 students, each of which has the same chance of graduating, (i) none, (ii) one, (iii) at least two, (iv) no more than four, and (v) all will pass.
5. XYZ ltd. produces a product and finds that 15 percent of its output is defective. A small sample of 7 items is taken from the production line. Find the probability of getting each of the following number of defective items in the sample: 0, 1, 2, 3, 4, and 5,6,7.

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6. A factory finds that, on an average, 20 percent bolts are defective from one machine. If 10 bolts are selected at random, find the probability that (a) Exactly two bolts are defective, (b) Less than two bolts are defective. (c) More than two bolts are defective. (d) More than eight bolts are defective.
7. If the probability of a defective bolt is 0.2, find the mean and standard deviation of the number of defective bolts in a total of 900 such bolts.
8. (a) In a binomial distribution involving 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048, respectively. Find the parameter p of the distribution. (b) In a binomial distribution with 6 independent trials, the probabilities of 3 and 4 successes are found to be 0.2457 and 0.0819, respectively. Find mean and variance of this distribution.
9. A project yields an average case flow of Rs. 550 lakh and standard deviation of Rs. 110 lakhs. Compute the following probabilities :

   (a) Cash flow will be more than Rs. 675 lakhs,

   (b) Cash flow will be less than Rs. 450 lakh and

   (c) Cash flow will be between Rs. 425 and Rs. 750 lakhs.
10. Bring out the fallacy, if any, in the following statements:

    (a) The mean of a binomial distribution is 6 and its standard deviation is 3.

    (b) The mean of a binomial distribution is 3 and its variance is 4.
11. For a binomial variable x, it is given that $n = 8$, and $P(x - 2) = 16\ P(x = 6)$. Determine the values of p and q.
12. The administrative officer of a nursing home reports that the number of patients admitted to the ICU on any day follows a Poisson probability law, with a mean of 7. What is the probability that on a given day

    (a) No patient will be admitted?

    (b) Exactly seven patients will be admitted?

    (c) No more than three patients will be admitted?
13. The incidence of occupational disease in an industry is such that the workmen have a 30 percent chance of suffering from it. What is the probability that out of 8 workmen, 6 or more will contact the disease?

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14. In an examination 20% of candidate passed with distinction, 50% passed and 30% failed. If it is given that a candidate needs 50% marks to pass and 75% marks to pass with distinction, determine mean and standard deviation of the distribution of marks assuming the marks are distributed normally.

15. ABC project yields an average case flow of Rs. 600 lakh and standard deviation of Rs. 100 lakhs.

    Compute the following probabilities :

    (a) Cash flow will be more than Rs. 700 lakhs,

    (b) Cash flow will be less than Rs. 500 lakh and

    (c) Cash flow will be between Rs. 400 and Rs. 800 lakhs.

3.12 REFERENCES AND SUGGESTED READINGS

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LESSON-4

INFERENCE FROM SAMPLES

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STRUCTURE

4.1 Learning Objectives

4.2 Introduction

4.3 Sampling from a Population

- 4.3.1 Describing Population, Sample and Sampling
- 4.3.2 Types of Sampling
- 4.3.3 Parameter and Statistic

4.4 Sampling Distribution of the Mean

- 4.4.1 Describing Sampling Distributions
- 4.4.2 Central Limit Theorem
- 4.4.3 Relationship between Sample Size and Standard Error
- 4.4.4 Sampling Distributions of Sample Proportion

4.5 Estimation

- 4.5.1 Describing Estimator and Estimate
- 4.5.2 Criteria of a Good Estimator
- 4.5.3 Point Estimates
- 4.5.4 Interval Estimates
- 4.5.5 Confidence Intervals

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4.5.6 Determining the Sample Size in Estimation

4.6 Summary

4.7 Glossary

4.8 Answers to In-text Questions

4.9 Self-Assessment Questions

4.10 References

4.11 Suggested Readings

4.1 LEARNING OBJECTIVES

1. To **comprehend** the concept of sampling and various sampling techniques.
2. To **learn** the concept of the sampling distribution of a sample mean and its properties.
3. To **state** the concept of the central limit theorem and sampling distributions of the sample proportion.
4. To **identify** the various properties of a good estimator.
5. To **explore** the types of estimates: point and interval estimates.

4.2 INTRODUCTION

Sampling is an important concept in research. It assists the researchers to gather enough data so as to answer their research questions and will help them to generalize their results. Another significant concept is the estimation which is done based on the observations taken from the samples and used to measure the true value of a specified set of populations.

This lesson provides an overview of sampling distribution and estimation. It discusses the concept of sampling and its various techniques. The next part of the lesson briefly explains the sampling distribution of a sample mean and sample proportion and also discusses the central limit theorem. The lesson also explores the four main properties of a good estimator. Later on, this lesson also discusses the two types of estimates i.e. point and interval estimates.

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This lesson will help the learners to understand various properties related to sampling distribution and estimation which will assist them in collecting the data and calculating the mean and standard deviation of the sample mean and proportion.

4.3 SAMPLING FROM A POPULATION

4.3.1 Describing Population, Sample and Sampling

A **population** is a total group about whom the researcher wishes to make conclusions. It is defined as the sum of all the members of a specified group that is being investigated. A population in research does not usually relate to people. It can refer to any set of items that you wish to investigate such as objects, organizations, events, species nations, organisms, etc.

Information about a population can be obtained from a sample. A **sample** is a particular group from whom you will gather the data. The sample size is always smaller than the entire population size. A sample is required when your population is large, geographically distributed or difficult to contact. Statistical analysis allows you to utilize sample data to produce estimates or test hypotheses about population data.

Sampling is a process of picking individuals in order to draw conclusions from them statistically and estimate the entire population's attributes. In market research, researchers frequently employ diverse sampling techniques so that they do not have to analyse the whole population in order to gain meaningful insights. For instance, if you want to study the growth of banking activities (ATMs, debit/credit cards, etc.) across various countries since 2001, then the population and sample will be:

Population: All countries of the world

Sample: Countries with published data available on banking activities since 2001.

4.3.2 Types of Sampling:

Sampling is broadly classified into two categories:

Probability Sampling

A type of sampling technique in which a researcher chooses specific criteria and picks individuals randomly from a population is known as probability sampling. With this selection criteria, all members have an equivalent probability to be a part of a sample. Probability sampling is categorized into four types namely:

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- **Simple Random Sampling:** In this technique, every individual in a population is chosen at random, and each individual has an "*equal probability of being chosen in a sample*". For instance, if a company wants to undertake motivational activities for 1000 employees. So, in this case, the employees will be selected randomly say by picking chits out of a bowl, hence, each one of them is having an equal probability of being in a sample.

- **Systematic Sampling:** In this, the members of the sample are selected at "*periodic intervals*" from a population. Since this technique has a specific set range, hence, it is the least time-consuming method of sampling. For instance, a research scholar wants to gather data. So, he/she chooses a systematic sampling technique in which he wants a sample of 100 individuals from a population of say 1000. As a result, to be a member from 1-1000, he/she chooses every tenth individual (i.e., 1000/100= 10).

- **Stratified Random Sampling:** In this technique, the population is divided into smaller groups (i.e., stratas) where these stratas reflect the entire population and there is no overlapping. Then the sample is drawn from each group independently using any of the sampling techniques discussed above. If simple random sampling is used to choose the sample from each stratum, then it is termed a stratified simple random sampling technique. The population can be categorized into strata on the basis of characteristics such as age, income, sex, etc. For instance, if you want to analyze the attributes of individuals based on their annual family income, then groups (i.e., stratas) will be like: less than Rs 25,000, Rs 25,000 – Rs 35,000, Rs 36,000 – Rs 45,000, Rs 46,000 - Rs 55,000, and so on.

- **Cluster Sampling:** Cluster sampling is a technique in which researchers divide a population into subpopulations (known as clusters) that reflect the population. For each selected cluster, the elements are included in the sample. Elements within a cluster should be heterogenous as possible, but clusters themselves should be homogeneous as possible. The clusters are determined and included in a sample based on demographic criteria such as age, gender, geography, and so on. For instance, if the Indian government decides to examine the foreign students studying in India in various universities, they can split it into clusters depending on Indian universities such as the University of Delhi, IP University, Amity University, University of Orissa, and so on. This kind of surveying will be more successful since the findings will be categorized by state and will give informative foreign students statistics.

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Non-Probability Sampling

In non-probability sampling, the researcher selects study participants at random. This sampling approach is not a predetermined or set selection procedure. As a result, it is difficult for all parts of a population to have an equivalent probability to be a part of a sample. There are four types of non-probability sampling namely:

- **Purposive Sampling:** In purposive sampling, the researcher selects the sample on the basis of who they believe would be suitable for their study. This technique is also referred to as judgment sampling as in this, the researcher often uses his own judgment to choose the sample. Purposive sampling involves greater chances of a personal bias than convenience sampling as the researcher might select a sample that yields favorable results as per their point of view. For example, when the researcher wants to study customer satisfaction regarding the SBI bank's online channels, then the selection criteria would be: Are you using the bank's online channels offered by SBI? Only those who responded Yes will be included in the sample, others will be excluded.

- **Convenience Sampling:** Convenience sampling is a technique in which the samples are selected simply because they were considered to be the most convenient sample to choose from. This technique is based on ease of sample selection. In this, the respondents are selected because they happen to be available at the right time in the right place. Hence, such a technique is biased as the researchers might reflexively approach some respondents while ignoring others. For instance, non-governmental organizations (NGOs) and startups typically use convenience sampling in a mall to distribute flyers about future events or to promote a cause.

- **Quota Sampling:** In quota sampling, the samples are selected from different strata in quotas. Typically, restrictions are imposed on how each quota is to be filled. The sample selection is based on the discretion of the researcher as long as the quota criteria are met. This technique is considered to be a rapid technique for collecting samples. For instance, if you want to study the technology managers across the companies, the quota can be divided into 25% from small-scale industries, 35% from medium-scale industries and 40% from large-scale industries.

- **Snowball Sampling:** Snowball sampling is a technique in which the existing sample elements from their contacts recruit sample elements. In this, the sampling begins with a small pool of elements that met the sampling criteria and by their referral, the sample size grows. Hence, the sample group seems to expand like a rolling snowball. This technique

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is also known as chain-referral sampling, chain sampling and referral sampling. This technique is usually employed when the subjects are hard to trace or the topic is extremely sensitive. For example, surveys to gather information about alcohol addicts or HIV aids patients.

4.3.3 Parameter and Statistic:

A **parameter** is a number that describes a whole population (such as population mean), whereas a **statistic** is a number that describes a sample (such as sample mean). For example, the average income in India is a population parameter. In contrast, the average income for a sample chosen from India is a sample statistic. Both these values indicate the average income, but one is a parameter while the other is a statistic.

Let us look at Table 4.1 below to understand the Parameter and Statistics of various techniques:

Table 4.1: Summary Value, Parameter and Statistic

Summary Value	Parameter	Statistic
Mean	μ or Mu	x̄ or x-bar
Standard deviation	σ or Sigma	s
Proportion	P	p̂ or p-hat
Correlation	ρ or rho	r

Now, let us understand the difference between a parameter and a statistic by carefully looking at how the same subject and the summary value can be either a parameter or a statistic in Table 4.2. This difference is based on whether that value is summarized as a population or a sample.

Table 4.2: Examples of Parameter and Statistic

Parameter	Statistic
Mean weight of all Bulldogs.	Mean weight of a random sample of 100 Bulldogs.
Standard deviation of all transaction times in an SBI bank	Standard deviation of a random sample of 1000 transaction times at SBI bank.

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IN-TEXT QUESTIONS

6. Median income of 500 college students in University of Delhi is an example of:
   a) Statistic b) Parameter
   c) Proportion d) Population
7. Which of the following is called Interval Sampling?
   a) Simple Random Sampling b) Stratified Sampling
   c) Purposive Sampling d) Cluster Sampling
8. For stratified sampling, the strata should be:
   a) Mutually exclusive b) Collective exhaustive
   c) Both a and b d) Overlapping
9. _____ is a technique in which the existing samples elements from their contacts recruit sample elements:
   a) Snowball Sampling b) Systematic Random Sampling
   c) Purposive Sampling d) Cluster Sampling
10. A _____ is a number that describes a whole population.
   a) Element b) Parameter
   c) Proportion d) Statistic

ACTIVITY

A research scholar wants to collect the data from the banks' customers who are using electronic banking services to analyse the satisfaction and loyalty of the customers towards the electronic banking services offered by their banks. As a researcher, what all are required to be undertaken for collecting the data? Do you need to take sample? Which sampling technique you will use? Is it probability sampling or non-probability sampling? Discuss the same keeping in view of the various sampling techniques available in research.

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4.4 SAMPLING DISTRIBUTION OF THE SAMPLE MEAN

4.4.1 Describing Sampling Distributions

Any probability distribution (and, hence, any sampling distribution) is a list of all possible values for a statistic and the probability associated with each value can be somewhat represented by its mean and standard deviation (see Fig. 4.1).

"*A probability distribution of all the possible means of the samples is a distribution of sample means*" which is known as the **sampling distribution of the mean**. It tends to be normal for samples of all sizes whenever the population is considered to be normal. The **sampling distribution of the proportion** is defined as "*a probability distribution of all the possible proportions of the samples which may be somewhat represented by the mean and standard deviation of the distribution of the proportions*".

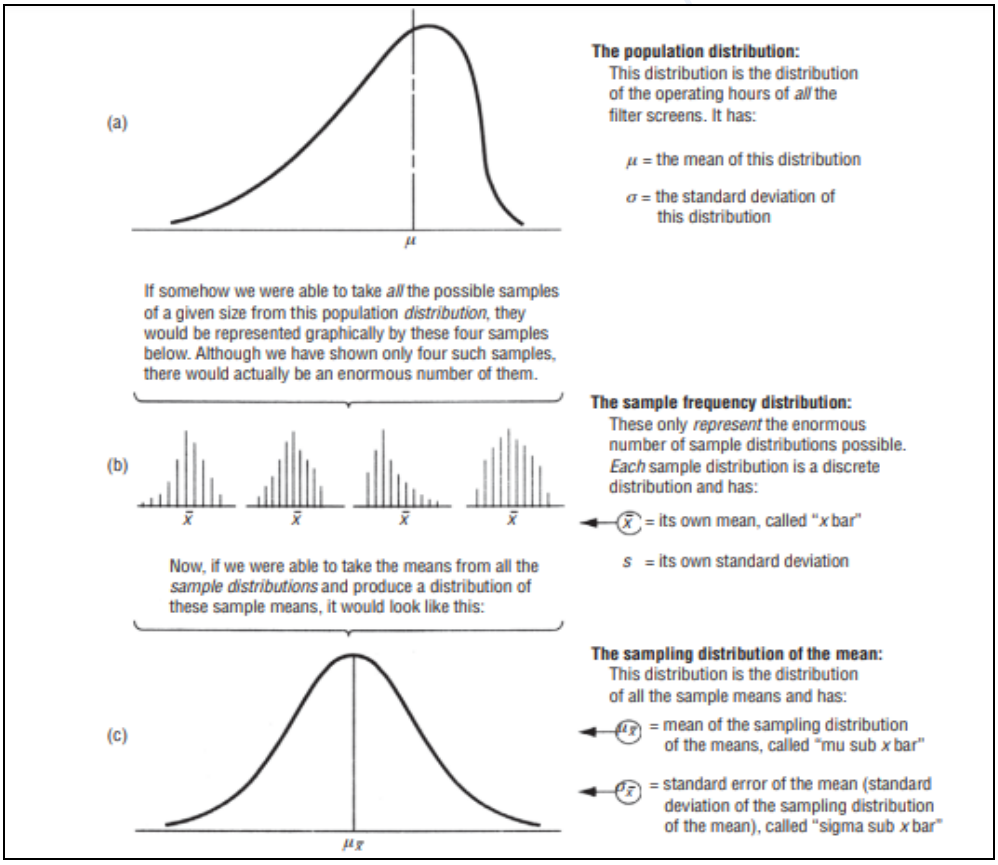

Fig 4.1: Conceptual Population Distribution, Sample Distributions, and Sampling Distribution (*Source: Levin, Siddiqui, Rastogi & Rubin, 2017*).

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The Mean of the Sampling Distribution of the Mean

It is defined as *"the mean of the population from which the scores are sampled"*. Hence, the population mean and mean of the sampling distribution of the mean are equal as shown in the below formula:

Mean of the sampling distribution of the mean ← $\mu_{\bar{x}} = \mu$ → **Population Mean**

The Variance of the Sampling Distribution of the mean

It is defined as the population variance that is divided by the sample size "*n*" as shown below:

Variance of the sampling distribution of the mean → $\sigma^2_{\bar{x}} = \frac{\sigma^2}{n}$ ← **Population Variance**

Sample Size → n

The above formula depicts that as the sample size increases, the variance of the sampling distribution of the mean decreases, hence, an inverse relationship exists between the two.

Illustration 4.1: Assume, the population variance and the sample size given are 120 and 25 respectively. You are required to calculate the variance of the sample mean.

Solution: To compute the value of the variance of the sample mean,

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{120}{\sqrt{25}}$$

$$= \mathbf{40}$$

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Illustration 4.2: Assume in the previous example, the sample size increases to 36. Now, calculate the variance of the sample mean.

Solution: To compute the value of the variance of the sample mean,

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{120}{\sqrt{36}}$$

$$= \mathbf{20}$$

As the sample size increases from 25 to 36, the variance of the sample mean decreases from 40 to 20 depict an inverse relationship between the two.

The Standard Error of the Sampling Distribution of the mean

It reveals how much we are anticipating the means from various samples to differ due to sampling error. It is known as the *standard error of the mean*. The distribution of the sample means that is less spread or has a smaller standard error is considered to be a better estimator of the population mean.

- **When the population is <u>infinite</u>, the formula for standard error is:**

Standard error of the mean (Infinite population)

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

Population Standard Deviation

Sample Size

- **When the population is <u>finite</u> and our sample is more than 5 percent of the population, the formula for standard error is:**

Standard error of the mean (Finite population)

Population Standard Deviation

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \times \frac{\sqrt{N-n}}{\sqrt{N-1}}$$

Sample Size

Population Size

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Illustration 4.3: Assume, the population size in the case of textile enterprise is 40 whereas the population standard deviation is 10. Suppose, we take a random sample of 10 of these textile enterprises. You are required to compute the standard error of the mean.

Solution: To compute the value of the standard error of the mean,

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \times \frac{\sqrt{N-n}}{\sqrt{N-1}}$$

$$= \frac{150}{\sqrt{10}} \times \frac{\sqrt{40-10}}{\sqrt{40-1}}$$

$$= (47.44)\ (0.877)$$

$$= \mathbf{41.60}$$

Illustration 4.4: Assume, a random sample of 25 is drawn from a population of 120 and the population standard deviation given is 50. Compute the standard error of the mean.

Solution: To compute the value of the standard error of the mean,

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \times \frac{\sqrt{N-n}}{\sqrt{N-1}}$$

$$= \frac{50}{\sqrt{25}} \times \frac{\sqrt{120-25}}{\sqrt{120-1}}$$

$$= (10)\ (0.894)$$

$$= \mathbf{8.94}$$

4.4.2 Central Limit Theorem:

The central limit theorem states that:

"*Given a population with a finite mean μ and a finite non-zero variance σ^2, the sampling distribution of the mean approaches a normal distribution with a mean of μ and a variance of σ^2/n as n, the sample size, increases*".

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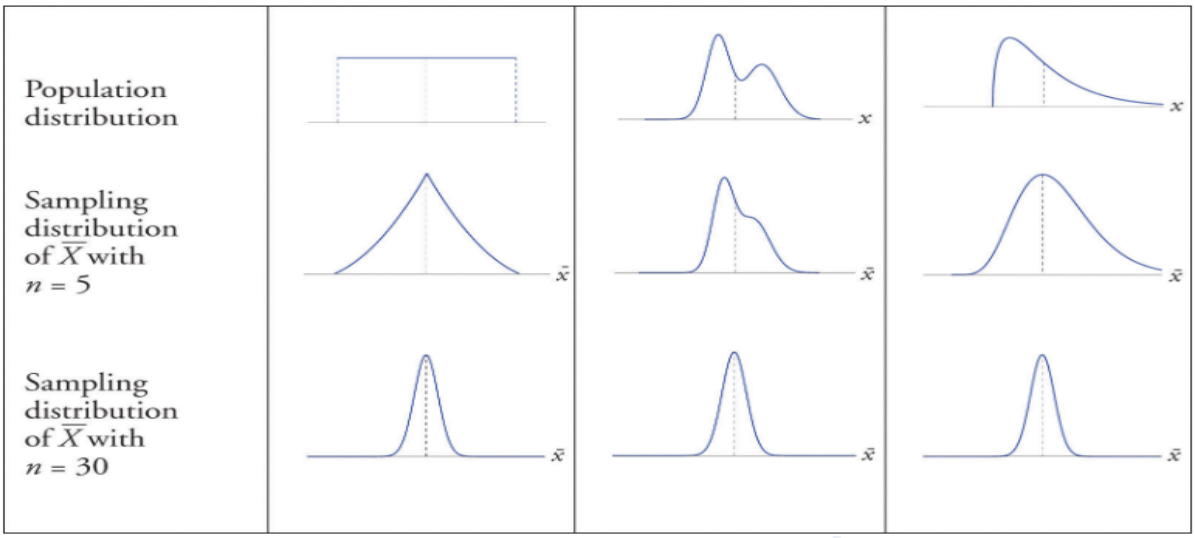

Fig. 4.2 Distribution of Populations and Sample Means (*Source:* https://saylordotorg.github.io/text_introductory-statistics/s10-02-the-sampling-distribution-of-t.html)

The population means are indicated by the dashed vertical lines as shown in Fig 4.2. As the sample size increases (regardless of population distribution), the shape of the sampling distribution of the sample mean becomes progressively bell-shaped, centered on the population mean. The distribution of the sample mean approximately becomes a normal distribution by the time the sample size reaches 30.

Also, if the sample is drawn from a normal population, the sample distribution of the mean will be normal irrespective of the sample size.

The formula for determining the probability that the mean will lie between the specified values is:

$$z = \frac{x - \mu}{\sigma}$$

According to the above formula, we must subtract the mean of the variable being standardized and divide it by the standard error in order to convert any "*normal random variable*" to a "standard normal random variable". As a result, in this case, the above formula becomes

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Sample mean

Population mean

$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$$

Standard error of the mean

This is the formula for standardizing the sample mean.

Illustration 4.5: The mean and standard deviation of the population is μ= Rs 13,525 and σ= Rs 4,180. Assume 100 samples are randomly drawn from the population. Calculate the mean and standard deviation of the sample mean.

Solution: Since n=100,

$\mu_{\bar{x}} = \mu$ =Rs 13,525

and

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{\text{Rs } 4{,}180}{\sqrt{100}} = \text{Rs } 418$

Illustration 4.6: The mean and standard deviation of the population is μ = Rs 112 and σ = Rs 40. Assume 50 samples are randomly drawn from the population.

a) Calculate the mean and standard deviation of the sample mean.

b) What will be the probability that the sample mean lies between a value of 110 and 114?

Solution:

a) Since n=50 ,

$\mu_{\bar{x}} = \mu$ =Rs 112

and,

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{\text{Rs } 40}{\sqrt{50}} = 5.65685$

b) The probability that the sample mean lies between a value of 110 and 114:

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In the question, it is given that 50 samples are drawn, so, as per this Central Limit Theorem applies which means that as the sample size exceeds 30, the sample mean becomes approximately normally distributed.

$$P(110 < \bar{X} < 114) = P\left(\frac{110 - \mu_{\bar{x}}}{\sigma_{\bar{x}}} < z < \frac{114 - \mu_{\bar{x}}}{\sigma_{\bar{x}}}\right)$$

$$= P\left(\frac{110 - 112}{5.65685} < z < \frac{114 - 112}{5.65685}\right)$$

$$= P(-0.35 < Z < 0.35) = 0.6368 - 0.3632 = \mathbf{0.2736}$$

It is a 27.36% probability that the sample mean will lie between 110 and 114.

Illustration 4.7: The population of miles driven by truckers exhibits a mean and standard deviation of 38.5 miles and 2.5 miles respectively. If a random sample of five drivers is taken, determine the probability that the sample mean will be less than 36 miles. Assume that the population of miles is normal.

Solution: In this, the sample mean is:

$$\mu_{\bar{x}} = \mu = 38.5$$

and, the standard deviation is:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{2.5}{\sqrt{5}} = 1.11803$$

As the sample size exceeds 30, the sample mean becomes approximately normally distributed.

Hence,

$$P(\bar{X} < 36) = P\left(z < \frac{36 - \mu_{\bar{x}}}{\sigma_{\bar{x}}}\right)$$

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$= P\left(z < \frac{36-38.5}{1.11803}\right)$

$= P(z < -2.24) =$ **0.0125**

It is a 1.25% probability that the sample mean will be less than 36.

4.4.3 Relationship between Sample Size and Standard Error:

There is an inverse relationship between sample size and standard error. As the sample size increases, the standard error decreases which means that the value of any sample means will likely be closer to the value of the population mean.

Illustration 4.8: Calculate the value of standard error when the population standard deviation σ given is 100 and the sample size is:

a) 25

b) 64

Solution:

a) When the sample size is 25

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{25}} = \frac{100}{5} = 20$

b) When the sample size is 64

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{64}} = \frac{100}{6} = 16.67$

As the sample size increases from 25 to 64, the standard error decreases from 20 to 16.67 depicting an inverse relationship between the two. As a result, there is a "*diminishing return in sampling*" because $\sigma_{\bar{x}}$ varies inversely with the square root of *n*.

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4.4.4 Sampling Distributions of Sample Proportion:

The **sampling distribution of the proportion** is defined as "*a probability distribution of all the possible proportions of the samples which may be somewhat represented by the mean and standard deviation of the distribution of the proportions*".

- **The formula for the mean of the sample proportion is:**

Mean of sample proportion ← $\mu_{\hat{p}} = p$ → **Mean of Population proportion**

- **The formula for the mean of the standard error of the sample proportion is:**

Standard error of the sample proportion ← $\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$ **, where q= 1- p**

Illustration 4.9: An opinion poll of 900 residents of a large city asks whether they favour a particular bond issue. If 45% are in favour, calculate the mean and standard error of the sample proportion (from a sample of 400).

Solution: In this,

p = 0.45,

hence q =1− p = 0.55.

The mean and standard deviation of the sample proportion is:

$\mu_{\hat{p}} = p = 0.38$

$\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.45)(0.55)}{400}} = \mathbf{0.0249}$

Illustration 4.10: An opinion poll of 5000 residents of a large city asks whether they favor a particular bond issue. If 35% are in favor, calculate the mean and standard error of the sample proportion (from a sample of 1600).

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Solution: In this,

p = 0.35,

hence q =1− p = 0.65.

The mean and standard deviation of the sample proportion is:

$\mu_{\hat{p}} = p = 0.35$

$\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.35)(0.65)}{1600}} = \mathbf{0.11925}$

IN-TEXT QUESTIONS

16. Suppose that a population with N= 144 has μ= 24. What is the mean of the sampling distribution of the mean if the sample size given is 30?
a) 2 b) 4.8
c) 24 d) cannot be determined from given information
17. The central limit theorem assures that the sampling distribution of the mean:
a) is always normal
b) is always normal for large samples
c) appears normal only when N is greater than 1000.
d) Approaches normality as sample size increases.
18. Standard error ($\sigma_{\bar{x}}$) varies _____with the square root of n.
a) directly b) inversely
c) positively d) no relation
19. Suppose the population with N=200 has μ= 14 and a standard deviation of 3. The sample size of your sampling distribution is 100. What is the standard error of the sampling distribution of the mean?
a) 14 b) 3
c) 0.3 d) cannot be determined from given information
20. As per central limit theorem, as the sample size reaches ____, the distribution of the sample mean approaches the normal distribution.
a) 10 b) 20
c) 30 d) 40

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4.5 ESTIMATION

4.5.1 Describing Estimator and Estimate

An **estimator** is defined as a sample statistic that is employed to estimate a population parameter. In other words, an estimator is a method of estimation i.e. statistical measure that has been used. For estimating the population mean μ, the sample mean " $\bar{x}$ " can be used as an estimator whereas for estimating the population proportion, the sample proportion can be used as an estimator.

Whenever we want to describe a particular numerical value of our estimator, we use the term "**estimate**". To put it in another way, an estimate is described as "*a specific observable statistical value*". For example (see table 4.3):

Table 4.3: Example of Population, Population Parameter, Sample Statistic and Estimate

Population (interested)	Population Parameter (Wish to estimate)	Sample Statistic (estimator)	Estimate
Employees in a chocolate factory	Mean turnover per year	Mean turnover for 1 month	9.5% turnover per year

In this example, the mean turnover for 1 month is an estimator and the specific numeric value i.e. 9.5% is an estimated value.

4.5.2 Criteria of a Good Estimator:

As you have now understood the meaning of an estimator and estimate, let us explore the various criteria of a good estimator. A good estimator is typically close to the parameter being estimated. Hence, its quality will be determined by the following four properties namely:

Unbiasedness

An estimator is called an unbiased estimator when the expected value of the estimator is the same as that of the population parameter that is being estimated. That is, if θ is an unbiased estimate of θ, then E (θ) must be equal to θ. The sample mean is considered to be an unbiased estimator of a population mean. This is so because the population mean itself is

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equivalent to the mean of the sampling distribution of a sample mean drawn from the same population. Many estimators are "asymptotically unbiased," which means that their biases reduce to a nearly insignificant value (zero) when *n* becomes sufficiently large.

Efficiency

The term "efficiency" relates to an estimator's sampling variability i.e. the magnitude of the standard error of the statistic. When two unbiased estimators compete, the one with the lower standard error or standard deviation of the sampling distribution (for a given sample size) is considered to be relatively more efficient. For example, in order to estimate the population mean, we should decide whether to go for the sample mean or sample median. So, for this, we have calculated the standard error of both the sample mean and sample median and it was found to be 2.4 and 2.6 respectively. Hence, we can conclude that for estimating the population mean, the sample mean is a more and better estimator as compared to the sample median because it has a smaller standard error. Therefore, the smaller the estimator's standard error, the more concentrated the distribution of an estimator around the parameter being estimated, and hence the better this estimator is.

Consistency

Whenever there is an increase in the sample size, an estimator approaches the population parameter closer and closer. Hence, we can say that an estimator is a consistent estimator of a population parameter. To put it more precisely, an estimator becomes more accurate with larger samples if it is consistent. The sample mean is considered an unbiased estimator of a population mean irrespective of the shape of the population distribution, while the sample median is an unbiased estimate of a population mean only if the population distribution is symmetrical. In terms of both unbiasedness and consistency, the sample mean outperforms the sample median as an estimate of a population mean.

Sufficiency

An estimator is considered to be sufficient if it conveys as much information about the parameter in the sample as possible. The importance of sufficiency stems from the fact that if a sufficient estimator exists, it is completely unnecessary to examine any other estimate; a sufficient estimator guarantees that all information a sample may provide with regard to the estimation of a parameter has been extracted.

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There are several techniques for estimating parameters that might result in estimators meeting these properties. The two most essential methods are the least square method and the maximum likelihood method.

4.5.3 Point Estimates

From the previous section, we have understood that the sample mean **"**$\bar{x}$*"* is considered to be the best estimator of the population mean *"*μ*"*. It has all four properties namely unbiasedness, efficiency, consistency and sufficiency.

Point estimation is described as the process of determining an estimated value of a population parameter such as the mean of a population from random samples of the population. Any statistic can be referred to as a point estimate. A statistic is considered to be an estimator of some parameter in a population. It is a type of estimation in which a single value or a sample statistic is used to infer information about the population parameter as a single value or point.

For instance:

- A point estimate of the population mean (μ) is the Sample mean ($\bar{x}$)
- A Point estimate of the population variance (σ^2) is the Sample variance (s^2)
- A Point estimate of the population standard deviation (σ) is the Sample standard deviation (s).

Point Estimate for the Population Mean

Consider the case of a pen manufacturing company. Each pen is individually wrapped in a clean package before being haphazardly packed in a huge corrugated box. Because of the haphazard packing, each carton contains a different quantity of pens. Because the pens are sold per unit, the corporation needs to know how many pens are in each carton for invoicing purposes. We randomly selected 5 boxes (105+ 110+ 120+ 115+ 130) and counted the number of pens in each. As you are aware, the sample mean is computed by adding all of the individual values (in this case, 580) and then dividing by the number of samples tested (in this case, 5).

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$$\textbf{Sample Mean: } \bar{x} = \frac{\sum x}{n}$$

In order to solve this question, we can use the above equation and we get 580/5=116 pens. As a result, the point estimate of the population mean, using the sample mean as our estimator, is found to be **116** pens per box.

Point Estimate for the Population Variance & Standard Deviation

Now to estimate the variance or standard deviation associated with a population, the point estimate of the population variance and standard deviation is simply the sample variance and sample standard deviation as follows:

$$\textbf{Sample Variance: } s^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

$$\textbf{Sample Standard Deviation: } s = \frac{\sqrt{\sum (x_i - \bar{x})^2}}{\sqrt{n-1}}$$

Point Estimate for the Population Proportion

The point estimate for the population proportion is defined as the proportion of units in a given population that possess a specific property. It is symbolized as $\bar{p}$. If we get to know the proportion of sample units that have the same attributes (symbolized p), we can use this $\bar{p}$ as an estimator of p.

4.5.4 Interval Estimates:

An interval estimate is described as a set of values between which a population parameter falls. For example, $a < \bar{x} < b$ is an interval estimate of the population mean. It depicts that the population mean is greater than "*a*" but less than "*b*".

4.5.5 Confidence Intervals:

A confidence interval comprises three parts namely i) Confidence level, (ii) Margin of error, and iii) Statistic. The confidence level is defined as the uncertainty level in a process of sampling. An interval estimate is formed by a margin of error and statistics that represent the accuracy of the method. The margin of error of a sample statistic produces the interval estimate of a confidence interval.

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We may, for instance, state that we have a 90% confidence level that the true population mean lies within a given range. This is a confidence interval. To put it another way, if the same sampling procedure is being used to choose other samples and determine various interval estimates, then, in this case, 90% of the time the true population mean would fall within the range indicated by the sample statistic margin of error. The confidence interval for a 90% confidence level is:

$$\bar{x} - 1.64\sigma_{\bar{x}} = \text{lower limit}$$

$$\bar{x} + 1.64\sigma_{\bar{x}} = \text{upper limit}$$

Hence, the confidence limits are defined as the lower and upper limits of the confidence interval.

Confidence intervals are preferable over point estimates as they emphasize both the uncertainty and precision of the estimate.

Confidence Level

A confidence level is defined as "*the probability element of a confidence interval*". It expresses our level of assurance that a specific sampling procedure will produce a confidence interval containing the true population parameter. Assume we collected several samples and generated confidence intervals for each. While certain confidence intervals might accurately represent the population parameter, others would not. For instance, if the confidence interval is 90%, it assures that 90% of the intervals will have the true population parameter.

Relationship between Confidence Level and Confidence Interval

We might believe that in all estimating issues, we should employ a high confidence level, such as 99%. A high confidence level appears to indicate an estimate with a high degree of precision. However, in reality, a high confidence level will result in large confidence intervals, which are not accurate because they may yield vague estimates.

Confidence Intervals for the Population Mean for Large Samples

The level of confidence can be any number between 0 and 100% but the most common values are probably 90% (α=0.10), 95% (α=0.05), and 99% (α=0.01). For 95% confidence, see Fig 4.3.

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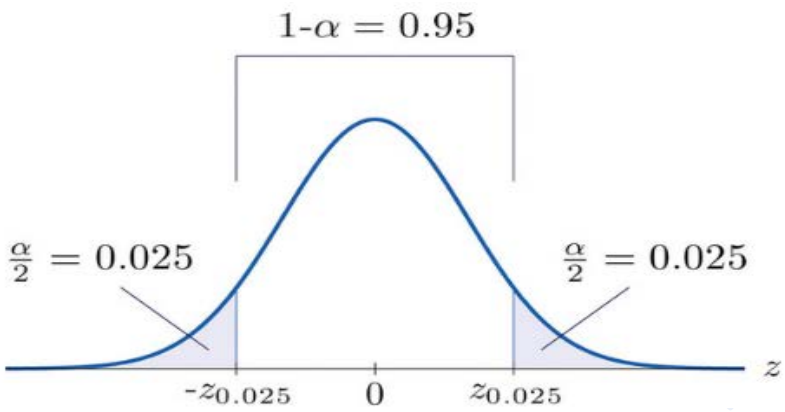

Fig 4.3: For 95% confidence, the area in each tail is α/2 = 0.025.

When the population standard deviation (σ) is unknown, in that case, for estimating the population standard deviation, we will make use of the sample standard deviation. So, in this σ will be replaced by **s**. However, we can also symbolize this estimated value by $\hat{\sigma}$, which is called a sigma hat.

- **The formula for the confidence intervals for the population mean for large samples (n≥ 30):**

  If σ is known: $\bar{x} \pm z_{a/2} \frac{\sigma}{\sqrt{n}}$

  If σ is unknown: $\bar{x} \pm z_{a/2} \frac{s}{\sqrt{n}}$

- **Estimate of the Population Standard Deviation (When the population is Infinite)**

$$\hat{\sigma} = s = \frac{\sqrt{\sum (x_i - \bar{x})^2}}{\sqrt{n-1}}$$

- **Estimate of the Population Standard Deviation (When the population is Finite)**

$$\hat{\sigma}_{\bar{x}} = \frac{\hat{\sigma}}{\sqrt{n}} \times \frac{\sqrt{N-n}}{\sqrt{N-1}}$$

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Illustration 4.11: A random sample of 36 was drawn having a sample mean of 150. The population standard deviation given is 24. You are required to provide the confidence interval assuming a 95% confidence interval.

Solution: In this question, the population standard deviation is known.

n= 36, σ = 24, $z_{a/2}$ = 1.96 and $\bar{x}$ = 150

$$\frac{\sigma}{\sqrt{n}} = \frac{24}{\sqrt{36}} = 4$$

Now, let us find the confidence limits:

$$\bar{x} \pm z_{a/2} \frac{\sigma}{\sqrt{n}}$$

= 150 ± 1.96 (4) = 150 ± 7.84

= **(142.16, 157.84)**

Illustration 4.12: A random sample of 25 was drawn having a sample mean of 120 and a sample standard deviation of 15. You are required to provide the confidence interval assuming a 95% confidence interval.

Solution: In this question, the population standard deviation is unknown.

n= 25, σ = 15, $z_{a/2}$ = 1.96 and $\bar{x}$ = 120

$$\frac{s}{\sqrt{n}} = \frac{15}{\sqrt{25}} = 3$$

Now, let us find the confidence limits:

$$\bar{x} \pm \frac{z_{a/2}\, s}{\sqrt{n}}$$

= 120 ± 1.96 (3) = 120 ± 5.88

= **(114.12, 125.88)**

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Margin of Error

In a confidence interval, the margin of error is defined as *"the range of values above and below the sample statistic"*. For example, assume that the local newspaper conducts an election poll and finds that the independent candidate will receive 40% of the vote. The survey, according to the newspaper, had a 5% margin of error and a 95% confidence level. Based on these observations, the confidence interval is as follows:

"We are 95% confident that the independent candidate will receive between 30% and 40% of the vote".

The formula for the margin of error is:

$$E = z_{a/2} \frac{\sigma}{\sqrt{n}}$$

$$E = z_{a/2} \frac{s}{\sqrt{n}}$$

Confidence Intervals for the Population Mean from Small Samples

If the population standard deviation is unknown and we have a small sample size "*n*", then when we replace the sample standard deviation s for σ, the normal approximation is no longer applicable. In this scenario, we choose a different distribution known as the "***Student's t-distribution***" with *n-1* degrees of freedom (*df*).

The Student's t-distribution is similar to the standard normal distribution in that it is centered at 0 and has the same qualitative bell shape, but it has heavier tails than the standard normal distribution, as seen in Fig. 1.4, where the curve (in brown) that meets the dashed vertical line at the lowest point is the t -distribution with two degrees of freedom, the next curve (in blue) is the t-distribution with five degrees of freedom, and the thin curve (in red) is the standard normal distribution. As seen in Fig 1.4, as the sample size *n* rises, Student's t-distribution approaches the standard normal distribution. Although there is a separate t-distribution for each value of *n*, if the sample size is 30 or greater, it is usually appropriate to use the standard normal distribution.

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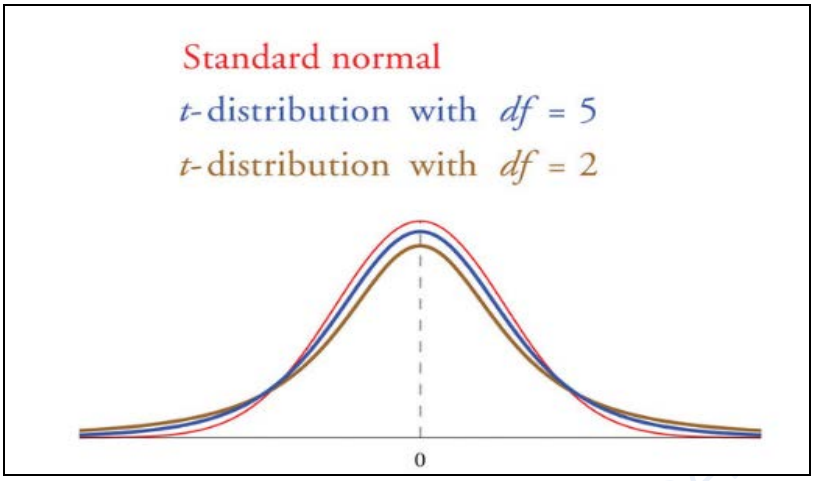

Fig 4.4: Student's t- distribution

- **The formula for the confidence intervals for the population mean for small samples (n<30):**

If σ is known: $\bar{x} \pm z_{a/2} \frac{\sigma}{\sqrt{n}}$

If σ is unknown: $\bar{x} \pm t_{a/2} \frac{s}{\sqrt{n}}$

Degrees of freedom i.e. *df* = n-1 and population must be normally distributed.

Illustration 4.13: A random sample of 25 was drawn having a sample mean of 120 and a sample standard deviation of 15. You are required to provide the confidence interval assuming a 95% confidence interval.

Solution: In this the population standard deviation is unknown.

n= 25, σ = 15, $z_{a/2}$ = 1.96 and $\bar{x}$ = 120

$$\frac{s}{\sqrt{n}} = \frac{15}{\sqrt{25}} = 3$$

Now, let us find the confidence limits:

$$\bar{x} \pm z_{a/2} \frac{s}{}$$

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$\sqrt{n}$

= 120 ± 1.96 (3) = 120 ± 5.88

= **(114.12, 125.88)**

Illustration 4.14: Based on the random sample of 25 people working in a company, the average travel time to reach the office is 60 minutes. The population standard deviation given is of 20 minutes. You are required to design the working hours by establishing a 99% confidence interval for the average travel time of everyone in the company.

Solution: In this, the population standard deviation is known.

n= 36, σ = 20, $z_{a/2}$ = 2.58 and $\bar{x}$ = 60

$$\frac{\sigma}{\sqrt{n}} = \frac{20}{\sqrt{25}} = 4$$

Now, let us find the confidence limits:

$$\bar{x} \pm z_{a/2} \frac{\sigma}{\sqrt{n}}$$

= 60 ± 2.58 (4) = 60 ± 10.32

= **(49.68, 70.32)**

Illustration 4.15: Based on the random sample of 100 people working in a company, the average travel time to reach the office is 60 minutes with a standard deviation of 20 minutes. You are required to design the working hours by establishing a 95% confidence interval for the average travel time of everyone in the company.

Solution: In this the population standard deviation is unknown.

n= 100, s = 20, $t_{a/2}$ = 2.262 and $\bar{x}$ = 60

$$\frac{s}{\sqrt{n}} = \frac{20}{\sqrt{100}} = 2$$

Now, let us find the confidence limits:

$$\bar{x} \pm z_{a/2} \frac{s}{}$$

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$\sqrt{n}$

$= 60 \pm 2.262\ (2) = 60 \pm 4.524$

$=$ **(55.476, 64.524)**

Confidence Intervals for the Proportion Mean from Large Samples

The formula for determining the mean and standard error of proportion (already covered in detailed in the sampling section of this lesson).

- **The formula for the mean of the sample proportion is:**

Mean of sample proportion ← $\mu_{\bar{p}} = p$ → Mean of Population proportion

- **The formula for the standard error of the sample proportion is:**

Standard error of the sample proportion ← $\sigma_{\bar{p}} = \frac{\sqrt{p\,q}}{\sqrt{n}}$, where q= 1- p

- **Estimated Standard error of proportion:**

Symbol signifying standard error of proportion estimated ← $\hat{\sigma}_{\bar{p}} = \frac{\sqrt{\bar{p}\,\bar{q}}}{\sqrt{n}}$ → Sample Statistic

Confidence Interval formula for a Population Proportion (large samples):

$$\hat{p} \pm z_{a/2} \frac{\sqrt{\hat{p}\,(1-\hat{p})}}{\sqrt{n}}$$

Illustration 4.16: A random sample of 100 students is chosen for estimating the proportion of female students at a large college. In the sample, there are 65 female students. You are required to construct a 90% confidence interval for the proportion of female students at the college.

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Solution: The proportion of female students in the sample is

$\hat{p}$ =65/100=0.65

A 90% Confidence level means that α =1− 0.90=0.10,

So, α/2=0.05, hence, $z_{0.05}$=1.65.

$$\hat{p} \pm z_{a/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$= 0.65 \pm 1.65\sqrt{\frac{p(1-\hat{p})}{n}}$$

$$= 0.65 \pm 1.65\sqrt{\frac{(0.65)(0.35)}{100}}$$

$$= 0.65 \pm 0.079$$

$$= (0.571, 0.729)$$

Hence, the confidence interval for the proportion of female students at the college is (0.571, 0.729).

Illustration 4.17: A random sample of 100 students is chosen for estimating the proportion of female students at a large college. In the sample, there are 65 female students. You are required to construct a 90% confidence interval for the proportion of female students at the college.

Solution: The proportion of female students in the sample is

$\hat{p}$ =65/100=0.65

A 90% Confidence level means that α =1− 0.90=0.10,

So, α/2=0.05, hence, $z_{0.05}$=1.65.

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$$\hat{p} \pm z_{a/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$= 0.65 \pm 1.65\sqrt{\frac{p(1-\hat{p})}{n}}$$

$$= 0.65 \pm 1.65\sqrt{\frac{(0.65)(0.35)}{100}}$$

$$= 0.65 \pm 0.079$$

$$= \mathbf{(0.571, 0.729)}$$

Hence, the confidence interval for the proportion of female students at the college is (0.571, 0.729).

Illustration 4.18: A random sample of 25 students is chosen for estimating the proportion of female students at a large college. In the sample, there are 45 male students. You are required to construct a 95% confidence interval for the proportion of male students at the college.

Solution: The proportion of female students in the sample is

$\hat{p} = 45/100 = 0.45$

A 95% Confidence level means that $\alpha = 1 - 0.95 = 0.05$,

So, $\alpha/2 = 0.025$, hence, $z_{0.025} = 1.96$.

$$\hat{p} \pm z_{a/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$= 0.45 \pm 1.96\sqrt{\frac{p(1-\hat{p})}{n}}$$

$$= 0.45 \pm 1.96\sqrt{\frac{(0.45)(0.55)}{25}}$$

$$= 0.45 \pm 0.976$$

$$= \mathbf{(0.526, 1.426)}$$

Hence, the confidence interval for the proportion of female students at the college is (0.526, 1.426).

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4.5.6 Determining the Sample Size in Estimation:

The formula for the minimum sample size required for estimating a population mean:

Sample size → $n = \frac{(z_{a/2})^2 \sigma^2}{E^2}$ ← Population Standard Deviation

Margin of Error

Illustration 4.19: You are required to find out the minimum sample size needed to establish a 99% confidence interval for μ with a margin of error (E) = 0.2. Assume that the population standard deviation is σ = 1.3.

Solution: 99% Confidence level means that α = 1− 0.99 = 0.01,

So, α/2=0.005, we obtain $z_{0.005}$ = 2.58.

$$n = \frac{(z_{a/2})^2 \sigma^2}{E^2} \quad \textbf{(rounded up)}$$

$$= \frac{(2.58)^2 (1.3)^2}{(0.2)^2} = \mathbf{280.362}$$

The final answer is rounded up to **281** as it is not possible to take a fractional observation.

Illustration 4.20: You are required to find out the minimum sample size needed to establish a 95% confidence interval for μ with a margin of error (E) = 0.5. Assume that the population standard deviation is σ = 2.5.

Solution: 95% Confidence level means that α = 1− 0.95 = 0.05,

So, α/2=0.005, we obtain $z_{0.025}$ = 1.96

$$n = \frac{(z_{a/2})^2 \sigma^2}{E^2} \quad \textbf{(rounded up)}$$

$$= \frac{(1.96)^2 (2.5)^2}{(0.5)^2} = \mathbf{96.2}$$

The final answer is rounded up to **96** as it is not possible to take a fractional observation.

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IN-TEXT QUESTIONS

11. Which of the following is not the property of a good estimator?
    a) Sufficiency b) Biasedness
    c) Consistency d) Efficiency
12. A _____is described as a set of values between which a population parameter falls.
    a) Interval Estimate b) Point Estimate
    c) Confidence Level d) Margin of Error
13. If the population standard deviation is unknown and the sample size n is small, then we use _____ distribution?
    a) Normal Distribution b) Student t–distribution
    c) Non-normal Distribution d) Polynomial Distribution
14. A sample of 45 individuals is taken from a population of 650. From this sample, the sample mean is found to be 3.6 and standard deviation is found to be 2.52 respectively. You are required to calculate the estimated standard error of the mean?
    a) 0.476 b) 0.376
    c) 0.276 d) 0.176
15. Population mean is denoted by which symbol?
    a) $\bar{x}$ b) $\sigma_{\bar{x}}$
    c) s^2 d) μ

4.6 SUMMARY

- A population is a total group about whom the researcher wishes to make conclusions.
- A sample is a particular group from whom you will gather the data.
- Sampling is a process of picking individuals in order to draw conclusions from them statistically and estimate the entire population's attributes.

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- A type of sampling technique in which a researcher chooses specific criteria and picks individuals randomly from a population is known as probability sampling. It is categorized into four types namely simple random sampling, stratified random sampling, systematic sampling and cluster sampling techniques.
- Non-probability sampling is a sampling approach in which a researcher selects study participants at random. There are four types of non-probability sampling namely convenience sampling, purposive sampling, quota sampling and snowball sampling techniques.
- A parameter is a number that describes a whole population (such as population mean), whereas a statistic is a number that describes a sample (such as sample mean).
- The sampling distribution of the mean is defined as "*the probability distribution of all the possible means of the samples is a distribution of sample means*".
- The sampling distribution of the proportion is defined as "*a probability distribution of all the possible proportions of the samples which may be somewhat represented by the mean and standard deviation of the distribution of the proportions*".
- The central limit theorem states that "*Given a population with a finite mean μ and a finite non-zero variance σ^2, the sampling distribution of the mean approaches a normal distribution with a mean of μ and a variance of σ^2/N as N, the sample size, increases*".
- An estimator is defined as a sample statistic that is employed to estimate a population parameter. Whenever we want to describe a particular numerical value of our estimator, we use the term "estimate".
- The four properties of a good estimator are unbiasedness, efficiency, consistency and sufficiency.
- Point estimation is described as the process of determining an estimated value of a population parameter such as the mean of a population from random samples of the population whereas an interval estimate is described as a set of values between which a population parameter falls.
- A confidence level is the probability element of a confidence interval.

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4.7 GLOSSARY

Central Limit Theorem: As the sample size "n" increases the sampling distribution of the mean tends to approach normality irrespective of the shape of the population distribution.

Cluster Sampling: A probability technique in which researchers divide a population into subpopulations (known as clusters) that reflect the population.

Confidence Interval: A range of values that has some designated probability of including the true population parameter value.

Confidence Level: Reflects the degree of uncertainty in a sampling process.

Consistent Estimator: Whenever there is an increase in the sample size, an estimator approaches the population parameter closer and closer, thus, termed as a consistent estimator of a population parameter.

Convenience Sampling: A non-probability technique in which the samples are selected simply because they were considered to be the most convenient sample to choose from.

Efficient Estimator: Sampling variability of an estimator.

Estimate: A specific observable statistical value.

Estimator: A sample statistic that is employed to estimate a population parameter.

Finite Population: A population having a stated or limited size.

Infinite Population: A population in which it is not possible to describe all the elements theoretically.

Interval Estimate: A set of values between which a population parameter falls.

Non-Probability Sampling: A researcher selects study participants at random.

Parameter: A number that describes a whole population.

Point Estimation: A process of determining an estimated value of a population parameter such as the mean of a population from random samples of the population.

Population: A total group about whom the researcher wishes to make conclusions.

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Probability Sampling: A researcher selects a few criteria and randomly selects individuals from a population.

Purposive Sampling: A non-probability technique in which the researcher selects the sample on the basis of who they believe would be suitable for their study.

Quota Sampling: A non-probability technique in which the samples are selected from different strata in quotas.

Sample: A particular group from whom you will gather the data.

Sampling distribution: A list of all possible values for a statistic and the probability associated with each value that can be partially described by its mean and standard deviation.

S**ampling:** A process of picking individuals in order to draw conclusions from them statistically and estimate the entire population's attributes.

Simple Random Sampling: A probability technique in which every individual in a population is chosen at random, and each individual has an "*equal probability of being chosen in a sample*".

Snowball Sampling: A non-probability technique in which the existing sample elements from their contacts recruit sample elements.

Standard Error of Mean: Reveals how much we are anticipating the means from various samples to differ due to sampling error.

Statistic: A number that describes a sample.

Stratified Random Sampling: A probability technique in which the population is divided into smaller groups (i.e. stratas) where these stratas reflect the entire population and there is no overlapping.

Sufficient Estimator: An estimator is considered to be sufficient if it conveys as much information about the parameter in the sample as possible.

Systematic Sampling: A probability technique in which the researchers choose sample members from a population at periodic intervals.

Unbiased Estimator: An estimator is called an unbiased estimator when the expected value of the estimator is the same as that of the population parameter that is being estimated.

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4.8 ANSWERS TO IN-TEXT QUESTIONS

1. Statistic	9. 0.3
2. Stratified Sampling	10. 30
3. Both a and b	11. Biasedness
4. Snowball Sampling	12. Interval Estimate
5. Parameter	13. Student t–distribution
6. 24	14. 0.376
7. Approaches normality as sample size increases.	15. μ
8. inversely	

4.9 SELF-ASSESSMENT QUESTIONS

1. Explain the various techniques of non-probability sampling with suitable examples.
2. The mean and standard deviation of the population is μ=Rs 12,550 and σ= Rs 2,250. From a population, random samples of 100 are drawn. Calculate the mean and standard deviation of the sample mean.
3. A management consulting agency wants to assess the mean number of years of experience of executives in a given branch of management. A random sample of 28 executives gives $\bar{x}$= 6.7 years and s = 2.4 years. Give a 99% of confidence interval for the average number of years of experience for all executives in this branch.
4. The mean and standard deviation of a population of grade point averages at a college are 3.51 and 0.3 respectively. Determine the probability that the sample mean will fall between 2.41 and 2.71, if, from the population, a random sample of size 100 is selected.
5. Briefly explain the four properties of a good estimator.

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4.11 SUGGESTED READINGS

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LESSON-5

HYPOTHESIS DESIGN AND TESTING

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STRUCTURE

5.1 Learning Objectives

5.2 Introduction

5.3 Population and sample

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5.1 LEARNING OBJECTIVES

- To understand the concept of Hypothesis
- To design the hypothesis
- To learn how to test the hypothesis
- To analyze the concept of Error – I and II
- To explain the hypothesis testing with mean and proportion
- To test hypothesis with confidence interval
- To explain the Analysis of Variance (ANOVA)

5.2 INTRODUCTION

To understand hypothesis in research, students must have prior knowledge of basic statistics like average mean, standard deviation, standard error, sampling methods and sample size etc. In this lesson, students and researchers will be able to understand the concept of hypothesis, designing of hypothesis, and testing of hypothesis with the help of t-test and ANOVA. Students will also learn the basics sampling error – I and error – II.

The researchers and students are always curious to understand the tentative outcome of research. The testing of hypothesis explain us how to design the research hypothesis and how to know with confidence level that on the basis of just one sample how do we predict that same thing is prevailing in population also. This lesson will assist students to understand

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the risk involve in testing hypothesis in terms of Sampling error I and II which will help us to minimize the risk of taking decision of rejecting or fail to reject the hypothesis. This lesson will also explain different types of hypothesis method and how to design hypothesis. The confidence interval will give us more confidence that research has not done any mistake in testing hypothesis. The hypothesis will be tested with the help of T- test and further the extension of t test in term of analysis of Variance (ANOVA).

Research is all about prediction, forecasting and measuring cause effecting relationship among different variables. For example, students can test the hypothesis that intelligence of a student is positively related to student's grade or marks. Similarly, students can collect data and analyse them to test any business problem or situation on the basis of a sample data. This lesson is interesting as it will help students to know the tentative outcome. Fig 5.1 represent the various topics; we have covered in the lesson.

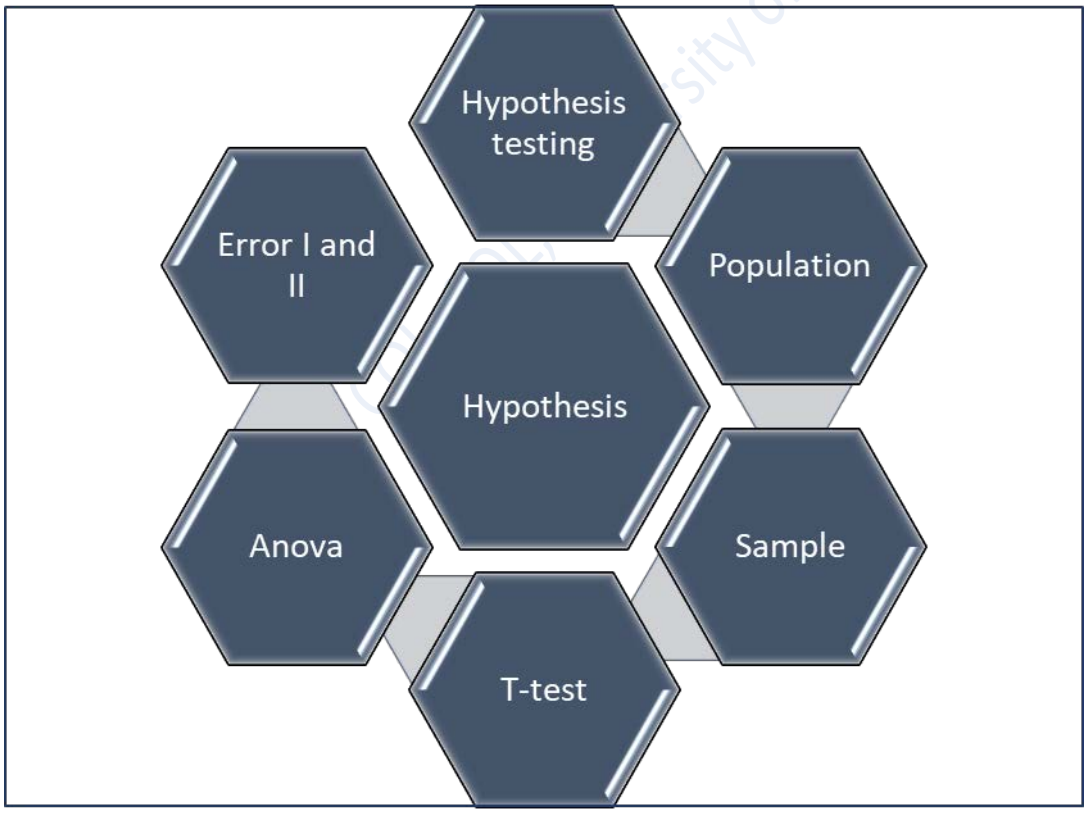

Fig 5.1: Hypothesis testing types and steps

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5.3 POPULATION AND SAMPLE

We often work with certain datasets, on which we usually use the right statistical and mathematical methods to find the hidden knowledge in the data. Scientists, mathematicians, and statisticians have come up with a lot of ways to deal with data from all types of sources. The real roots of inferential statistics lie in the testing of hypotheses, which is at the heart of sampling theory. But real-life situations aren't always what you'd expect. Instead, they usually have random details that are hard to deal with. Hypothesis testing is a related method that can be used in these situations. Hypothesis testing or statistical hypothesis testing is a way to compare two datasets or a sample from a dataset. It's a statistical method for drawing conclusions, so at the end of the test, you can come to some conclusions about the things you matched.

In this lesson, we start with the basics of sampling, population, sample, standard error, sampling error, and attempt to understand why this area of analytics is important. We then proceed on to the basics of hypothesis testing.

5.3.1 Population:

In a statistical investigation, the focus is usually on figuring out how big something is in general and studying how people in a group differ in one or more ways. The people being studied are called the population or universe. As such, in statistics, the population is a group of things, living or not, that are being studied. Depending on the situation, this population could be small or large. Most of the time, it's either impossible or impractical to get an entire total number of the population. The population may be so big that it can't be counted. Also, the units of the population could be destroyed or disturbed during a full examination, making it impossible. All of these problems lead us to the idea of sampling, which means we need to know what the word sample means. The characteristics of the population is described with the population, e.g., the population mean (μ), variance (σ^2) etc., referred to as *parameters.*

5.3.2 Samples:

- A sample is a small group of people from a population that can be counted. The number of participants in a sample is called the sample size. Instead of counting all of the people in the population, only the participants in the trial are observed to find out what their characteristics are. Then, the characteristics of the sample are used to make an approximation or estimate of the population. However, sampling has a lot of benefits,

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especially when it comes to saving time and money. Sampling is used quite often in our everyday lives. For example, A housewife usually tastes small quantity of food she has cooked to see if it is done right and has the right amount of salt. The characteristics of sample is described in terms of the sample of the respective population, e.g., the sample mean ($\bar{x}$), sample variance (s^2), etc., were termed as *statistics.*

ACTIVITY

A Ph.d student wants to conduct a research on students of University of Delhi regarding their experience about online classroom learning during Covid – 19. In this case, the population, he suppose to study will be all students of University of Delhi and it would be impractical to get total number of students at a particular point of time. So how to make this research/study possible. Do you need to take sample? Decide on what basis and how you will select a sample for this study. Make a assumption about the study.

5.3.3 Standard Error (S.E) :

The basic concept of standard error is to justify how you can decide and interpret the result on the basis of just one sample drawn from the population. Standard deviation calculate deviation within the observation of one set of data so how you can decide that if you take another sample the output will remain same. To overcome from this problem, standard error is calculated which help us to prove that if you take sample again and again then same outcome or result will come. So Standard error is average of standard deviation of sampling distribution.

S.E. stands for "standard error," which is the sampling distribution of a statistic's standard deviation. The standard errors of well-known statistics is given below for large samples, where n is the sample size, 2 is the population variance, P is the population proportion, and Q = 1 – P, n 1 and n 2 are the sizes of two independent random samples drawn from the given population (s).

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Statistics	Standard Error
Sample mean ($\bar{x}$)	$\frac{\sigma}{\sqrt{n}}$

Standard deviation of sampling distribution is called standard error. Average sample to sample variation is called standard error. It gives consistency so called reliability coefficient.

IN-TEXT QUESTIONS

1. Standard deviaton of sampling distribution is called _____.
2. There is no difference between standard deviation and standard error. True / False
3. The characteristics of sample are:
   a) sample mean b) Variance
   c) population mean d) all of the above
4. Error – I is representing alpha or byta _____.
5. I-you-me-mode is a style of writing.

5.4 HYPOTHESIS

5.4.1 Why hypothesis: In research it is very difficult to access the whole population because it is time consuming and a costly affair so infer the population with the help of sample. In other words we can't access population or it's unknown so use sample and infer to population (hypothesis). For example, Tata automobile manufacture EV - Tiago and now improved version of old one and they claim that New millage is > 26 KM. It's assumption about population. So population parameter is 26. Can you test all the car to know whether mileage is more than 26 or not. Answer is no because it is not possible to test all the car so We go for sample (subset of population) and test the hypothesis.

5.4.2 What hypothesis: Hypothesis is an assumption to claim. In businesses and industries, manager, supervisor, and expert claim on the basis of their experience, practices and hunches. For example:

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- Manufacture of i – phone, Apple company claim that performance of i-phone 14 is better than i-phone 13. It is a claim on the basis of assumptions made by representative of Apple company.
- Mahindra and Mahindra launched a car model Thar and claimed that new Thar version will give better performance in terms of millage. It is also a claim on the basis of their hunches, experience etc.
- Micro-lab a pharmaceutical company manufacture Dolo – 650 claims that it is a different if you compare with other salt available in the market.

In academic research, hypothesis is designed on the basis of review of literature. For example:

- New research published in American Economic Review claims a strong link between Facebook use and increasing anxiety and depression.
- Humerous advertising is more effective in comparison to emotional and rational advertising.
- There is a difference between the General Fertility Rate (GRF) of the illiterate and literate women with the latter depicting lower levels of GFR at the national level.
- (GFR referes to the number of children born per 100-0 women in a year in the reproductive age group of 15 -49 years.)
- Frequent breaks during daytime cut stress and prevent fatigue.
- the way exercise boosts immunity is by increasing the circulation of immune cells in your blood, to help fight off infectious bacteria and viruses.

5.4.3 Types of hypotheses:

Alternative hypothesis: Your claim about population is alternative hypothesis which you decide on the basis of your experience, practice, hunches, and review of existing literature or reports or research. usually denoted by H_1 or H_a For example:

- Mahindra claim about Thar that now improve version will give mileage more than 25 is a claim and alternative hypothesis. In this example something is more than other so Here, $H_1: \mu > \mu_0$, called a right-tailed alternative hypothesis. This is also known as directional hypothesis as direction of more than something is given.

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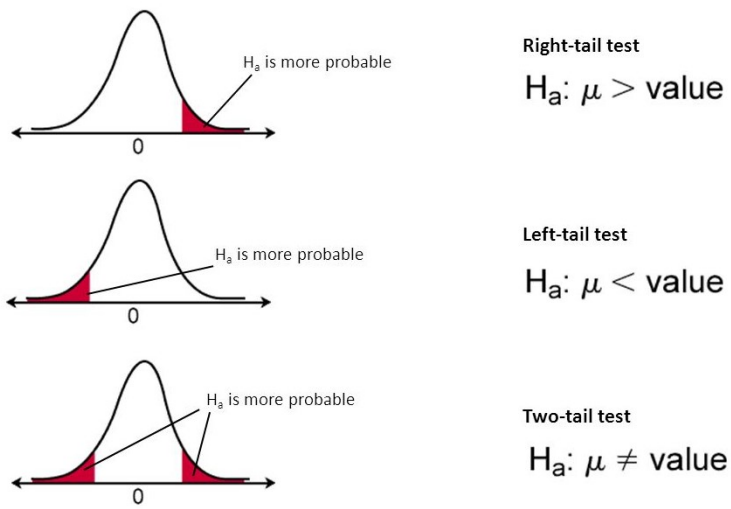
- Dolo paracetamol manufacture claim that chances of ineffectiveness of dole is less than 2%. In this example something is less than other. So Here, $H_1: \mu < \mu_0$, called a left-tailed alternative hypothesis. This is also known as directional hypothesis as direction of less than something is mentioned.

- During Covid – 19, Bharat Biotech claim that efficacy of covaxin and covi-shild is not same. In this example nothing is more or less. You don't have any direction that which is one is more or less so this is called non-directional hypothesis. $H_1: \mu \neq \mu_0$ $(\mu > \mu 0 \ or \ \mu > \mu 0)$, called a two-tailed alternative hypothesis.



Null Hypothesis: the complimentary of alternative is called null hypothesis. *The null hypothesis* is an assumption taken during the estimation of any test statistic, that denies the possibility of any difference from the situation present in the actual population as a whole, it is denoted by H_0. The null hypothesis is the hypothesis that is tested for possible rejection under the assumption that it is true. For example:

- The null hypothesis for above alternative (Mahindra claim about Thar that now improve version will give mileage more than 25 is a claim and alternative hypothesis. In this example something is more than other) will be :

That now improve version of Thar will give mileage less than or equal to 25.

So null hypothesis is : $H_0 \leq 25.(\mu \leq \mu_1)$

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- The null hypothesis for above alternative (Dolo paracetamol manufacture claim that chances of ineffectiveness of dole is less than 2%. In this example something is less than other) will be:

  That now Dolo ineffectiveness will be more than or equal to 2%.

  So null hypothesis is $H_0 \geq 2\%$. ($\mu \geq \mu_1$).

- The null hypothesis for above alternative hypothesis (During Covid – 19, Bharat Biotech claim that efficacy of covaxin and covi-shild is not same.) will be:

  That efficacy of Covaxin and Covi-shield vaccine is same.

  So null hypothesis is: $\mu = \mu_1$.

5.4.3.1How to decide right tailed or left tailed:

On the basis of alternative hypothesis.

(i) > right tailed

(ii) < Left tailed.

(iii)$\mu 1 \neq \mu 2$ two tailed.

Caveat: never use equal sign in alternative. always use in null hypothesis.(≥, or ≤, =)

ACTIVITY

Make different kind of claims to represent different kind of alternative hypothesis in terms of directional hypothesis and non-directional hypothesis. You can also design hypothesis on the basis of literature review and on the basis of hunches, experiences and define them in terms of right tailed, left tailed and two tailed test hypothesis.

5.4.4 Hypothesis testing:

On the basis of sample if you infer the population, it is called hypothesis testing. For example if Mahindra and Mahindra claim (Hypothesis) that now new Thar mileage will be better than

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previous Thar then on the basis of sample testing of 10 (sample) from population of Thar (1000). You can test and claim whether claim is true or not. This process of matching sample with population is called hypothesis testing. Here we will discuss the steps of hypothesis testing

- **Setting up the hypotheses**: In this step, we set up alternative hypothesis on the basis of claim and information available in the literature etc. and then make complementary null hypothesis H_0 by assuming that the sample statistical value is the same as the population value. Also, the alternative is said to be consistent with the null hypothesis. The most important thing is to choose the type of alternative (two-tailed or single-tailed) based on the testing conditions and requirements.
- **Choosing the level of significance:** In this step, we choose the right level of Significance (α) based on how accurate the estimates are and how much risk we are willing to take. This will be decided before the sample is chosen, which means that α will be set earlier in the process. Common significance levels are 0.10 (1 chance in 10), 0.05 (1 chance in 20), and 0.01 (1 chance in 100).
- **Test criterion or test statistic:** In this step, we choose the best test statistic and figure out its value(s) based on the null hypothesis.
- Conclusion: Finally, we compare the statistic value with the standard value at the given significance level, and accordingly conclude that whether to accept or reject the null hypothesis.

5.4.5 Hypothesis testing with mean - Student's t-Test (t-Test):

In some cases, researchers want to test hypotheses about population means with sample sizes that aren't big enough to be roughly estimated by the normal distribution. The t-distribution is used when the sample size is small and the population's standard deviation is unknown. The t-distribution is a bell-shaped distribution with a mean of zero and a standard deviation of one, just like the standardised normal curve. When the number of samples is more than 30, the distribution and the Z-distribution may be almost the same.

- A t-test is a type of inferential statistic that is used to see if the sample mean (x) is very different from the hypothetical population mean (μ) value.
- the significance of the difference between two sample means only.
- significant differences between the two sets of data.

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- The statistical significance is determined by the t-statistic, the t-distribution values, and the degrees of freedom.
- An analysis of variance is required in order to perform a test with three or more means.

T-test assumptions:

- **Normal Distribution:** The first assumption is that a plot of the data shows a bell-shaped distribution curve, which is a normal distribution.
- **Continuous dependent variable**: The second assumption about t-tests is about the size of the measurement scale. The assumption for a t-test is that the scale used to measure the data collected is a continuous scale, like the scores on an IQ test.
- **Equality of variance:** The final assumption is that the variance is the same everywhere. Homogeneous, or equal, variance happens when the standard deviations of samples are almost the same.
- **Random sample**: The final assumption is that the data comes from a simple random sample, which means that it comes from a random selection of people who are representative of the whole population.
- **Sample size is less than 30**: A hypothesis test that uses the t-distribution rather than the z- distribution. It is used when testing a hypothesis with a small sample size and unknown σ.

5.4.6 Univariate hypothesis test using the t – test:

$$t = \frac{\bar{x} - \mu}{\frac{S}{\sqrt{n}}},$$

where

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \quad \text{and} \quad S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

follows student's $t -$ distribution with $(n-1)$ d.f. In symbolic form

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$$t = \frac{\bar{x} - \mu}{\frac{S}{\sqrt{n}}} \sim t_{n-1}.$$

We now compare the calculated value of t with the tabulated value of a certain level of significance. If the calculated value $|t| >$ tabulated value of t, null hypothesis is rejected and if the value of $|t| <$ tabulated of t, null hypothesis may be accepted at that level of significance. The tabulated values of t as given below:

d_f	Level of Significance for Directional Test (t_{crit})					
	∝=0.10	∝=0.05	∝=0.025	∝=0.01	∝=0.005	∝=0.0005
	Level of Significance for Non-directional Test (t_{crit})					
	∝=0.20	∝=0.10	∝=0.05	∝=0.02	∝=0.01	∝=0.001
1	3.0780	6.3140	12.7100	31.8200	63.6600	636.6000
2	1.8860	2.9200	4.3030	6.9650	9.9250	31.6000
3	1.6380	2.3530	3.1820	4.5410	5.8410	12.9200
4	1.5330	2.1320	2.7760	3.7470	4.6040	8.6100
5	1.4760	2.0150	2.5710	3.3650	4.0320	6.8690
6	1.4400	1.9430	2.4470	3.1430	3.7070	5.9590
7	1.4150	1.8950	2.3650	2.9980	3.4990	5.4080
8	1.3970	1.8600	2.3060	2.8960	3.3550	5.0410
9	1.3830	1.8330	2.2620	2.8210	3.2500	4.7810
10	1.3720	1.8120	2.2280	2.7640	3.1690	4.5870
11	1.3630	1.7960	2.2010	2.7180	3.1060	4.4370
12	1.3560	1.7820	2.1790	2.6810	3.0550	4.3180
13	1.3500	1.7710	2.1600	2.6500	3.0120	4.2210
14	1.3450	1.7610	2.1450	2.6240	2.9770	4.1400
15	1.3410	1.7530	2.1310	2.6020	2.9470	4.0730

Illustration: suppose a teacher believes that the average marks secured by students in each subject is 50. A data is collected from 11 students and marks obtained are as follows:

Marks	56	54	44	57	55	57	58	51	61	51	54

Do the marks confirm the teacher believe?

The first step is to state the null hypothesis and the alternative hypothesis:

$$H_0: \mu = 50$$

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$H_1: \mu \neq 50.$

Next, calculate a sample mean, $\bar{x}$ = 54.36 and a sample standard deviation, S = 4.5, and estimates the standard error of the mean (SEM).

$$\bar{x} = \frac{598}{11} = 54.36$$

Standard error of mean; **SEM = SD/√N**.

4.5/√11 =1.35

Next, finds the t value associated with the desired level of statistical significance. If a 95 percent confidence level is required, the significance level is .05.

So

$t = 3.20 \sim t_{10}.$

The value of t at $\alpha = 0.05$ and 10 d.f. is 2.228. As $t = 3.20 > 2.228$, therefore H_0 is rejected. It means that average marks are more than 50 marks at a 5% level of significance. For confidence interval

$$CI = X \pm Z \times \frac{\sigma}{\sqrt{n}}$$

$$= 54.36 \pm 1.9600 \times \frac{1.35}{\sqrt{11}}$$

$$= 54.36 \pm 0.798$$

a 95% confidence interval of the mean [53.56 55.15] suggests that we are 95% confident that the population mean is between 53.56 and 11.

5.4.7 Hypothesis test of a proportion:

The hypothesis test of a proportion is conceptually same as univariate hypothesis testing but there is a difference in the mathematical formulation of standard error of the proportion.

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Researchers often test univariate statistical hypotheses about the size and distribution of a population. Based on the sample proportion, you can guess what the population proportion is. Conceptually, testing a hypothesis about a proportion is the same as testing a hypothesis when the mean is the main matter. Mathematically, the standard error of the proportion is calculated differently.

Illustration: MIT sloan school of management published a report on link between presence of Facebook and a deterioration in mental health among college students. The negative mental health effects were significant: "Access to Facebook lead to an increase in severe anxiety disorder by 20%.

In other words, the null hypothesis to be tested is that the proportion of severe anxiety disorder among college students is .2. The researcher formulates the statistical null hypothesis that the population proportion (π) equals 20 percent (.2).

$H_0: \pi = .2$

$$H_1: \pi \neq .2$$

If a researcher conducts a survey with a sample of 200 students and calculates p = .7. though the population proportion is not known. Here we will use Z test rather than t -test as sample size is large. If the decision will be taken at the ,01 level of significance, the critical Z value of 2.57 is used for the hypothesis test. Using the following formula

$$z = \frac{p - \pi}{Sp},$$

The formula for Sp = **√p(1-p)/n**

Sp = estimate of the standard error of the proportion

P = proportion of successes

So

Sp = **√(.2)(.2)/200 = .028**

Z = p – π/Sp = .2 - .8/.028 = 21.42

Here Z value of 21.42 is more than the critical value of 2.57 so the null hypothesis is rejected.

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5.4.8 hypothesis testing for two population mean:

In this case, two independent samples $(x_1, x_2, \cdots, x_{n_1})$ and $(y_1, y_2, \cdots, y_{n_2})$ of sizes n_1 and n_2 have been drawn from the normal populations with mean μ_X and μ_Y respectively under the assumption that the population variance is equal and equal to σ^2.

$$= \frac{(\bar{x} - \bar{y})}{S\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim t_{n_1+n_2-2}$$

The null hypothesis about difference between group is stated as:

$\mu_1 = \mu_2$ or $\mu_1 - \mu_2$

The comparisons are between two sample means $(\bar{x} - \bar{y})$

Illustration: Null hypothesis: There is no difference between perception of students towards online learning between male and female students.

Male students	Female students
$\bar{x}_1 = 11.2$	$\bar{x}_2 = 14.5$
$S_1 = 2.6$	$S_2 = 2.1$
$n_1 = 14$	$n_2 = 21$

$$S^2 = \frac{1}{n_1 + n_2 - 2}\left(\sum_{i=1}^{n_1}(x_i - \bar{x})^2 + \sum_{i=1}^{n_2}(y_i - \bar{y})^2\right)$$

S = .797

The t – value is = (11.2 – 14.5)/ .797 = 4.14

Here calculated value of t, 4.14 exceed the critical t value of 2.75. at the .01 level. In other words, research shows that female students have more positive perception towards online learning.

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5.5 ANALYSIS OF VARIANCE

In t test, we compare two mean or populations for group. For example comparison between male and female towards attitude or perception about online learning. Here, we have only two groups or level of the independent variable, gender (male and female). On the other hand dependent variable is one (attitude). If in case we want to compare more than two groups then t- test will not work. For example we want to analyse the attitude of students of primary school, middle school and college. Here we have three groups of students (independent variable) but one dependent variable (attitude). In this case one – way analysis of variance (ANOVA) is the appropriate statistical tool. Here we cannot use the t – test for hypothesis testing. So null hypothesis is:

H_o: $\mu_1 = \mu_2 = \mu_3$

Ha: $\mu_1 \neq \mu_2 \neq \mu_3$

The null hypothesis is that all the means are equal and alternative is that atleast there is difference between two groups.

Assumptions: (i) Data is normally distributed

(ii) Groups are independent.

(iii) Equality of Variance

Difference between groups: The difference between μ_1 and μ_2 and μ_3 is called difference between group.

Difference within groups: The difference within μ_1 or μ_2 or μ_3 is called difference within groups.

Simultaneously comparing mean in case of more than two level is called Anova.

$$f = \frac{Variance\ between\ groups}{Variance\ within\ groups},$$

Illustration:

Using the following data, perform analysis of variance (ANOVA) using α = .05

Groups I Group II Group III

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67	45	74
45	43	76
33	23	87
53	23	56
43	43	56

Sol:

$$f = \frac{Variance\ between\ groups}{Variance\ within\ groups},$$

Source of Variance	Degree of Freedom (df)	Sum Square (SS)	Mean Square (MS)	F-ratio
Between Groups (Treatment)	k-1	$SSB = \sum_{j=1}^{k}\left(\frac{T_j^2}{n_j}\right) - \frac{T^2}{n}$ $\quad SSB = \sum_{j=1}^{k} n_j(\bar{X}_j - \bar{X}_t)^2$	$MSB = \frac{SSB}{k-1}$	$F = \frac{MSB}{MSW}$
Within Groups (Error)	n-k	$SSW = \sum_{j=1}^{K}\sum_{i=1}^{n} X_{ij}^2 - \sum_{j=1}^{K}\left(\frac{T_j^2}{n_j}\right)$ $\quad SSW = \sum_{j=1}^{k}\sum_{i=1}^{n}(X_{ij} - \bar{X}_j)^2$	$MSW = \frac{SSW}{n-k}$	
Total	n-1	$SST = \sum_{j=1}^{K}\sum_{i=1}^{n} X_{ij}^2 - \frac{T^2}{n}$ $\quad SST = \sum_{j=1}^{k}\sum_{i=1}^{n}(X_{ij} - \bar{X}_t)^2$		

- SST = SSB + SSW

k: number of groups n: number of samples

df: degree of freedom

SS_{within}: is calculated by squaring the deviation of each score from its group mean and summing these scores.

Where X_{ij} = individual score.

$\bar{x}_j$ = group mean for the j_{th} group

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k = number of observations in a group

n = number of j_{th} groups.

$SS_{between}$ is the variability of the group means about a grand mean, is calculated by squaring the deviation of each group mean from the grand mean, multiplying by the number of items in the group, and summing these scores.

Where $\bar{x}_j$ = group mean for the j_{th} group

$\bar{x}_t$ = grand mean

n_j = number of items in the jth group.

$SS_{within} = (67 – 48.2)^2 + (45-48.2)^2 + (33-48.2)^2 + (53-48,2)^2 + (43-48.2)^2 + (45-35.4)^2 + (43-35.4)^2 + (23-35.4)^2 + (23-35.4)^2 + (74-69.8)^2 + (76-69.8)^2 + (87-69.8)^2 + (56-69.8)^2 + (56-69.8)^2$

= 1892.8

$SS_{between} = 5(48.2-51.13)^2 + 5(35.4 – 51.13)^2 + 5(69.5 – 51.13)^2$

= 3185.23

$MS_{between}$ = 3185.23/(3-1) = 1592.5

MS_{within} = 1892/(15-3) = 157.6

F = 1592.5/157.6 = 10.10

$F_{critical}(2,12)=3.89$

Decision = Reject H_0

The critical value of f at the .05 level for 2 and 12 degrees of freedom indicated that an F of 3,89 would be required to reject the null hypothesis. In this example, we conclude that we reject the null hypothesis. It appears that all groups are different.

5.6 ERROR – I AND II

Sampling error or risk in testing hypothesis: (Error – I and II)

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How confident you are if test is repeated, are you going to get same result or not. Because hypothesis is tested on the basis of sample. There may be chance of error while selecting the sample. So there is chance of risk involve in the hypothesis testing. Basically two types of risk is involved while testing hypothesis. Here we will see which risk is more problematic. The risk arise due to different situations.

Situation 01: Mahindra and Mahindra claim about new Thar that now new engine will give you mileage more than 25.

In this case, if null hypothesis is rejected while it was true. Then in long run company image will be affected due to wrong message about mileage of Thar.

Situation 02: Micro -lab pharmaceutical claim about dolo paracetamol that ineffectiveness of medicine is less than 2%.

In this case if null hypothesis is rejected while it was true then cost of risk would be at the cost of people. So in Error I and II we discuss the two types of error while testing the hypothesis. The main goal of sampling theory is to be able to make valid conclusions about the parameters of the whole population based on the results of a sample. In practise, we decide whether to accept or reject a lot after looking at a sample from it. Because of this, we might make the following two kinds of mistakes:

- **Type I Error:** Rejecting the Null Hypothesis H_0, when it is true.
- **Type II Error:** Accepting H_0 when it is wrong, i.e., when H_1, is true.

In terms of probability, we can write,

$$P[Reject\ H_0\ when\ it\ is\ true\ ] = P[\ Reject\ H_0\ |\ H_0\ ] = \alpha$$

$$P[Accept\ H_0\ when\ it\ is\ wrong\ ] = P[Accept\ H_0|H_1] = \beta$$

The α and β are called the sizes of type I error and type II error, respectively. α is called the *producer's Risk*, and β is called the *consumer's Risk.*

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	H_0 is true	H_0 is false
Accept H_0	No error	β
Reject H_0	α	No error

CASE STUDY

US Study: Being addicted to social media can cause anxiety and depression

According to new research published in the American Economic Review, there is a strong link between using Facebook and feeling more anxious and sadder. But social networks don't agree and say the evidence isn't clear. The MIT Sloan School of Management wrote a report about how college students' mental health seems to get worse when they use Facebook. A new study is important because it compares two different sets of data from the early days of Facebook, from February 2004 to September 2006. Facebook was slowly introduced to college campuses in the US. It began with Harvard. The researchers compared how students reacted when Facebook came to a campus. When the researchers looked at the answers to the 4.3 lakh survey from that time, they found "a significant link between college students' use of Facebook and their mental health getting worse."

The bad effects on mental health were big: "Access to Facebook led to a 7% rise in severe depression and a 20% rise in anxiety disorders." Researchers think that using Facebook is about 20% as bad as losing a job. And this was before the "like" button was added to Facebook. Another thing that was seen was that Facebook's effects on mental health got worse over time.

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IN-TEXT QUESTIONS

6. Data should be normally distributed for t-test. True / False
7. Rejecting the Null Hypothesis H_0, when it is true is called _____.
8. Your claim is:

a) Alternative hypothesis b) Null hypothesis
c) Both of the above d) none of the above

9. Full form of ANOVA _____
10. Standard error is _____.
11. Complementary to your claim is

a) Alternative hypothesis b) Null hypothesis
c) Both of the above d) none of the above

12. Is there any error in case hypothesis is accepted when it is true.(T/F)
13. Accepting H_0 when it is wrong, i.e., when H_1, is true is:

(a) Error – I (c) Both a and b
(b) Error - II (d) none of the above

14. Risk in Hypothesis testing is known as

(a)Error – I (c) Both a and b
(b)Error - II (d) none of the above

15. Matching sample mean with population is known as hypothesis testing. true/false
16. Which among the followings representing assumptions of hypothesis testing.

(i) Data is normally distributed (iii) Equality of variance
(ii) Groups are independent. (iv) All of the above.

17. μ represent sample parameter (True/False)
18. You can use .(≥, or ≤, =) in alternative hypothesis.True/False.
19. We use Sample size less then 30 in ---------- test.
20. In case of sample size is more then 30 we use ---------- test.

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5.7 SUMMARY

In a statistical investigation, the interest usually lies in the assessment of the general magnitude and the study of variation concerning one or more characteristics relating to individuals belonging to a group. This group of individuals under study is called the population or universe.

A finite subset of statistical individuals in a population is called a sample and the number of individuals in a sample is called the sample size.

The two sets of individuals, population and sample, the latter being a subset, may possess separate statistical constants in varied situations. To avoid the verbal confusion, these constants associated with the population, e.g., the population mean (μ), variance (σ^2) etc., referred to as parameters. Similarly, the constants associated with the sample of the respective population, e.g., the sample mean ($\bar{x}$), sample variance (s^2),

Tests of significance are one of an important aspect of the sampling, which helps to make conclusions based on the sample results if there is:

the deviation between the observed sample statistic and the hypothetical parameter value, or

the deviation between two independent sample statistics; is significant or might be attributed to chance or the fluctuations of sampling.

The null hypothesis is an assumption taken during the estimation of any test statistic, that denies the possibility of any difference from the situation present in the actual population as a whole, it is denoted by H_0. The null hypothesis is the hypothesis that is tested for possible rejection under the assumption that it is true.

A hypothesis which is complementary to the null hypothesis is called an alternative hypothesis, usually denoted by H_1 or H_a. As such we are liable to commit the following two types of errors:

Type I Error: Rejecting the Null Hypothesis H_0, when it is true.

Type II Error: Accepting H_0 when it is wrong, i.e., when H_1, is true.

A region (corresponding to a statistic t) in the sample space S which amounts to a rejection of H0 is termed as the critical region or region of rejection.

A t-test is a type of inferential statistic used to test: the sample mean ($\bar{x}$) differs significantly from the hypothetical value μ of the population mean. the significance of the difference between two sample means. a significant difference between the two datasets.

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5.8 GLOSSARY

- **Hypothesis** is an assumption to claim.
- **Standard Error**. stands for "standard error," which is the sampling distribution of a statistic's standard deviation
- **Normal Distribution:** The first assumption is that a plot of the data shows a bell-shaped distribution curve, which is a normal distribution.
- **Continuous dependent variable**: The second assumption about t-tests is about the size of the measurement scale. The assumption for a t-test is that the scale used to measure the data collected is a continuous scale, like the scores on an IQ test.
- **Equality of variance:** The final assumption is that the variance is the same everywhere. Homogeneous, or equal, variance happens when the standard deviations of samples are almost the same.
- **Random sample**: The final assumption is that the data comes from a simple random sample, which means that it comes from a random selection of people who are representative of the whole population.

5.9 ANSWERS TO IN-TEXT QUESTIONS

1. standard error	11. b
2. False	12. True
3. a	13. b
4. a	14. c
5. Conversational style	15 true
6. True	16. (iv)
7. Error - I	17. False
8. a	18. False
9. Analysis of Variance	19. t-test
10. which is the sampling distribution of a statistic's standard deviation	20. z test

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5.10 SELF-ASSESSMENT QUESTIONS

1. Explain the need of the testing of hypothesis. Discuss the steps of hypothesis testing.
2. Discuss a hypothesis. What types of hypotheses do you know? Discuss each of them.
3. Discuss two types of errors in the hypotheses testing. Discuss their role in testing?
4. Define the following terms:
   i) Type II error.
   ii) Type I error
   iii) Anova
5. Write the assumptions of the following tests:
   i) t –test
   ii) F –test
6. A sample of 200 batteries made by a company give a lifetime mean of 1540 hours with a standard deviation of 42 hours. Is it possible that a sample has been drawn from a population with a mean life time of 1500 hours? You may use 5% level of significance. (Given Tabular value is 13.47) (D.U 2021)
7. The result of students' survey indicated that a sample of 70 students secured an average of 80 marks in business research paper with a deviation of 12 marks. Test the hypothesis that the value hypothesis that the marks of the population mean is 100 against the alternative that is less than 100 marks. Use 5% level of significance. (Critical value of statistic is 1.64).
8. Using the following data, perform analysis of variance (ANOVA) using $\alpha = .05$

Groups I	Group II	Group III
84	131	99
87	120	96
118	143	129
130	145	153

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5.11 SUGGESTED READINGS

Surya, P.K., Sharma, S.K. (2020) Business research methods and analytics, Taxman publication, New Delhi

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LESSON-6

NON-PARAMETRIC TEST

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STRUCTURE

6.1 Learning Objectives
6.2 Introduction
6.3 Chi-square test
    6.3.1 Chi-square goodness- of-fit test
    6.3.2 Chi-square test of independence
6.4 Sign test
    6.4.1 One sample sign test
    6.4.1 Two sample sign test
6.5 Mann-Whitney U test
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6.9 Self-Assessment Questions
6.10 References
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6.1 OBJECTIVE

After studying this lesson, you should be able to:

1. Understand the concept of non-parametric test
2. Identify different types of non-parametric test
3. Hypothesis testing using chi-square
4. Hypothesis testing using Sign test
5. Hypothesis testing using Mann-Whitney U test
6. Hypothesis testing using Wilcoxon signed rank test
7. Hypothesis testing using Kruskal Wallis test

6.2 INTRODUCTION

Parametric tests are generally used to draw inferences about one or more population based upon sample information from those populations by making certain assumptions about the population distribution like t-distribution or normal distribution. When the assumption of normality is not satisfied along with small sample size, then we can use non-parametric statistical test which is free form the assumption of normality.

The most important and popular statistical test for nominal and ordinal data is chi-square. A nominal scale can be constructed for affiliation to political ideology by grouping individual according to party loyalties – so many Right-wing, so many Left-wing, so many independent and so on. From the nominal scale we cannot characterize the strength of any individual affiliation to political ideology; we can only know what the affiliation is. From nominal scale we get nose-counting data which tells us in how many cases a certain trait occurs. There is no scope of shades of Gray in nominal data ; an observation either has the trait or not.

Nominal data are generated by sorting and counting – sorting the data into discrete, mutually exclusive categories and then counting the frequency of occurrence within each category.

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The non-parametric tests are generally used when the data are not normally distributed. Therefore, it is also known as Distribution free tests.

The non-parametric test is an alternative to parametric tests such as T-Test, ANOVA, Linear Regression which are based upon the certain assumptions of the data.

6.3 CHI-SQUARE TEST

One of the most versatile and extensive used statistical tests is chi-square (χ^2). The chi-square is a non-parametric test applied to test any hypothesis relating to categorical data.

$$\chi^2 = \sum_{i=1}^{2} \frac{(O_i - E_i)^2}{E_i}$$

Where Oi = Observed frequency

Ei = Expected frequency

Chi-square distribution is defined for a certain number of degrees of freedom. The degree of freedom ν(nu) is equal to the number of classes or categories to be compared as reduced by the number of restrictions imposed on the comparison.

- If we do not have to estimate population parameter from the sample statistic for calculation of expected frequency, then ν = k-1
- If we have to estimate (m) population parameter from the sample statistic for calculation of expected frequency, then ν = k-m-1
- When the total frequency is small and ν =1, then we need to introduce a continuity correction factor equal to 0.5 in computing chi-square value.

$$\chi^2 = \sum_{i=1}^{2} \frac{(|O_i - E_i| - 0.5)^2}{E_i}$$

Chi-square distribution properties:

- The chi-square χ^2 value can never be negative as chi-square χ^2 value is a squared value.

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- The standard normal variable (Z) lies between -1 and 1 is approximately 68 percent, hence $\chi^2(Z)^2$ will be between 0 and 1 approximately 68 percent of time. Similarly, 27 percent of the time the value lie between 1 and 4.
- The shape of chi-square distribution depends on the degree of freedom. With the increase in the degree of freedom, the distribution trends to be normal.
- For the application of the chi-square test, the data should be given in proportions or percentages which should be converted into frequencies.
- The height of the density function decreases as the value of the random variables increases.
- As the degree of freedom $v(read\ as\ nu)$ becomes large the distribution becomes more symmetrical. In fact, as v become infinite, its limit is the normal distribution
- The distribution of chi-square χ^2 can be presented graphically as in Figure given below

. Types of chi-square tests:

- Chi-square test of goodness-of-fit
- Chi-square test of independence/ homogeneity
- Chi-square test for difference in proportions

6.3.1 Goodness-Of-Fit Tests:

The chi-square goodness-of-fit test is also known as chi-square test for single sample, is employed in hypothesis testing situation involving single sample. It determines the association between the two variables.

Hypothesis evaluated : In the underlaying population represented by a sample are the observed cell frequencies different form the expected cell frequencies?

The chi-square goodness-of-fit test is used to test the hypothesis that a random variable follows a specified (i.e., hypothesized) distribution. The procedure employs a criterion proposed by Karl Pearson in 1899.

The chi-square goodness-of-fit test is based upon following assumptions

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- The data is categorical/nominal. The test data should represent frequencies for k mutually exclusive categories
- The data evaluated consist of a random sample of n independent observations.
- The expected frequency of each cell is 5 or greater.

The following are the steps of computation:

1. Formulate the hypothesis:

a. Null Hypothesis: Data is consistent with specified population proportions

b. Alternative Hypothesis: Data is not consistent with the specified population proportions

2. Select an appropriate level of significance (α) for testing the null hypothesis (Ho). (E.g., 1%, 5%, 10% etc.)

3. Compute the expected frequencies (Ei) of the occurrence of events. The expected frequency counts at each level of the categorical variables are equal to the sample size times that hypothesized proportion form the null hypothesis.

   $E_i = n \times p_i$

   Where E_i = expected frequency count at the level i,

   n = sample size

   p_i = probability or proportion of observation in level i.

4. The formula used to calculate chi-square is

$$\chi^2 = \sum_{i=1}^{2} \frac{(O_i - E_i)^2}{E_i}$$

Suppose we are given a set of J categories and from sample data the observed number of occurrences of the random variable in each category : Oj where j = 1, 2,…….j. Under the null hypothesis we assume that a set of expected frequencies from the J categories can be computed: Ej where j = 1,2,……,j. The data could be presented as in Table below

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Category	1	2	3	….....	J
Observed frequency	O_1	O_2	O_3	….....	O_J
Expected frequency	E_1	E_2	E_3	….....	E_J

Using Pearson's criterion, we compute a statistic known as Pearson's χ^2.

$$\chi^2 = \sum_{i=1}^{2} \frac{(O_i - E_i)^2}{E_i}$$

For the goodness of fit test, the number of degrees of freedom (v) is always i-1. One degree of freedom is lost because the sum of the expected frequencies is forced to equal the sum of the observed frequencies.

Null Versus alternative hypotheses

Null hypothesis Ho : Oi = Ei for all cells

Where Oi = observed frequency for i^{th} cell

Ei = Expected frequency for i^{th} cell

Alternative hypothesis H1 : Oi ≠ Ei for at least one cell.

Where Oi = observed frequency for i^{th} cell

Ei = Expected frequency for i^{th} cell

Illustration 6.1

We are given a die that we hypothesize to be fair: i.e., all faces equally likely to appear. Then, if p_j equals the probability that the kth face appears, suppose that the die is thrown 54 times and the one-through-six faces are observed 5,8,9,14,12 and 6 times respectively. If the die is fair, we would expect to see each face 9 times. The data are presented in table given below.

Null Hypothesis **Ho** : $p_j = 1/6$ (The die is fair)

Alternate Hypothesis **H1** : $p_j \neq 1/6$ (The die is not fair)

Level of Significance, $\alpha = 0.01$

Calculation of chi-square $\chi^2 = \sum_{i=1}^{2} \frac{(O_i - E_i)^2}{E_i}$

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Die	Oi	Ei	(Oi-Ei)	$(Oi-Ei)^2$	$\frac{(Oi-Ei)^2}{Ei}$
1	5	9	-4	16	1.78
2	8	9	-1	1	0.11
3	9	9	0	0	0
4	14	9	5	25	2.78
5	12	9	3	9	1
6	6	9	-3	9	1
	∑Oi =54	∑Ei 54	∑(Oi-Ei) = 0		$\Sigma\chi^2 = 6.67$

The critical value of chi-square χ^2 with 5 degree of freedom (v = k-1) and α of 0.01 is 15.09 (given in chi-square table). Since our computed χ^2 value of 6.67 is less than the critical χ^2 (15.09) we fail to reject the null hypothesis. Thus, we can conclude that the die is fair. We could have rejected the null hypothesis if the computed χ^2 exceeds the critical value of χ^2.

Illustration 6.2

An automobile company routinely purchases a certain type of raw material in lots of 1,000. The purchase department spread the orders among suppliers M,N,O,P in the ratio of 2:2:1:1. Data of 48 purchase orders are randomly selected from the last one-year orders. Supplier M,N,O and P have received 26,8,8 and 6 orders respectively. Does the purchases were done as per the given ratio? Test at α = 0.01.

Ho: purchases are distributed in the ratio of 2:2:1:1

H1: purchases are not distributed in the ratio of 2:2:1:1

Under Ho:

Supplier M is expected to receive = 2/(2+2+1+1) = 1/3 of the purchase orders. (16)

Supplier N is expected to receive = 2/(2+2+1+1) = 1/3 of the purchase orders. (16)

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Supplier O is expected to receive = 1/(2+2+1+1) = 1/6 of the purchase orders. (8)

Supplier M is expected to receive = 1/(2+2+1+1) = 1/6 of the purchase orders. (8)

Calculation of chi-square $\chi^2 = \sum_{i=1}^{2} \frac{(O_i - E_i)^2}{E_i}$

Supplier	Oi	Ei	(Oi-Ei)	$(Oi-Ei)^2$	$\frac{(Oi - Ei)^2}{Ei}$
M	26	16	10	100	6.25
N	8	16	-8	64	4
O	8	8	0	0	0
P	6	8	-2	4	0.5
	∑Oi =48	∑ Ei = 48	0		∑ =10.75

The critical value of chi-square χ^2 with 3 degree of freedom (v = k-1) and α of 0.10 is 6.25 (given in chi-square table). Since our computed χ^2 value of 10.75 is more than the critical χ^2 (6.25) so we reject the null hypothesis. Thus, we can conclude that the purchases are not distributed in the ratio of 2:2:1:1.

Illustration 6.3

ABC Sports company manufactures cricket bat of 3 different sizes. The company claims 60% of bats are large, 30% Medium and 10 % small. Suppose a random sample of 100 cricket bats has 45 large size, 50 medium and 5 small sizes. Is this consistent with the company's claim? Use a 0.05 level of significance.

Solution:

Let p_l = the proportion of large

p_m = the proportion of medium

p_s = the proportion of small

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Null hypothesis: Ho : $p_l = 0.60$ $p_m = 0.30$ $p_r = 0.10$

Alternate Hypothesis: Ha : at least one of the proportions in the null hypothesis is false.

Calculation of expected frequency:

Expected frequency large size = 100 × 0.6 = 60

Expected frequency medium size = 100 × 0.3 = 30

Expected frequency small size = 100 × 0.1 = 10

The formula for calculation of chi-square $\chi^2 = \sum_{i=1}^{2} \frac{(O_i - E_i)^2}{E_i}$

Bat Size	Observed (Oi)	Expected (Ei	(Oi-Ei)	$(Oi-Ei)^2$	$\frac{(Oi - Ei)^2}{Ei}$
Large	45	60	-15	225	3.75
Medium	50	30	20	400	13.33
Small	5	10	-5	25	2.5
	∑Oi = 100	∑ Ei = 100	0		∑ = 19.58

The computed value of the chi-square test is 19.58.

The critical value of chi-square χ^2 with 2 degree of freedom (v = k-1) and α of 0.00 is 5.99 (given in chi-square table). Since our computed χ^2 value of 19.58 is more than the critical χ^2 (6.25) so we reject the null hypothesis. Thus, we can conclude that the cricket manufactured by ABC Sport company is not in the proportion of 6:3:1

6.3.2 Test of Independence of Variables/ Test of association

Chi-square test of independence is applied when you have two categorical variables form a single population. It is used to determine whether there is a significant association between the two variables. Here the data are represented in tabular form in row and column. These tests are also termed contingency-table tests because the tables representing cross-classified data are called contingency tables.

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For example: if you want to understand whether there is any association between gender (Male & Female) and profession (Teacher & Doctor), then we employ test of independence to determine whether the variables are statistically independent. Suppose the response obtained are given below

Gender	Teacher	Doctor	Total
Male	32	48	80
Female	16	24	40
Total	48	72	120

Here the respondents are classified into four categories: Male teacher, Female teacher, Male Doctor and Female doctor.

The following are the steps of computation

- Formulate the hypothesis:
    - Null Hypothesis: There is no association between the two variables
    - Alternate Hypothesis: There is an association between the two variables

      or

    - Null Hypothesis: The two variables are independent of each other
    - Alternate Hypothesis: The two variables are not independent of each other
- Select an appropriate level of significance α for testing the null hypothesis.
- Compute the expected frequency (Ei). The expected frequency counts at each level of the categorical variable are equal to the sample size times the hypothesized proportion from the null hypothesis

$$Eij = \frac{Ri\ X\ Cj}{n} = \frac{Row\ total\ X\ Column\ total}{Grand\ total}$$

Where Ei = expected frequency count at level i

N = sample size

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Ri = Total observation of ith row

Cj = Total observation of jth column

- The formula used to calculate chi-square test statistics is

$$\chi^2 = \sum_{ij=1}^{rc} \frac{(O_{ij}-E_{ij})^2}{E_{ij}}$$

Where, Oij = Observed frequency counts at ij^{th} cell

E_{ij} = expected frequency

r = number of rows

c = number of columns

- Estimate the table value of chi-square test statistics by using chi-square distribution table with a degree of freedom = (r-1)(c-1) and α percent of level of significance.
- Decision rule: Compare the computed chi -square with critical value of chi-square. If the computed value is greater than critical value (from chi-square table) then rejects the null hypothesis. And if computed chi-square value is smaller than or equal (<=) to critical value of chi-square then we fail to reject he null hypothesis.

Illustration 6.4

Apple a smartphone manufacturing company provides you with the following information about age groups and the liking for a particular model of smartphones which it plans to launch.

On the basis of above data, can we conclude that the model appeal is independent of the age of the respondents? Use alpha = 0.05 percent.

Customer who	Age (< 25)	Age (25-50)	Age (>50)
Like	90	60	50
Unlike	110	40	50

Null Hypothesis Ho: the model appeal is independent of age.

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Alternate hypothesis: H1 : The model appeal is not independent of age.

Level of significance = α = 0.05

Decision rule: $\chi^2_{2,0.05}$ > 5.9915 then reject the null hypothesis.

Calculation of Expected frequency

Customer who	**Age (< 25)**	**Age (25-50)**	**Age (>50)**	**Total**
Like	90	60	50	200
	100	50	50	
Unlike	110	40	50	200
	100	50	50	
Total	200	100	100	400

Calculation of Chi-square value

Observed frequency	Expected frequency	(Oi-Ei)	(Oi-Ei)^2	(Oi-Ei)^2/Ei
90	100	-10	100	1
60	50	10	100	2
50	50	0	0	0
110	100	10	100	1
40	50	-10	100	2
50	50	0	0	0
			Total	6

Conclusion: The computed value of the chi-square test is 6.

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The critical value of chi-square χ^2 with 2 degrees of freedom (v = (c-1)(r-1) = (3-1)*(2-1)) and α of 0.05 is 5.99 (given in chi-square table). Since our computed χ^2 value 6 is more than the critical χ^2 (5.99), so we reject the null hypothesis. Thus, we can conclude that the model appeal is not independent of age.

IN-TEXT QUESTIONS

True of False

6. Non-parametric test deal with cases in which the assumption of normality of the population is not satisfied.
7. Non-parametric tests are also called distribution-free tests because they do not involve tests related to probability distribution
8. The observed frequency of every class should be at least equal to 5.
9. The O and E used to calculate $\chi 2$ must be absolute frequency
10. In goodness-of-fit test, the rejection region lies in both tails of the distribution.

6.4 SIGN TEST

The sign test is used to test the null hypothesis that the median of a distribution is equal to some value. It is applicable when the objective is to compare samples from two populations and the samples are matched pairs. It can be used a) in place of a one sample t-test b) paired sample t-test, c) for ordered categorical data (ordinal data) where a numerical scale is inappropriate but where it is possible to rank the observations.

Types of sign tests:

- One-sample sign test
- Two sample sign tests.

6.4.1 One sample sign test

The sign test can test if the median of a collection of numbers is significantly greater than or less than a specified hypothesized value.

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The following steps are required to calculate the sign test:

- Calculate the median value. The value greater than the median value is treated with positive signs and values lesser than the median value is treated as a negative sign. If the value is equal to the median value, that observation is excluded from data, and the size of the sample gets reduced accordingly.

- For hypothesis testing, it is assumed that positive sign values are equal to negative sign values. Hence, the data for the small sample is assumed binomial distribution. The data for a large sample is assumed normal distribution. Data is considered as large sample when np and nq are at least 5. In such a situation Z-statistic is used. Formulate null (Ho) and Alternate (H1) hypothesis:

  Null hypothesis: $p = ½$

  Alternative hypothesis: $p \neq ½$ (Two-tail) or $p > ½$ or $p < ½$ (One-tail)

- Select an appropriate level of significance (a) for testing the null (Ho) hypothesis. (Usually, 0.05/0.01/0.10 is used).

- The formula used to estimate Z-test is:

$$z = \frac{X - \mu p}{\sigma X}$$

- Where X = observed number of positive signs in sample. For large sample (np and nq are at least 5) X value is increased by 0.5 if X < np and decreased by 0.5 if X> np, μp= mean of the binomial distribution, σ_x= standard deviation of the binomial distribution

$$\mu p = np$$

$$\sigma_x = \sqrt{np\,(1 - po)} = \sqrt{npq}$$

Where n= sample size, p = probability of occurrence = ½, q =1- p = 1/2)

- Estimate the table value for critical regions by using the Z-test statistic table.

- Decision Rule: Compare Z- test computed value and critical value (given in chi-square table) (Decision Rule of the run test).

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Illustration 6.5

In a clinical trial, survival time (weeks) is collected for 10 subjects with non Hodgkin's lymphoma. The exact survival time was not known for one subject who was still alive after 362 weeks when the study ended. The subjects' survival times of 10 subjects are

49, 58,75, 110, 112, 132, 151, 276, 281, 362

The researcher wished to determine if the median survival time was less than or greater than 200 weeks. Use 5% significance level for testing.

Solution

The median value is given as 200 weeks.

Number of observations below 200 weeks = 7 observations Negative (-) 49,58,75,110,112,132,151

Number of observations above 200 weeks = 3 observations (+)276, 281,362

Hypothesis: The null hypothesis is that the median survival is 200 weeks

Ho: p = ½

Ha: p ≠ ½

The formula used to estimate one sample Z-test is

$$z = \frac{X-\mu p}{\sigma X} = \frac{6.5-5}{1.581} = 0.949$$

Where X =7. For large sample (np and nq are at least 5) X value is increased by 0.5 if X < np and decreased by 0.5 if X > np. Here, np = 10 x ½ = 5, nq = 5. Hence, consider the sample as large sample size. Now, X > np; X value is decreased by 0.5 which will be 7- 0.5 = 6.5

μp = mean of the binomial distribution, σX = standard deviation of the binomial distribution

$$\mu p = np = 10 \times 1/2 = 5$$

$$\sigma x = \sqrt{np\,(1-po)} = \sqrt{npq} = \sqrt{10(\tfrac{1}{2})(\tfrac{1}{2})} = 1.581$$

Where n= 10, p = probability of occurrence = ½, q= 1 - p = 1/2

The critical value of the Z-test at 5% level of significance lies between (±1.96). As the

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calculated value (0.949) of Z is lies between the table values (t1.96), the null hypothesis (Ho) is accepted. Therefore, the median survival is 200 weeks.

6.4.2 Two-sample sign test

The sign test is used when two observation of the same sample is done, one before treatment another one after the treatment. It uses only sign between two values let's say x and y. Sign test will only observe whether x > y or x = y or x < y. The values are not used in the computation process.

The following steps are required to calculate the sign test:

- calculate the difference between the two observation's value. The difference between two value is given positive or negative sign. Hence two samples are taken, one with a plus and another with a minus sign. If the values have no difference, the values are deleted from the data and the sample size gets reduced accordingly.
- For hypothesis testing, it is assumed that positive sign values are equal to negative sign value. Hence, the data for the small sample is assumed as binomial distribution. The data for a large sample is assumed as normal distribution. Data is considered as large sample size when np and nq are at least 5. In such a situation Z-statistic is used.

Formulate null (Ho) and Alternate (H1) hypothesis:

Null hypothesis: Ho = There is no difference before and after observations

Alternative hypothesis: Hi = There is a difference in before and after observations

- After that, the third (3) step to the sixth (6) step process is the same as in the one-sample sign test.

Illustration 6.6:

Two professors have developed height measurement instrument for students. A

researcher has administered 10 students. The results are presented in the below table. Use a 5% level of significance, test the claim that there is no difference between two instruments.

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Students	Researcher1	Researcher2
1	142	138
2	140	136
3	144	147
4	144	139
5	142	143
6	146	141
7	149	143
8	150	145
9	142	136
10	148	146

Solution

Students	Researcher1	Researcher2	Difference (R1-R2)
1	142	138	+
2	140	136	+
3	144	147	-
4	144	139	+
5	142	143	-
6	146	141	+
7	149	143	+
8	150	145	+
9	142	136	+
10	148	146	+

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There are 8 positive differences and 2 negative differences.

Formulate hypothesis: The null hypothesis is that there is no difference between the instruments used for height measurement.

Ho: There is no difference between the two instruments

Ha: There is a difference in two instruments

$$z = \frac{X-\mu p}{\sigma X} = \frac{7.5-5}{1.581} = 1.582$$

Where X =8. For large sample (np and nq are at least 5) X value is increased by 0.5 if X < np and decreased by 0.5 if X > np. Here, np = 10 x ½ = 5, nq = 5. Hence, consider the sample as large sample size. Now, X > np (8>5); X value is decreased by 0.5 which will be 8- 0.5 = 7.5

μp = mean of the binomial distribution, σX = standard deviation of the binomial distribution

$$\mu p = np = 10 \times 1/2 = 5$$

$$\sigma x = \sqrt{np\,(1-po)} = \sqrt{npq} = \sqrt{10(\tfrac{1}{2})(\tfrac{1}{2})} = 1.581$$

Where n= 10, p = probability of occurrence = ½, q= 1 - p = 1/2

The critical value of the Z-test at 5% level of significance lies between (±1.96). As the calculated value (1.581) of Z lies between the critical values (± 1.96), the null hypothesis (Ho) is accepted. Therefore, there is no difference between the two instruments used for measuring height.

6.5 MANN- WHITNEY U TEST

The Mann-Whitney U test is used to compare differences between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. The test is used to examine whether two samples have been drawn from population with the same means. This test is an alternative to a parametric independent sample test.

The following steps are required to calculate the Mann-Whitney U test:

1) Formulate hypothesis: The two independent samples are equal or not.

   Null Hypothesis: Two samples have an equal distribution from the mean

   Alternative Hypothesis: Two samples do not have equal distribution

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Or

The sample I has the higher or lower distribution of mean as compared to the II sample

2) The two independent samples are pooled together into a single sample to provide a rank to each observation in the pooled sample. Arrange all the observations in the ascending order and assign ranks all. If two or more observations have the same value then the rank is equal to the average of the ranks that otherwise be allotted in the pooled sample.

3) Now, Segregate the sample and determine the sum of the ranks of each sample (R. and R2). R1 and R2, is the sum of the ranks to sample one and two

4) The formula used to estimate U-test is:

$$U_1 = n_1 n_2 + \frac{n_1(n_{1+1})}{2} - R_1$$

$$U_2 = n_1 n_2 + \frac{n_2(n_{2+1})}{2} - R_2$$

And note U1+U2 = $n_1 n_2$

U_1 = U-test with the sample 1,

U2 = U-test with sample II,

n_1 = Sample size I,

n_2 = sample size II

R_1 = Sum of ranks of I,

R_2 = sum of ranks of II

A large sample is considered when n1 or n2 is greater than 10. Then, Z-test used is:

$$Z = \frac{u1 - \mu u1}{\sigma u1}$$

Where, $\mu u1 = \frac{n1n2}{2}$ $\sigma u1 = \sqrt{\frac{n1n2(n1+n2+1)}{12}}$

$\mu u1$= mean of sample I, σx= standard deviation of sample I

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5) Estimate the table value for critical regions by using the Z-test statistic table. (Refer run test step 4 for computation of z-table critical value).

6) Decision Rule: Compare Z- test computed value (given in step 4) and table value (given in step 5)

Illustration 6.7

The following data shows the age at which type II diabetes was diagnosed in young adults. Use the 5% level of significance to check whether age of diagnosing is different for males and females?

Females: 20 11 17 12 18

Males: 19 22 16 29 24 20 23 25 28 10

Solution:

The two independent sample of females (n1) and males (n2) age at the time of diagnose of type II diabetes is given.

Null Hypothesis: Ho: Two groups of males and females have an equal distribution of age mean

Alternative Hypothesis: H: Two groups of males and females do not have an equal distribution of age mean

Ist step is to pool the data in a large sample and arrange it in ascending order to assign rank.

Next step is to segregate the sample and determine the sum of ranks of each sample (R1and R2)

The formula used to estimate U-test is:

$$U_1 = n_1 n_2 + \frac{n_1(n_{1+1})}{2} - R_1$$

$$= (5)(10) + \frac{(5)(10)}{2} - 24.5 = 50.5$$

Here, n (number of females) = 5, n2 (number of males) = 10, R1 = 24.5, R2 = 95.5

A large sample is considered when n1 or n2 is at least 10. Then, Z-test used is:

$$Z = \frac{u1 - \mu u1}{\sigma u1} \quad \frac{50.5 - 25}{8.165} = 3.123$$

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Where , $\mu u1 = \frac{n1n2}{2} = \frac{(5)(10)}{2} = 25$

$$\sigma u1 = \sqrt{\frac{n1n2(n1+n2+1)}{12}} = \sqrt{\frac{(5)(10)(5+10+1)}{12}} = 8.165$$

$\mu u1$= mean of sample I = 25, σx= standard deviation of sample I= 8.165

Age	M/F	Rank	Ri Females	R2 Male
10	M	1		2
11	F	2	2	
12	F	3	3	
16	M	4		4
17	F	5	5	
18	F	6	6	
19	M	7		7
20	F	8.5	8.5	
20	M	8.5		8.5
22	M	10		10
23	M	11		11
24	M	12		12
25	M	13		13
28	M	14		14
29	M	15		15
	Total	120	24.5	95.5

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The critical value of the Z-test at 5% level of significance lies between (±1.96). As the calculated value (3.123) of Z is higher than the table values (1.96), the null hypothesis (Ho) is not accepted. Therefore, there is a difference in two groups of males and females as they do not have an equal distribution of age mean.

6.6 WILCOXON SIGNED-RANK TEST

Wilcoxon signed-rank test is used to test the paired or two related samples means. It is used to examine whether their population mean ranks are different in two related samples or not. It Can be used as an alternative to paired t-test. The assumptions of the normal distribution are not required in the Wilcoxon signed-rank test. It is a non-parametric test that can be used to determine whether two dependent samples were selected from populations having the same distribution or not.

The following steps are required to calculate the Wilcoxon signed-rank test:

1. Formulate the hypothesis

   Null Hypothesis; There is no difference in two related sample mean

   Alternate Hypothesis: There is a difference in two related sample mean

2. Compute the difference between the two paired samples. Retain the positive and negative values but remove the value with no difference (zero) which reduces. sample size accordingly.

3. Convert the difference in values into absolute values by removing their signs and assign the rank to the absolute difference values. If two or more observations have the same value then the rank is equal to the average of the ranks.

4. Segregate the ranks of absolute differences into positive and negative ranks. The division. is possible by re-looking at the signs given in first step difference columns.

5. Calculate the sum of ranks of positive and negative values which is represented as T+ and T- respectively. Select T be the smaller of T+/ T-.

6. The formula used to estimate Z-test is:

$$Z=\frac{T-\mu T}{\sigma T}$$

Where, $\mu T = \frac{n(N+1)}{4}$ $\quad \sigma T = \sqrt{\frac{n(n+1)(2n+1)}{24}}$

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N = sample size, T+ = sum of positive absolute ranks differences, T- = sum of negative absolute ranks differences, T = smaller of T+ or T-,

$\mu u1$= mean of sample I, σx= standard deviation of sample T

7) Estimate the table value for critical regions by using the Z-test statistic table.

test step 4 for computation of z-table critical value)

8) Decision Rule: Compare Z- test computed value (given in step 6) and table value (given in step 7)

Illustration 6.8

The below table provides details of people who lost weight due to medicine -X. The table provides weight details of 12 people before and after taking medicine - X. The

weight (in kgs) is given below

Before	7	5	8	9	4	6	8	10	10	6	7	8
After	6	5	3	8	4	9	12	14	13	7	5	11

Does the medicine significantly (5%) impact reduction in weight?

Solution:

The paired samples are given before and after medicine 'X.

Null Hypothesis: Ho: There is no impact on weight reduction due to medicine X*

Alternative Hypothesis: H: There is an impact on weight reduction due to medicine X

N = 11, T+ = 47, T- = 19, T (smaller value of T+ / T-) = 19

$$Z=\frac{T-\mu T}{\sigma T} = \frac{19-33}{11.247} = -1.244$$

$$\text{Where, } \mu T = \frac{n(n+1)}{4} = \frac{11(11+1)}{4}$$

$$\sigma T = \sqrt{\frac{n(n+1)(2n+1)}{24}} = \sqrt{\frac{11(11+1)(2(11)+1)}{24}} = 11.247$$

$\mu u1$= mean of sample T, σx= standard deviation of sample T

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Before	After	d (Before - After)	The absolute value d	The rank of absolute d	Negative rank	Positive rank
7	6	-1	1	2	2	
5	5	0	0	6.5		6.5
8	3	-5	5	11	11	
9	8	-1	1	2	2	
4	4	0	0			
6	9	3	3	6.5		6.5
8	12	4	4	9.5		9.5
10	14	4	4	9.5		9.5
10	13	3	3	6.5		6.5
6	7	1	1	2		2
7	5	-2	2	4	4	
8	11	3	3	6.5		6.5
			Total	66	19	47

The critical value of the Z-test at 5% level of significance lies between (±1.96). As the calculated value (-1.244) of Z lies between the table values (±1.96), the null hypothesis (Ho) is accepted. Therefore, there is no impact on weight reduction due to medicine X.

6.7 KRUSKAL- WALLIS TEST

The Kruskal -Wallis test is used to compare differences of more than two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. It is also used when the sample size is very small. The test is used to examine whether the 'n' number of samples has been drawn from population with the same mean or median. This test is an alternative to a parametric one-way ANOVA test.

The following steps are required to calculate the Kruskal-Wallis test:

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1) Formulate the hypothesis

   Null Hypothesis: the samples (groups) come from populations with the same distribution.

   Alternative Hypothesis: At least one of the samples (group) comes from different populations

2) The 'n' independent samples are pooled together into a single sample to provide a rank to each observation in the pooled sample. Arrange all the observations in the ascending order and assign rank to all. If two or more observations have the same value then the rank is equal to the average of the ranks that otherwise be allotted in the pooled sample.

3) Now, segregate the sample and determine the sum of ranks of each sample (r1,r2,…)

   Let ri be the sum of all ranks r1+ r2 +.... till i^{th} sample.

4) The formula used to estimate H-test and follows the chi-square distribution:

   $$H = \frac{12}{n(n+1)} \sum_{i}^{k} \frac{ri^2}{ni} - 3(n+1)$$

   Where k= number of groups, n = total number of elements in k groups

5) Estimate the table value for critical regions by using chi-square distribution to test the null hypothesis with a degree of freedom, df=k-l and at alpha percent level of significance.

6) Decision Rule: If the Computed value > Critical Table value, the null hypothesis is rejected. In other words, it the computed value <= Critical Table value, the null hypothesis is accepted.

Illustration 6.9:

Does physical exercise alleviate depression? The researcher finds some depressed

people and check that they are all equivalently depressed. The allocation of each person is done randomly to one of three groups: no exercise; doing jogging every day or doing gym every day. At the end of the month, each participant needs to rate how depressed they feel now on a Likert scale that runs from 1 ("totally miserable") to 100 (ecstatically happy"). The table is given below:

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NE	Jog	Gym
23	22	59
26	27	66
51	39	38
49	29	49
58	46	56
37	48	60
29	49	56
44	65	62

Use 5% level of significance to check whether physical exercise significantly effects in the alleviation of depression or not?

Solution:

The researcher has three sample groups with no exercise, doing jogging and gymming.

The hypothesis is:

Null Hypothesis: Ha: Alleviation of depression level is the same from all types of physical exercises

Alternative Hypothesis: H1: Alleviation of depression level in at least two is different from all

types of physical exercises

The next step is to pool the data of all the samples and arrange them in ascending order. After that assign rank and segregate based on type of physical exercise. Then do some of the ranks of each sample and label it 'r1'. 'r2', 'r3.

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Pooled data	K sample	Ascending order		ri Rank	R1 (NE)	R2 (Jog)	R3 (Gym)
23	NE	22	Jog	1		1	
26	NE	23	NE	2	2		
51	NE	26	NE	3	3		
49	NE	27	Jog	4		4	
58	NE	29	NE	5.5	5.5		
37	NE	29	Jog	5.5		5.5	
29	NE	37	NE	7	7		
44	NE	38	Gym	8			8
22	Jog	39	Jog	9		9	
27	Jog	44	NE	10	10		
39	Jog	46	Jog	11		11	
29	Jog	48	Jog	12		12	
46	Jog	49	NE	14	14		
48	Jog	49	Jog	14		14	
49	Jog	49	Gym	14			14
65	Jog	51	NE	16	16		
59	Gym	56	Gym	17.5			17.5
66	Gym	56	Gym	17.5			17.5
38	Gym	58	NE	19	19		
49	Gym	59	Gym	20			20
56	Gym	60	Gym	21			21
60	Gym	62	Gym	22			22
56	Gym	65	Jog	23		23	
62	Gym	66	Gym	24			24
			Total	300	76.5	79.5	144

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The formula used to estimate H-test and follows the y distribution:

$$H = \frac{12}{n(n+1)} \sum_{i}^{k} \frac{ri^2}{ni} - 3(n+1)$$

$$H = \frac{12}{24(24+1)} \left[\frac{76.5^2}{8} + \frac{79.5^2}{8} + \frac{144^2}{8} \right] - 3(24+1)$$

= 7.27

Where k = 3 and n = 8+8+8 = 24

Estimate table value by using chi-square distribution with degree of freedom, df =k -1 = 3-l =2. And at 5% level of significance. The table value is 5.991

Here, computed value (7.27) > Critical Table value (5.991). The null hypothesis (Ho) is rejected. That means alleviation of depression level in at least two is different from all types of physical exercises. There is a significant effect of exercise on depression levels.

Illustration 6.10: In a college 4 (Four) different groups of students were randomly assigned to be taught by 4 different teachers, and their achievement test scores were recorded. Are the distributions of test scores the same, or do they differ?

1	2	3	4
67	75	59	94
87	69	78	89
73	83	67	80
79	81	62	88

Solution: Rank the 16 measurements from 1 to 16, and calculate the four rank sums.

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1	2	3	4
67 (3)	75 (7)	59 (1)	94 (16)
87 (13)	69 (5)	78 (8)	89 (15)
73 (6)	83 (12)	67 (4)	80 (10)
79 (9)	81 (11)	62 (2)	88 (14)
T_i 31	**35**	**15**	**55**

H $= \frac{12}{n(n+1)} \sum_i^k \frac{ri^2}{ni} - 3(n+1)$

$= \frac{12}{16(16+1)} [\frac{31^2+35^2+15^2+55^2}{4}] - 3(16+1)$

$= 8.96$

H_0: the distributions of scores are the same

H_a: the distributions of scores are not same

Rejection region: For a right tailed chi-square test with $\alpha = .05$ and df = 4-1 =3, reject H 0 if $H \geq 7.81$.

Reject H_0. There is sufficient evidence to indicate that there is a difference in test scores for the four teaching techniques.

6.8 KOLMOGOROV-SMIRNOV TEST

Kolmogorov- Smirnov test or K-S Test is a nonparametric test named after Andrey Kolmogorov and Nikolai Smirnov which is used as a goodness of fit and is suitable for small sample size. It is the test of the equality of continuous or discontinuous, one-dimensional probability distributions that can be used to compare a sample with a reference probability distribution (one-sample K–S test), or to compare two samples (two-sample K–S test). In essence, the test answers the question "What is the probability that this collection of samples could have been drawn from that probability distribution?" or, in the second case, "What is the probability that these two sets of samples were drawn from the same (but unknown) probability distribution?". It is named after Andrey Kolmogorov and Nikolai Smirnov.

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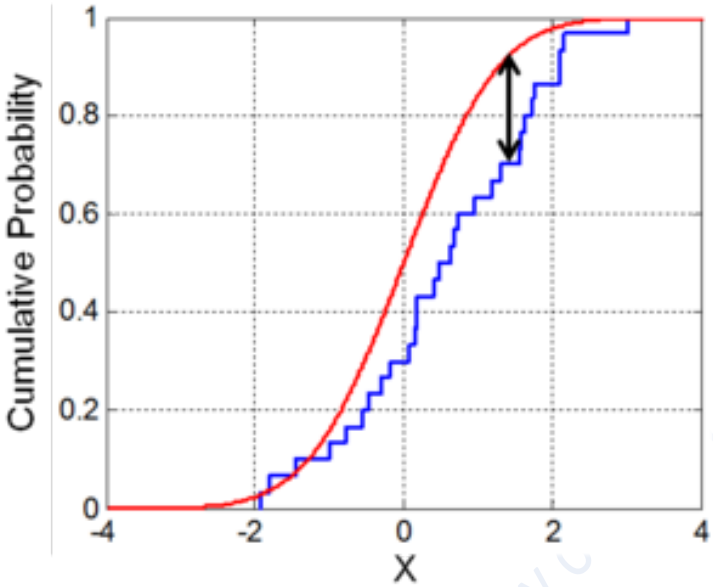

Figure 6.1: Illustration of the Kolmogorov–Smirnov statistic. The red line is a model CDF, the blue line is an empirical CDF, and the black arrow is the K–S statistic

The Kolmogorov–Smirnov statistic quantifies a distance between the empirical distribution function of the sample and the cumulative distribution function of the reference distribution, or between the empirical distribution functions of two samples. The null distribution of this statistic is calculated under the null hypothesis that the sample is drawn from the reference distribution (in the one-sample case) or that the samples are drawn from the same distribution (in the two-sample case). In the one-sample case, the distribution considered under the null hypothesis may be continuous, purely discrete or mixed. In the two-sample case, the distribution considered under the null hypothesis is a continuous distribution but is otherwise unrestricted. However, the two-sample test can also be performed under more general conditions that allow for discontinuity, heterogeneity and dependence across samples.

Let's assume that we have observation X1,X2……Xn, which come from a distribution P. The KS Test is used here to test whether the sample belong to P distribution.

Null Hypothesis H_0 = the sample come from P distribution

Alternate Hypothesis H_1 = the sample do not come from P distribution

The value of test statistics D is calculated as:

D = Maximum |Fo(X)−Fr(X)|

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Where:

- $F_0(X)$ = Observed cumulative frequency distribution of a random sample of n observations.
- and $F_0(X) = k/n$ = (No. of observations ≤ X)/(Total no. of observations).
- $F_r(X)$ = The theoretical frequency distribution.

The critical value of D is found from the K-S table values for one sample test.

Acceptance Criteria: If calculated value is less than critical value accepts null hypothesis.

Rejection Criteria: If calculated value is greater than table value rejects null hypothesis.

Illustration 6.11: Data was collected from 60 students (12 from each program) enrolled in different programs to understand the intention of student to join the NCC.

Course	B.Sc. Maths	B.A. Eco	B.Com	MBA	BMS
Number of students	5	9	11	19	16

It was expected that 12 students from each class would join the NCC. Using the K-S test to find if there is any difference among student classes with regard to their intention of joining the NCC.

Solution:

H_0: There is no difference among students of different program with respect to their intention of joining the NCC.

We develop the cumulative frequencies for observed and theoretical distributions.

Streams	No. of students interested in joining		FO(X) =O/N	FT(X) = T/N	|FO(X)−FT(X)|
	Observed (O)	Theoretical (T)			
B.Sc. Maths	10	12	0.1667	0.2	0.17
B.A. Eco	11	12	0.1833	0.2	0.18

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B.Com	15	12	0.25	0.2	0.25
BMS	10	12	0.1667	0.2	0.17
MBA	14	12	0.2333	0.2	0.23

Test statistic |D||D| is calculated as:

D=Maximum|F0(X)−FT(X)|= 0.25

The table value of D at 5% significance level is given by

$D_0.05$= 1.36/√n = 1.36/√60 = 0.175

Since the calculated value (0,25) is greater than the critical value,(0.175) hence we reject the null hypothesis and conclude that there is a difference among students of different streams in their intention of joining the Club.

K-S Two Sample Test

In case of two independent samples, we can use the K-S two sample test. The test is used to test the agreement between two cumulative distributions. The null hypothesis (H_0) states that there is no difference between the two distributions. The D-statistic is calculated in the same manner as the K-S One Sample Test

Formula

D=Maximum|Fn_1(X)−Fn_2(X)|

Where −

- n_1 = Observations from first sample.
- n_2 = Observations from second sample.

It has been seen that when the cumulative distributions show large maximum deviation |D| it is indicating towards a difference between the two sample distributions.

The critical value of D for samples where n1=n2 and is ≤ 40, the K-S table for two sample case is used. When n_1 and/or n_2 > 40 then the K-S table for large samples of two sample test should be used. The null hypothesis is accepted if the calculated value is less than the table value and vice-versa.

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6.9 SUMMARY

- Non-parametric tests make fewer and less stringent assumptions like data is not requirement to be normally distributed, data is drawn by random sampling, variables association can be non-linear and observations are independent of each other. The test is mainly used non-metric data i.e., ordinal or nominal.
- The Chi-square test is a non-parametric test used for mainly two purposes. First it determines whether a sample data matches the population. This is a test of goodness of fit. Secondly, it determines the association between the two variables. The comparison of two contingency (categorical) variables are checked to find whether they are related or not. This is a test of the independence of variables. Chi-square test has certain properties like data is unsymmetrical values greater than or equal to zero and categorical variables.
- The sign test is used to test the null hypothesis that the median of a distribution is equal to some value. It can be used a) in place of a one-sample t-test b) in place of a paired t t-test some value. or c) for ordered categorical data where a numerical scale is inappropriate but where it is possible to rank the observations.
- The Mann-Whitney U test is used to examine whether two samples have been drawn from population with the same mean. This test is an alternative to a parametric independent sample test.
- The Wilcoxon signed-rank test is used to test the paired or two related samples means. It is used to examine whether their populations mean ranks are different in two related

  samples or not. It can be used as an alternative to paired t-test.
- The Kruskal-Wallis test is used to examine whether the 'n' number of samples has been drawn from populations with the same mean or median. This test is an alternative to a parametric one-way ANOVA test.
- Kolmogorov- Smirnov test or K-S Test is a nonparametric test which is used as a goodness of fit and is suitable for small sample size.

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6.10 ANSWERS TO IN-TEXT QUESTIONS

1. T 2. F, 3. F 4. T 5. F

6.11 SELF-ASSESSMENT QUESTIONS

MCQ Questions

1. The nonparametric equivalent of an unpaired samples t-test is
   a) Sign test
   b) Wilcoxon signed-rank test
   c) Mann-Whitney U test
   d) Kruskal-Wallis test
2. The Wilcoxon rank-sum test compares
   a) Two populations
   b) Three or more populations
   c) A sample mean to the population mean
   d) None of these
3. The Wilcoxon rank-sum test can be
   a) Upper tailed
   b) Lower tailed
   c) Either of upper tailed or lower tailed
   d) None of these
4. If a Chi-square goodness of fit test has 6 categories and an N=30, then the correct number of degrees of freedom is
   a) 5
   b) 6
   c) 28

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d) 29

5. Comparing the times-to-failure of radar transponders made by firms A, B, and C, based on an airline's sample experience with the three types of instruments, one may well call for:

   a) A Kolmogorov-Smirnove test

   b) A Kruskal-Wallis test

   c) A Wilcoxon rank-sum test

   d) A Spearman rank-correlation test

6. Which of the following test use rank sums?

   a) F test

   b) Chi-square and Sign tests

   c) Runs test

   d) Kruskal-Wallis and Wilcoxon test

7. In the Kruskal-Wallis test of samples, the appropriate number of degrees of freedom is

   a) K

   b) K-1

   c) K-2

   d) n-K

8. When using the Sign test, if two scores are tied, then we

   a) Count them

   b) Discard them

   c) Depends upon the scores

   d) None of these

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9. The Mann-Whitney U test is preferred to a t-test when
    a) Data are paired
    b) Sample sizes are small
    c) The assumption of normality is not met
    d) Samples are dependent
10. The sign test assumes that the samples are
    a) Independent
    b) Dependent
    c) Have the same mean
    d) None of these
11. The sign test is
    a) Less powerful than that of the Wilcoxon signed-rank test
    b) More powerful than the pared sample t-test
    c) More powerful than the Wilcoxon signed-rank test
    d) Equivalent to the Mann-Whitney test
12. Which of the following test is most likely assessing the null hypothesis of "the number of violations per apartment in the population of all city apartments is binomially distributed with a probability of success in any one trial of $P=0.4"
    a. The Kolmogorov-Smirnove test
    b. The Kruskal-Wallis test
    c. The Mann-Whitney test
    d. The Wilcoxon signed-rank test
13. The Wilcoxon signed-rank is used
    a) Only with independent samples
    b) Only in matched pairs samples

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c) As an alternative to the Kruskal-Wallis test

d) To test for randomness

14. Which of the following tests must be two-sided?

a) Kruskal-Wallis test

b) Wilcoxon Signed rank test

c) Runs test

d) Sign test

15. In testing for the difference between two populations, it is possible to use

a) The Wilcoxon rank-sum test

b) The sign test

c) Either of the above

d) None of the these

Answers MCQ

1. d) Kruskal-Wallis test
2. a) Two populations
3. c) Either of upper tailed or lower tailed
4. a) 5
5. b) A Kruskal-Wallis test
6. d) Kruskal-Wallis and Wilcoxon test
7. b) K-1
8. b) Discard them
9. c) The assumption of normality is not met
10. b)Dependent
11. a)Less powerful than that of the Wilcoxon signed-rank test

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12. a. The Kolmogorov-Smirnove test
13. b)Only in matched pairs samples
14. d)Sign test
15. c)Either of the above

Questions

16. A poker-dealing machine is supposed to deal cards at random, as if from an infinite deck. In a test, you counted 1600 cards, and observed the following: Spades 404 Hearts 420 Diamonds 400 Clubs 376 Could it be that the suits are equally likely? Or are these discrepancies too much to be random?.
17. A genetics engineer was attempting to cross a tiger and a cheetah. She predicted a phenotypic outcome of the traits she was observing to be in the following ratio 4 stripes only: 3 spots only: 9 both stripes and spots. When the cross was performed and she counted the individuals she found 50 with stripes only, 41 with spots only and 85 with both. According to the Chi-square test, did she get the predicted outcome?
18. The personnel department of a large company wanted to see if there is any pattern in the casual leave taken by the employees on weekdays. A random sample of 132 cases is taken and classified by the day of the week the leave was taken. The observed frequencies are given below:

Day	Mon	Tue	Wed	Thu	Fri	Sat
Observed frequency:	21	26	12	15	23	35

Can the personnel department conclude that there is no difference among days of week insofar as casual leave is concerned? Test at 5 percent level of significance.

19. The divisional manager of a retail chain believes that the average number of customers entering each of the five stores in his division weekly is the same. In a given week, the manager reports the following number of customers in the five stores: 3,000; 2,960; 3,100; 2,780; and 3,160. Test the divisional manager's belief at 5 percent level of significance.
20. In setting sales targets, the marketing manager makes the assumption that order potentials are the same for each of the four sales territories. A sample of 200 sales data is given below:

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Sales Territories

I	II	III	IV
120	95	118	72

Should the manager's assumption be rejected? Use a = 0.05.

21. A sample analysis of examination results of 1,000 students was made. It was found that 260 students had failed, 110 students secured first division, 420 secured second division and the rest obtained third division. Are these figures commensurate with the general examination result which is in the ratio of 2:1:4:3, respectively, for the various categories? You are given that the critical value of chi-square for 3 degrees of freedom at 5% level of significance is 7.81

22. The following table gives the number of car accidents in Delhi that occurred during various days of the week.

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents:	14	16	8	12	11	9	14

Test whether the accidents are uniformly distributed over the week.

23. 7. A die is tossed 180 times with the following results:

No. Turned Up:	1	2	3	4	5	6
Frequency:	25	35	40	22	32	26

Test the hypothesis that the die is unbiased. Take a = 0.05.

24. A survey of 300 families, with three children each, selected at random gave the following results:

No. of Male Children:	0	1	2	3
No. of Families:	60	87	93	60

Are these data consistent with the hypothesis that male and female births are equally likely, at a lev of significance of 0.01?

25. The first proof of 200 pages of a book containing 560 pages revealed the number of printing errors: following distribution of the

No. of errors in a page:	0	1	2	3	4	5
Total						

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No. of pages:	112	63	20	3	1	1	200

Fit a Poisson distribution corresponding to these data and test the goodness of fit.

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LESSON-7

CORRELATION, REGRESSION AND ITS APPLICATIONS

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STRUCTURE

7.1 Learning Objectives
7.2 Introduction
7.3 Concepts of Covariance and Correlation
  7.3.1 Covariance
  7.3.2 Correlation
7.4 Regression Analysis
  7.4.1 Fitting of linear model
  7.4.2 Using regression for prediction
7.5 Summary
7.6 Self-Assessment Questions
7.7 References
7.8 Suggested Readings

7.1 LEARNING OBJECTIVES

After going through the lesson, the learners will be able to:

- Understand the concepts of covariance, correlation and regression

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- Learn about the fundamentals of linear regression
- Appreciate the technique of fitting of linear regression model
- Discover the practical applications of linear regression for prediction

7.2 INTRODUCTION

This lesson will introduce you to the statistical concepts of covariance, correlation and regression. Further, it will help you appreciate the techniques of building and fitting of a linear regression model along with its applicability in predicting future statistical outcomes. As in the previous lessons, the learner has already had a fair idea of various relevant statistical techniques including sampling and hypothesis testing, this lesson will add to the previously acquired knowledge base of the learner. Further, the new knowledge provided in the lesson will help you interestingly appreciate how the learnt concepts are put to practical uses in real-life scenarios.

CONCEPTS OF COVARIANCE AND CORRELATION

The lesson attempts to make the learner understand in simple terms the statistical concepts of covariance and correlation:

7.3.1 Covariance:

Covariance is a statistical tool used to assess the directional relationship between two random variables i.e. how a variable moves with regard to the direction of the other variable's movement. In simple terms, it lets you understand if a variables' value will increase or decrease in relation to the increase or decrease in the other variable's value. It studies how two variables change in comparison to one another. A positive covariance between two variables means that the two variables increase or decrease together while a negative covariance denotes that the two variables move in opposite directions. However, it does not indicate the degree to which the two variables being measured move or increase/decrease in relation to one another. A covariance of zero means that there is an unclear directional relationship between the variables being measured i.e. an increase in the value of a variable is equally likely to be paired with either an increase or decrease in the value of the other variable under study.

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As learnt in the previous lessons, in order to statistically study the behaviour of two variables, a number of observations are taken into consideration. So, in order to study the directional relationship between the two variables, it is the directional relationship between the mean scores of the two variables which is studied. Thus, covariance measures how data points are distributed around a calculated mean.

Covariance is measured in units. Covariance formula deals with the calculation of data points in relation to their movement from the average value in a dataset. As an example, the covariance between two random variables X and Y i.e. Cov (X, Y) can be calculated using the formula mentioned below (for population):

$$\text{Cov}(X,Y) = \frac{\sum (X_i - \bar{X})(\sum (Y_j - \bar{Y})}{n}$$

While for a sample covariance, the covariance formula is slightly tweaked as mentioned below:

$$\text{Cov}(X,Y) = \frac{\sum (X_i - \bar{X})(\sum (Y_j - \bar{Y})}{n - 1}$$

where,

X_i denotes the values of the X-variable

Y_j denotes the values of the Y-variable

$\bar{X}$ denotes the mean value of the X-variable

$\bar{Y}$ denotes the mean value of the Y-variable

n denotes the number of data points

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ACTIVITY

Suppose Mr. X is an investor whose existing portfolio of stocks owned by him tracks the performance of the Nifty 50 stock market index. Now, Mr. X wishes to include the stock of NNN Corp. But, before adding the stock to his portfolio he wants to assess the directional relationship between the performance of his stock and that of Nifty 50 as he doesn't want to own a stock that tends to move in the same direction as Nifty 50 as that might increase the unsystematic risk of his portfolio. How can you help Mr. X make his decision?

Suggested course of action:

- Mr. X can obtain the average stock prices of NNN corp.'s stock along with the yearly average figures of Nifty 50 index for the last 5 years and calculate the mean scores for both.
- The differences between the respective stock prices and index values are to be calculated from their respective mean values and the resultants be multiplied with each other to be finally divided by four to give sample covariance .
- If a positive covariance is found, it would indicate that the stock price and the Nifty 50 index would tend to move in the same direction and thus, the stock should not be bought.

7.3.2 Correlation:

Correlation is the statistical tool that measures the degree to which two random variables move or behave in relation to each other. Thus, correlation measures the strength of

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relationship between the two variables. The correlation between two variables is determined by the value of correlation coefficient which ranges between -1 and +1. A perfect positive correlation between two variables denotes that the value of correlation coefficient is +1 while that in case of perfect negative correlation will be -1. A positive correlation between two variables means that if the value of one variable increase than the value of the other variable will increase too and similar will be the case while the variable values are on decline. A perfect positive correlation means that the two variables under study will move in a similar manner i.e., simultaneously increase or decrease together for absolute 100% of the times. For example, if the prices of the oil related stocks increase in the stock market while the gas-related stock prices tend to increase as well, the both will be said to be positively correlated with each other. And, the more predictably the two given types of stock prices continue to increase or decrease together, their correlation coefficient will continue moving closer to +1 i.e., towards perfect positive correlation. Likewise, is the case for negative or perfect negative correlation wherein the variables under study move in reverse direction with respect to each other. For example, the height above sea level and temperature shares a negative correlation between them as the temperature drops as the height above sea level increases. A zero correlation is said to exist between the two variables if they share absolutely no relationship between themselves. For example, the level of intelligence vis-à-vis the amount of tea consumed could possibly be case of zero correlation if tested statistically.

There are several methods used to calculate the correlation between the variables. The most commonly used method for measuring the strength of relationship between two variables is calculating the coefficient of correlation through product moment method or Karl Pearson's coefficient of correlation or 'r' (also known as Pearson's R statistical test) which measures the linear relationship between the two variables under study.

- <u>Pearson's correlation coefficient for population</u>:

When Karl Pearson's correlation coefficient is calculated for a population, it is commonly represented by ρ (rho). The formula for calculating ρ for a given a pair of random variables (X,Y) is as given below:

$$\rho = \frac{\text{Cov}\,(X, Y)}{\sigma_x \sigma_y}$$

where,

Cov (X,Y) is the covariance between X and Y

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σ_x is the standard deviation of X

σ_y is the standard deviation of Y

- Pearson's correlation coefficient for sample:

Pearson's correlation coefficient for a sample can be calculated using the formula mentioned below:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

where,

n is sample size

x_i , y_i are the individual sample points

$\bar{x}$, $\bar{y}$ are the respective sample means

ACTIVITY

Count the number of glasses of water you consume in a day and find out the daily average temperature of your city for a week. On the basis of the data so collected, find out what level of correlation exists between the number of water glasses consumed in a day and the average daily temperature.

Illustration 7.1: Calculate the coefficient of correlation from the data pertaining to a sample as given below:

X	50	100	150	200	250	300	350
Y	10	20	30	40	50	60	70

Solution:

X	X - $\bar{X}$	$(X - \bar{X})^2$	Y	Y - $\bar{Y}$	$(Y - \bar{Y})^2$	$(X - \bar{X})(Y - \bar{Y})$

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50	-150	22500	10	-30	900	4500
100	-100	10000	20	-20	400	2000
150	-50	2500	30	-10	100	500
200	0	0	40	0	0	0
250	50	2500	50	10	100	500
300	100	10000	60	20	400	2000
350	150	22500	70	30	900	4500
∑		70000	-	-	2800	14000

$$\bar{X} = \frac{50+100+150+200+250+300+350}{7} = 200$$

$$\bar{Y} = \frac{10+20+30+40+50+60+70}{7} = 40$$

$$\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y}) = 14000$$

$$\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2} = \sqrt{70000} = 265$$

$$\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2} = \sqrt{2800} = 53$$

By substituting values in the formula, we get:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}} = \frac{14000}{265 \text{ x } 53} = 1$$

The calculated value of the Pearson's correlation coefficient as 1 denotes a perfect positive correlation between X and Y variables.

Illustration 7.2: A sample of five pairs of the ages of husbands and their wives is taken as given below. Calculate Karl Pearson's correlation coefficient between the ages of husbands and their wives and interpret the value of correlation coefficient.

Husband's age in years (X)	21	23	27	29	31	35	37

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Wife's age in years (Y)	19	20	25	22	29	32	35

Solution:

X	X - $\bar{X}$	$(X - \bar{X})^2$	Y	Y - $\bar{Y}$	$(Y - \bar{Y})^2$	$(X - \bar{X})(Y - \bar{Y})$
21	-8	64	19	-7	49	56
23	-6	36	20	-6	36	36
27	-2	4	25	-1	1	2
29	0	0	22	-4	16	0
31	2	4	29	3	9	6
35	6	36	32	6	36	36
37	8	64	35	9	81	72
∑		208	-	-	228	208

$$\bar{X} = \frac{21+23+27+29+31+35+37}{7} = 29$$

$$\bar{Y} = \frac{19+20+25+22+29+32+35}{7} = 26$$

$$\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y}) = 208$$

$$\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2} = \sqrt{208} = 14.42$$

$$\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2} = \sqrt{228} = 15.10$$

By substituting values in the formula, we get:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}} = \frac{208}{14.42 \text{ x } 15.10} = +0.96$$

The calculated value of the Pearson's correlation coefficient as + 0.96 denotes a high degree positive correlation between the ages of husbands and their wives for the chosen sample.

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7.4 REGRESSION ANALYSIS

It was Sir Francis Galton (1885) who introduced the term "regression" during his study which postulated that the average height of the children of tall parents tends to "regress" or move back towards the mean height of the population. He presented the term to imply it as a process of predicting one variable from analysing the values of the other variable. Regression as a tool of statistical analysis is employed to ascertain the inter-relationships or associations among the various variables which happen to occur in any given set of collected data. It can indicate the degree of strength of such inter-relationships and also ascertain their statistical significance i.e., whether or not the observed inter-relationships or associations exist due to chance or they exist owing to some logical reasons which warrant further investigation. Thus, regression is a potent tool for statistical exploration and inference that can also be used for predicting future results on the basis of the past observations.

'Linear Regression' is a scientific method or a statistical procedure of reliably predicting the future values of a 'dependent variable' based on the values of one or more variables known as 'independent variables. It is a way of quantifying the causal effect of one or more independent variables upon the dependent variable. For example, it can be used to predict upto a certain degree the expected change in quantity demanded of a commodity in case its price is increased or decreased. However, the prediction of future values is always an estimate which can be reported to be close to the actual values only within a certain degree of confidence or 'confidence interval'.

- <u>Simple Linear Regression</u>:

It is the simplest form of linear regression where there is only one independent variable under study in order to predict the values of a single dependent variable. For example, a firm's executive may try to predict the firm's sales on the basis of rate of GDP growth in the country using simple linear regression.

Simple linear regression model in the form of a regression line is stated as:

$$Y_i = a + bX_i + e_i$$

where,

Y_i is the dependent variable

X_i is the independent variable

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e_i is the unpredictable random element or residual or error term

a represents the Y-intercept of the regression line, which can be calculated as

$$a \text{ (intercept)} = \frac{\sum y \sum x^2 - \sum x \sum xy}{n \sum x^2 - (\sum x)^2}$$

b is a constant which represents the slope of the regression line, which can be calculated as

$$b \text{ (slope)} = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

Illustration 7.3 : Find simple linear regression equation for the following two sets of data for dependent variable 'y' and independent variable 'x':

x	2	5	6	9	8	3	7
y	3	7	4	10	5	6	4

Solution:

x	**y**	**x^2**	**xy**
2	3	4	6
5	7	25	35
6	4	36	24
9	10	81	90
8	5	64	40
3	6	9	18
7	4	49	28
$\sum x = 40$	$\sum y = 39$	$\sum x^2 = 268$	$\sum xy = 241$

n = 7

$$b \text{ (slope)} = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2} = \frac{7*241-(40)(39)}{7*268-(40)^2} = \frac{127}{276} = 0.46$$

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$$a \text{ (intercept)} = \frac{\sum y \sum x^2 - \sum x \sum xy}{n \sum x^2 - (\sum x)^2} = \frac{39*268-40*241}{7*268-(40)^2} = \frac{812}{276} = 2.94$$

Simple linear regression line is denoted by the equation y = a + bx i.e.

$$y = 2.94 + 0.46x$$

- **<u>Multiple Linear Regression</u>:**

When more than one independent variable are studied in order to predict one dependent variable, it is a multiple linear regression. It is an extension of simple linear regression, wherein a number of independent or explanatory variables contribute to predict the outcomes of a dependent variable.

The basic model of multiple linear regression is similar to that of simple linear regression and is as described below:

$$Y_i = a + b_1X_{i1} + b_2X_{i2} + \ldots\ldots\ldots\ldots + b_pX_{ip} + e_i$$

for each observation i = 1, ……. , n

In the above-mentioned formula, n observations are considered for one dependent variable and *p* independent variables. Thus, Y_i is the ith observation of the dependent variable, X_{ij} is i^{th} observation of the jth independent variable, where j = 1, 2, ..., *p*. b_j denotes the values of the parameters to be determined, and e_i is the ith independent identically distributed normal error.

7.4.1 Fitting of the linear model

The term 'fitness of model' in terms of statistics implies the extent to which the predicted outcome fits or matches with the actual observations made. A regression model is said to be a well-fitted model if the predicted results are close to the actually observed data values. In order to statistically measure the goodness of fit of any regression model, one can take into account the following measures:

- <u>Standard error of estimate</u>:

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This indicator of goodness of fit which is also known as standard error of regression measures the standard deviation of the error term or residual of the predicted regression model. It measures the average distance that the observed values fall from the predicted regression line. Smaller values of standard error of regression indicates a better fit as they mean that the actual observations are closer to the fitted line. Thus, it is a measure to assess the precision of the predictions made using the regression model. The formula for calculation of the standard error of estimate for a linear regression model with one independent variable is given as follows:

$$\text{SEE} = \sqrt{\frac{\sum_{i=1}^{n}(Y_i - a - bX_i)^2}{n-2}} = \sqrt{\frac{\sum_{i=1}^{n}(e_i)^2}{n-2}}$$

where, the variable names represent the same as already explained above.

Although the standard error of estimate gives some indication of how certain one can be about a particular prediction of dependent variable (Y) using the regression equation, it still does not tell how well the independent variable explains the variation in the dependent variable.

- <u>Coefficient of Determination (R^2)</u>:

In order to determine how well the independent variable explains the variation in the dependent variable, the measure of coefficient of determination i.e. R^2 is employed. It measures the fraction of total variance in dependent variable that can be explained by the independent variable in a regression model. The coefficient of determination or R-squared is a fraction of total variation that can be explained by the regression model. So, if the R^2 of a model is 0.50, it implies that approximately half of the observed variations in the outcome can be explained by the model's inputs. The formulae for calculating the R^2 are as mentioned below:

$$R^2 = \frac{\text{Explained variation}}{\text{Total variation}}$$

$$= \frac{\text{Total variation} - \text{Unexplained variation}}{\text{Total variation}}$$

$$= 1 - \frac{\text{Unexplained variation}}{\text{Total variation}}$$

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$$= 1 - \frac{\sum(Y_i - \hat{Y})^2}{\sum(Y_i - \bar{Y})^2}$$

where,

Total variation = $\sum(Y_i - \bar{Y})^2$ i.e. summation of squared deviation from the mean ($\bar{Y}$) of the dependent variable Y

Unexplained variation = $\sum(Y_i - \hat{Y})^2$ i.e. summation of squared deviation from the predicted value ($\hat{Y}$) of the dependent variable Y

- **<u>Adjusted R-squared</u>:**

Adjusted R-squared is a better indicator of goodness of fit for a regression model as compared to the coefficient of determination (R^2). It is a modified version of R-squared that has been adjusted for the number of independent variables in the model. The value of adjusted R-squared increases when the newly added independent variable or predictor improves the model more than what would be expected by chance. On the other hand, it decreases when a predictor improves the model by less than expected. Because of this, the adjusted R^2 is a better indicator of goodness of model-fit. The value of adjusted R-squared is positive and not negative. Also, it is always lower than the value of R-squared. Increasing the number of independent variables or predictors which are included in a regression model tends to increase the R-squared value for the model, which entices the makers of the model to add even more variables. This is called overfitting and can return a superfluously high R-squared value which just creates an illusion of improved fitness of model. Therefore, the adjusted R-squared is a measure used to ascertain how reliable the model-fit is and how much of it is actually determined by the addition of new independent variables.

7.4.2 Using regression for prediction

Regression equations are quite commonly used in order to predict future outcomes on the basis of the study of the given independent variables or predictors. This property of regression analysis lets it find applications in a number of fields of research studies. The coefficients in the regression equation denote the relationship between the independent and dependent variables. The most common application of a regression model is to predict a model on the basis of a new data set rather than explain the data already present at hand. For

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example, in the field of marketing, the regression model can be used to predict the increase or decrease in a firm's revenue in response to the advertising efforts such as the size of an advertisement campaign put up by it.

Any regression equation does not signify the direction of causation. So, the context of the relationships among the independent and dependent variables must be understood in order to justify the direction of causation indicated by the predicted regression model. For example, a robust relationship might be indicated by a regression model between the number of clicks received on an online advertisement and the amount of sales revenue actually collected. However, the researcher will be at a loss regarding the direction of causation i.e. what leads to what. At such a juncture, it is the common knowledge of marketing as a discipline which leads to the conclusion that the clicks on online advertisements actually lead to sales and the relationship is not vice versa. The regression equation in itself does not provide any idea about the direction of the relationship.

By putting in the respective values of the independent variables in the regression equation, the corresponding value of the mean of the dependent variables can be obtained. The value of the mean of the predicted dependent variable can prove to be a fairly accurate measure of the desired future outcome. However, it is subject to an error of prediction whose value is determined by the known as the residual variance or unexplained variance in the prediction model. The less the percentage of the unexplained variance is obtained, the more robust the predicted model is claimed to be. The regression of best fit is the one which contains the minimum amount of unexplained variance.

Further, the predicted regression model is subject to bias and precision. Bias in a regression model implies the systematic high and low that creep into the predicted values. On the other hand, the precision of a regression model implies the closeness of the observed values to the predicted values. The model is to be precise if the predicted values are close enough to the observed values.

The predictions in regression are made for calculation of the mean of the dependent variable and there is variation around that mean. In the fitted regression line plot, the regression line is nicely in the centre of the data points. However, there is a spread of data points around the line. We need to quantify that spread to know how close the predictions are to the observed values. If the spread is too large, the predictions will not provide useful information.

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Regression analysis find applications in a number of industries as it can be employed for the prediction of future industrial indices on the basis of a time-series of observations of the generally industry-accepted statistical means. Regression analysis endeavours to obtain a "best fitting" straight line between data points (plotted as X and Y coordinates on a graph) such that the line can then be extended to determine future points on that graph. This process can yield acceptable results subject to certain criteria which it is expected to satisfy. The study of past performance is logical method to predict future outcomes as the trend highlighted by the regression analysis attempts to demonstrate what might happen in future if no additional actions are taken. It is a good method as it is based on past data which represents a true or actual trend that had actually taken place in the past. Also, enough or adequate data should be available in order to enable the researcher to study the past trend. Outliers must not present in the data under analysis.

Let us study how we can actually regression analysis for prediction of future outcomes using a method known as 'Least Squares Method'. Least Squares Method is a type of mathematical regression analysis which is employed for determination of the line of best fit for a given set of data along with providing a visual demonstration of the relationship between the data points. Each point of data represents the relationship between a known independent variable and an unknown dependent variable. This method is used to find the best fit for a set of data points by minimizing the sum of the offsets or residuals of points lying off the plotted curve. This method of regression analysis involves the plotting of a set of data points on an x and y-axes graph. An analyst using the least squares method will attempt to obtain a line of best fit which will happen to be at the least possible distance from the maximum number of data points. Such line of best fit explains the potential relationship between independent and dependent variables which can be further extrapolated in order to predict the future data points that would fall on the explolated line of best fit. This way, the analyst can get a fairly close ides regarding how the future data points would behave.

The method of least squares also attempts to let the research have an idea of the overall rationale or a plausible explanation behind the placement of the line of best fit among the data points being studied. The most common application of this method, which is sometimes referred to as "linear" or "ordinary", aims to create a straight line that minimizes the sum of the squares of the errors that are generated by the results of the associated equations, such as the squared residuals resulting from differences in the observed value, and the value anticipated, based on that model. The line of best fit determined from the least squares method has an equation that tells the story of the relationship between the data points. Line of best fit equations may be determined by using various computer-assisted software models,

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which include a summary of outputs for analysis, where the coefficients and summary outputs explain the dependence of the variables being tested. The line that best fits the linear relationship between the two variables is known as a least-squares regression line, which is so plotted that it minimizes the vertical distance from the data points to the regression line. The term “least squares” is used because it is the smallest sum of squares of errors, which is also called the "variance". While plotting the regression analysis line graph, the dependent variables are shown on the vertical i.e. y-axis, while the independent variables are shown on the horizontal or x-axis as shown in Fig 7.1. These designations will form the equation for the line of best fit, which is determined from the least squares method for the given set of data points by reducing the sum of the squares of the offsets (residual parts) of the points from the plotted curve.

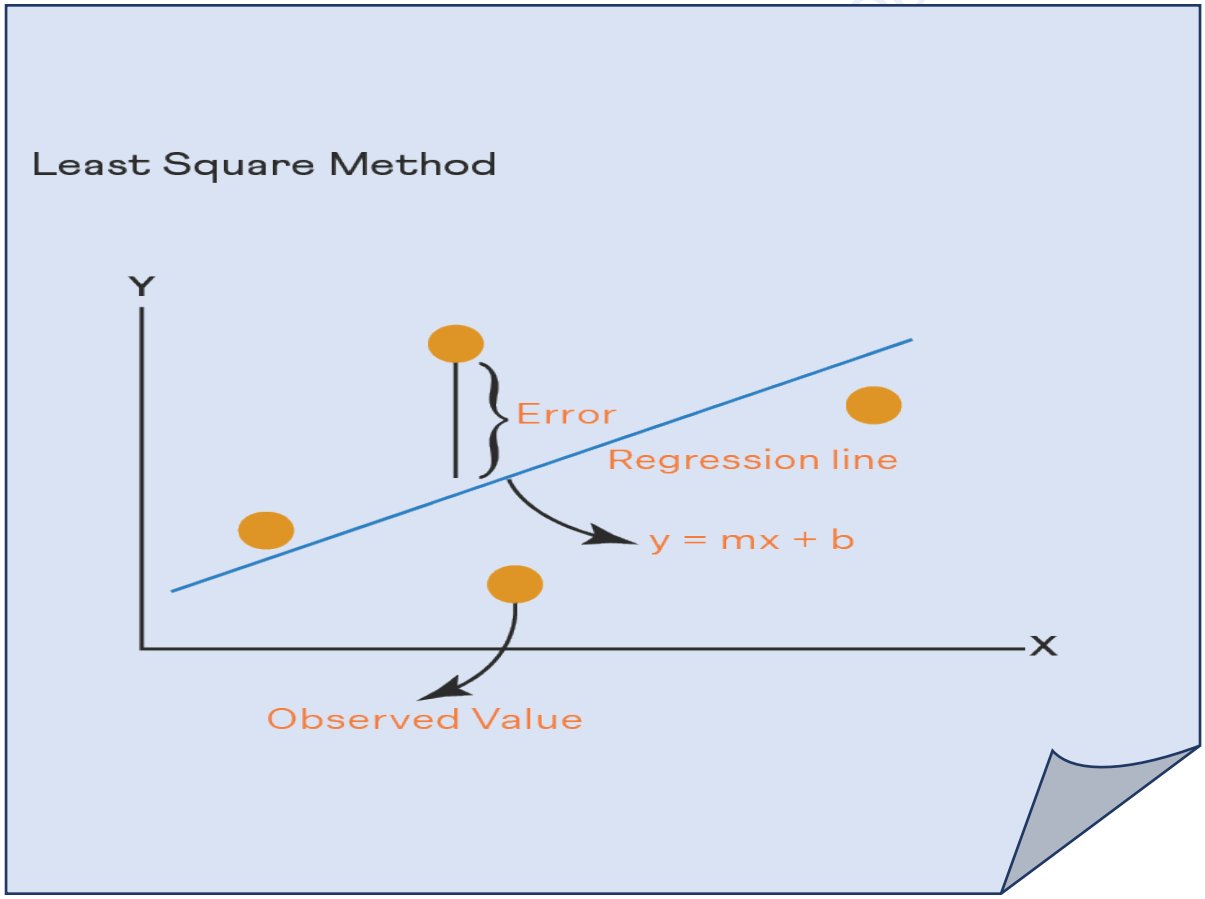

Fig 7.1: Line graph of regression equation using ‘Least Squares Method’

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7.4.3 Mathematical procedure to establish the line of best fit using "Least Squares Method"

As per the least squares method, the mathematical equation of the regression line can be expressed as given below:

$$Y = mX + b$$

where,

y = how far up on the y-axis
x = how far along the x-axis
b = the Y-intercept (where the line crosses the Y-axis)
m = slope or gradient of the regression line (how steep the line is)

Accordingly, in order to find out the line of best fit for 'n' points, the following steps are to be followed:

Step 1: For each (x,y) point, calculate the values of x^2 and xy

Step 2: Calculate the summation of all x, y, x^2 and xy, which are represented as $\sum x$, $\sum y$, $\sum x^2$ and $\sum xy$

Step 3: Calculate the value of slope m as below:

$$m \text{ (slope)} = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$$

where, 'n' is the number of points

Step 4: Calculate the value of Y-intercept 'b' as below:

$$b \text{ (intercept)} = \frac{\sum y - b\sum x}{n}$$

Step 5: Put together the equation of regression line as below:

$$Y = mX + b$$

7.4.4 Example of linear regression analysis using 'Least Squares Method'

Suppose a shopkeeper has found out for how many hours in a day did the sun shine in this area during the last five days (Monday to Friday) and also the number of ice cream cones that he had sold at his shop during the same days. Now, he wishes to predict the number of ice cream cones that he would be able to sell on Saturday so that he can make preparations

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accordingly if the weather forecast (hours of sunshine expected) is known. The information as recorded by the shopkeeper is as mentioned in the below table:

Sr. No.	**Day of the week**	**"X"** **Hours of sunshine**	**"Y"** **Number of ice cream cones sold**
1	Mon	2	4
2	Tue	3	5
3	Wed	5	7
4	Thu	7	10
5	Fri	9	15

Now, so as to predict the number of ice cream cones that the shopkeeper can expect to sell on Saturday, we need to find the best m (slope) and b (y-intercept) that suits the data

$$Y = mX + b$$

Accordingly, we ned to sequentially follow the steps as explained above:

Step 1: For each (x,y) point, the values of x^2 and xy can be calculated as below:

x	**y**	**x^2**	**xy**
2	4	4	8
3	5	9	15
5	7	25	35
7	10	49	70
9	15	81	135

Step 2: Let us calculate the summation of all x, y, x^2 and xy, which are represented as $\sum x$, $\sum y$, $\sum x^2$ and $\sum xy$ as below:

x	**y**	**x^2**	**xy**
2	4	4	8

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3	5	9	15
5	7	25	35
7	10	49	70
9	15	81	135
∑x: 26	**∑y: 41**	**∑x²: 168**	**∑xy: 263**

Also n (number of data values) = 5

Step 3: Let us calculate slope **m**:

$$\text{m (slope)} = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$$

$$= \frac{5 \text{ x } 263 - 26 \text{ x } 41}{5 \text{ x } 168 - 26^2}$$

$$= \frac{1315 - 1066}{840 - 676}$$

$$= \frac{249}{164} = 1.5183.....$$

Step 4: Next, let us calculate y-intercept **b**:

$$\text{b (y-intercept)} = \frac{\sum y - m\sum x}{n}$$

$$= \frac{41 - 1.5183 \text{ x } 26}{5}$$

$$= 0.3049.....$$

Step 5: Accordingly, let us put together the equation of the regression line as below:

$$y = mx + b$$

$$y = 1.518x + 0.305$$

Accordingly, the expected number of ice cream cones can be predicted within a certain degree accuracy by putting in the value of x (number of hours of sunshine predicted) in the above equation of regression line. So, suppose the shopkeeper gets to know about the weather

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forecast report which says "we expect 8 hours of sun tomorrow", he can then use the above equation to estimate that he will sell

$$y = 1.518 \times 8 + 0.305 = 12.45 \text{ ice cream cones}$$

Accordingly, the shopkeeper can prepare the fresh waffle cone mixture atleast for 13 ice cream cones in advance.

7.5 SUMMARY

The lesson, in a sequential order, covers the statistical concepts of covariance, correlation, regression and model fitting. It lets the learner understand the basic fundamentals at work behind the aforesaid statistical techniques along with appreciate the mathematical formulae used in order to quantify the values obtained as result of running the mentioned statistical techniques on a quantitative data set. Further, the lesson allows the learner to appreciate how the regression analysis is used for model fitting and prediction of future outcomes using the least squares method. Utilizing the knowledge acquired from studying the given lesson, the learner is encouraged to further expand his mental horizon by undertaking further study of how the given statistical techniques are practically applied in real-world scenarios. Doing so will result in a deep rooted and internalized knowledge with regard to the statistical techniques covered under the purview of the given lesson.

7.6 SELF-ASSESSMENT QUESTIONS

MCQ

Q.1) Which one of the following cannot be a value of a correlation coefficient between two variables?

A.) +1.25 **B.)** +1 **C.)** -1 **D.)** -0.5

Q.2) The term ‘regression’ was first introduced by whom?

A.) Karl Pearson **B.)** Blaise Pascal **C.)** Francis Galton **D.)** Thomas Bayes

Q.3) Which statistical tool is used to assess the directional relationship between two random variables?

A.) Correlation **B.)** Covariance **C.)** Linear Regression **D.)** Multiple Regression

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Q.4) In a Covariance formula, what does 'n' denote?

A.) Number of data points **B.)** Covariance **C.)** Mean **D.)** Error

Q.5) What do smaller values of standard error of regression indicate in a linear regression model?

A.) A better fit **B.)** A worse fit **C.)** No fit **D.)** None of the above

Q.6) The term "least squares" means the same as which one of the following?

A.) Covariance **B.)** Variance **C.)** Correlation **D.)** Standard error

Q.7) Which of the following is the best among the given indicators of goodness of fit of a regression model?

A.) R-square **B.)** Adjusted R-square **C.)** Correlation Coefficient **D.)** Standard error

Q.8) $\sum(Y_i - \hat{Y})^2$ i.e. summation of squared deviation from the predicted value ($\hat{Y}$) of the dependent variable Y denotes which of the following?

A.) Total variation **B.)** Explained variation **C.)** Unexplained variation **D.)** Coefficient of determination

Q.9) Which of the following statistical tools is often employed for prediction of future values based on the analysis of past values?

A.) Correlation **B.)** Covariance **C.)** Regression **D.)** Variance

Q.10) Which of the following cannot indicate the goodness of fit of a regression model?

A.) R-square **B.)** Adjusted R-square **C.)** Covariance **D.)** Standard error

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Q.11) In the formula of Pearson's correlation coefficient for sample, what does 'n' stand for?

A.) Sample size **B.)** Covariance **C.)** Mean **D.)** Error

Q.12) Which of the following statements is true for correlation analysis?

A.) It is a bivariate analysis

B.) It is a multivariate analysis

C.) It is a univariate analysis

D.) Both A and C

Q.13) Which of the following involves using an independent variable is used to explain a dependent variable?

A.) Linear regression analysis

B.) Multiple regression analysis

C.) Non-linear regression analysis

D.) None of the above

Q.14) Which of the following statements is true about the regression line?

A.) A regression line is also known as the line of the average relationship

B.) A regression line is also known as the estimating equation

C.) A regression line is also known as the prediction equation

D.) All of the above

Q.15) Which of the following are types of correlation?

A.) Positive and Negative

B.) Simple, Partial and Multiple

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C.) Linear and Nonlinear

D.) All of the above

Answer Keys

Q.1) A	Q.9) C
Q.2) C	Q.10) C
Q.3) B	Q.11) A
Q.4) A	Q.12) C
Q.5) A	Q.13) A
Q.6) B	Q.14) D
Q.7) B	Q.15) D
Q.8) C	

Long Questions

1. Explain the difference between the concepts of covariance and correlation. Elaborate each difference with providing suitable examples.
2. Discuss the various indicators of fitness of model for a multiple linear regression model.
3. Using a suitable example, explain how regression analysis can be used for prediction of future outcomes.

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LESSON-8

LINEAR AND DUAL PROGRAMMING PROBLEM

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STRUCTURE

8.1 Learning Objectives
8.2 Introduction
8.3 Linear Programming Problem
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8.3.2 Graphical Method of Solving LPP
8.3.3 Unbounded Solution
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8.3.5 Simplex Method with more than two variables
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8.4.5 Rules for Converting any Primal into Dual
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8.9 Suggested Readings

8.1 LEARNING OBJECTIVES

In Mathematics**, linear programming** is a method of optimizing operations with some constraints. The main objective of linear programming is to maximize or minimize the numerical value. It consists of *linear functions* which are subjected to constraints in the form of linear equations or in the form of inequalities. Linear programming is considered an important technique that is used to find the optimum resource utilization. The term "linear programming" consists of two words linear and programming. The word "linear" defines the relationship between multiple variables with degree one. The word "programming" defines the process of selecting the best solution from various alternatives.

Linear Programming is widely used in Mathematics and some other fields such as economics, business, telecommunication, and manufacturing fields.

8.2 INTRODUCTION

There are several techniques that someone can employ while making decisions. For example, quantitative techniques enable someone to take decisions objectively and efficiently.

Linear programming

This technique basically helps in maximizing an objective under limited resources. The objective can be either optimization of a utility or the minimization of a disutility. In other words, it helps in utilizing a resource or constraint to its maximum potential.

Someone generally uses this technique only under conditions involving certainty. Hence, it might not be very useful when circumstances are uncertain or unpredictable

Game theory

Sometimes, someone uses certain quantitative techniques only while taking decisions pertaining to their business rivals. The game theory approach is one such technique.

This technique basically simulates rivalries or conflicts between businesses as a game. The aim of managers under this technique is to find ways of gaining at the expense of their rivals. In order to do this, they can use 2-person, 3-person or n-person games.

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Queuing theory

Every business often suffers waiting for periods or queues pertaining to personnel, equipment, resources, or services.

For example, sometimes a manufacturing company might gather a stock of unsold goods due to irregular demands. This theory basically aims to solve such problems.

The aim of this theory is to minimize such waiting periods and also reduce investments in such expenses.

For example, departmental stores often have to find a balance between unsold stock and purchasing fresh goods. someone in such examples can employ the queuing theory to minimize their expenses

Network techniques

Complex activities often require concentrated efforts by personnel to avoid waste of time, energy, and money. This technique aims to solve this by creating strong network structures for work.

There are two very important quantitative techniques under this approach. These include the Critical Path Method and the Programme Evaluation & Review Technique. These techniques are effective because they segregate work efficiently under networks. They even drastically reduce time and money.

8.3 LINEAR PROGRAMMING PROBLEM

This technique basically helps in maximizing an objective under limited resources. The objective can be either optimization of a utility or the minimization of a disutility. In other words, it helps in utilizing a resource or constraint to its maximum potential.

In this problem we will find out the variable, constraints and objective function then we will find out the solution of the mathematical model of exist.

8.3.1 Formulation of LPP Models: Whenever some word problem is given then we convert it into a mathematical model which is known as LPP Problem.

We Shall begin with some simple examples.

Illustration 8.1: - Consider a calculator company that produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand for at least 1000 scientific and 800 graphing calculators each month. Because of limitations on production capacity, no more than 2000

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scientific and 1700 graphing calculators can be made monthly. To satisfy a supplying contract, a total of at least 2000 calculators must be supplied each month. If each scientific calculator sold results in Rs.120 profit and each graphing calculator sold produces an Rs.150 profit, how many of each type of calculator should be made monthly to maximize the net profit?

Solution -

Let's make a mathematical model for the problem. Suppose x is the number of scientific calculators produced and y is the number of graphing calculators produced.

Since the company cannot produce negative calculators; it will produce either no or positive numbers of calculators only,

we must have $x \geq 0$, $y \geq 0$. But, keeping in mind the demand of each type of calculator we have

$$x \geq 1000$$

$$y \geq 800$$

let $x \geq 0$, $y \geq 0$. Thus, we can drop a superficial requirement of $x \geq 0, y \geq 0$ from our modeling. But we caution you that this may not be the case always and many times it makes sense to assume variables to be non-negative.

Another issue is to take care of the production capacity of the calculators. So,

$$x \leq 2000$$

$$y \leq 1700.$$

Looking at the supply restriction, we must have

$x + y \geq 2000.$

There is no other information which is in the form of restrictions/conditions in the question. Then, we move on to look at the profit part. The net profit from sale of x scientific and y graphing calculators is

$120x + 150y$

Finally, we are able to identify our aim (or objective) so as to maximize the net profitper month, which means,

max $120x + 150y$

but our x and y must satisfy the restrictions. In conclusion, the ultimatemodel of the problem becomes

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Max $120x + 150y$

subject to

$1000 \le x \le 2000$

$800 \le y \le 1700$

$x + y \ge 2000.$

8.3.2 Graphical Method of Solving LPP:

Illustration 8.2

Consider a calculator company which produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 1000 scientific and 800 graphing calculators each month. Because of limitations on production capacity, no more than 2000 scientific and 1700 graphing calculators can be made monthly. To satisfy a supplying contract, a total of atleast 2000 calculators must be supplied each month. If each scientific calculator sold results in Rs.120 profit and each graphing calculator sold produces a Rs.150 profit, how many of each type of calculators should be made monthly to maximize the net profit.

Solution -

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$$x \ge 1000$$

$$y \ge 800.$$

let $x \ge 0$, $y \ge 0$. Thus, we can drop a superficial requirement of $x \ge 0, y \ge 0$ from our modeling. But we caution you that this may not be the case always and many at times it makes sense to assume variables be non-negative.

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graphing calculators is

$120x + 150y$

Finally, we can identify our aim (or objective) so as to maximize the net profit per month, which means,

max $120x + 150y$

but our x and y must satisfy the restrictions. In conclusion, the ultimate model of the problem becomes

$$\max\ 120x + 150y$$

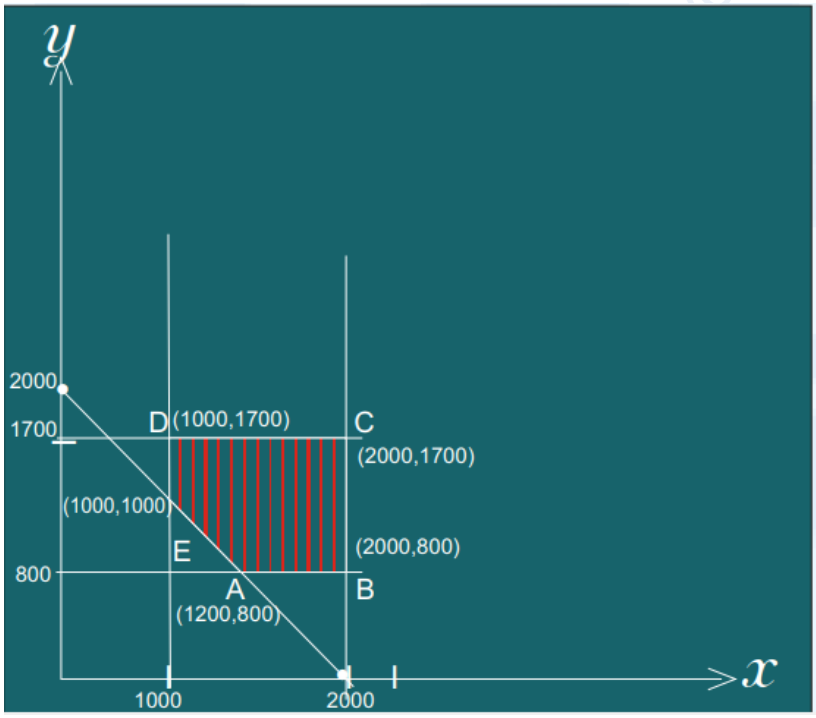
subjected to

$$1000 \le x \le 2000$$

$$800 \le y \le 1700$$

$$x + y \ge 2000$$

Since the model is set up in a two-dimensional plane, we can see what we are intending to do. Let us draw the region formed by the restrictions on x and y.



The portion shaded in red is the collection of points (x, y) satisfying

$1000 \le x \le 2000$

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$800 \leq y \leq 1700$

$x + y \geq 2000$

Now, what we want is to maximize $120x + 150y$ in this domain (i.e., red shaded region) only. In other words, we wish to find a pair (x^*, y^*) which lies in the shaded region and provide the maximum value of our goal function $120x + 150y$.

Though there are infinite points in the identified region and testing everyone of them is not a good idea, we need to design a strategy that can find the answer to our objective in a simpler way. This is what we shall be intending to do in the next few modules to follow but for the time being, let us see how the objective function behaves on the 'corner points' of the shaded region.

The corner points are *A, B, C, D, E,* and their coordinates are described in the graph. Let us tabulate the results

Point	Value of 120x+150y
A:(1200,80)	264,000
B:(2000,800)	360,000
C:(2000,1700)	510,000
D:(1000,1700)	375,000
E:(1000,1000)	270,000

From these five values(only), we can clearly make out that the best one is *C* (2000, 1700) with the maximum value of $120x + 150y$ as 510,000.

Although, we have not checked it just by looking at the above graph we can at least guess and get confident about our guess that no matter what other point (x, y) we select in the shaded region, the maximum value remains 510,000 and no further improvement (or enhancement) is possible in it within the shaded region.

We can conclude that the company should manufacture 200 scientific calculators and 1700 graphing calculators to get the best monthly profit of Rs 510,000 within the limitations of the company.

8.3.3 Unbounded Solution:

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If the value of the objective function can be increased or decreased indefinitely, such solutions are called unbounded solutions. In this case we say that the problem has unbounded solutions.

Let's take some examples for better understanding .

Illustration 8.3. Solve graphically the following L.P.P.

$$\text{Max. } Z = 3x_1 + 2x_2$$
$$x_1 - x_2 \leq 1,$$
$$x_1 + x_2 \geq 3$$
$$x_1, x_2 \geq 0.$$

Sol:

Proceeding stepwise, the permissible region is shaded in the figure which is unbounded. From the figure it is clear that the dotted line through the origin representing $Z = 0$ can be moved parallel to itself in the direction of Z increasing and still have some points in the permissible region.

Thus Z can be made arbitrarily large and so the problem has no finite maximum value of Z. Hence the problem has unbounded solution.

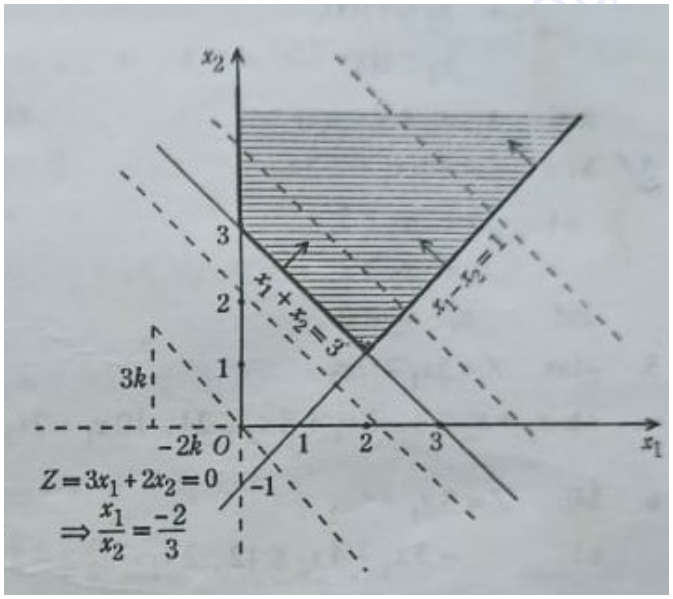

Illustration 8.4. Solve by graphical method, the L.P.P.

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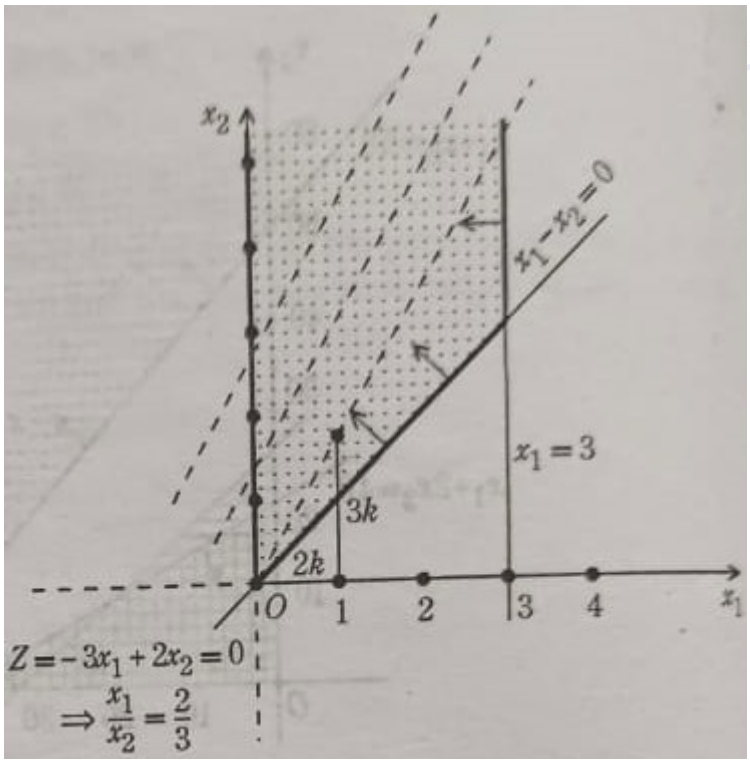
$$\begin{aligned} \text{Maximize} \quad & Z = -3x_1 + 2x_2 \\ \text{s.t.} \quad x_1 \quad & \leq 3 \\ x_1 - x_2 \quad & \leq 0 \\ \text{and } x_1, x_2 \quad & \geq 0. \end{aligned}$$

Sol:

Proceeding stepwise, the permissible region is shaded in the figure which is unbounded. From the figure it is obvious that the dotted line through the origin representing $Z = 0$ can be moved parallel to itself in the direction of Z increasing and still have some points in the permissible region.

Thus Z can be made arbitrarily large and so the problem has no finite maximum value of Z.

Hence the problem has unbounded solution.



8.3.4 Infeasible Solution:

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A set of values of the variables satisfying the constraints and the non negative restrictions of a L.P.P is called feasible solution of the L.P.P.

A solution is infeasible when no combination of decision variable values can satisfy the entire set of requirements and constraints.

Illustration 8.5

Maximize $Z = x_1 + x_2$

$x_1 + x_2 \leq 0$
and $x_1, x_2 \geq 0.$

Sol:

In the given problem sum of two variables less than or equal to zero but objective function is to maximize sum of the variable. So here we will have region in which solutions is not in the first quadrant so we can say solution is infeasible.

8.3.2 Simplex method with more than two variables:

COMPUTATIONAL PROCEDURE OF SIMPLEX METHOD. (THE MAXIMIZATION PROBLEM)
-It consists of the following steps systematically.

Step 1. If the given problem is of minimization, convert it into the maximization problem.

For this, multiply both sides of the objective function by -1 and put $-Z = Z'$. If v is the maximum value of Z' then $-v$ will be the minimum value of Z.
Step 2. Make all the b_i 's non-negative.

The R.H.S, of each of the constraints should be non-negative. If the L.P.P. has a constraint for which a negative b_i is given, it should be converted into positive value by multiplying both sides of the constraint by -1.

For example if the given constraint is $7x_1 - 8x_2 \geq -3$, it will change to $-7x_1 + 8x_2 \leq 3$.

Step 3. Convert inequalities of constraints into equations. For this introduce slack or surplus variables. The coefficients of slack or surplus variables in the objective function are zero. Introduce artificial variables, if necessary.

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Step 4. Find the initial B.F.S. Follow the method to find the initial B.F.S. If artificial variables are introduced in the L.P.P. then follow the two-phase method or Big M-method for solving such problems.

Step 5. Construct the initial simplex table. It should be remembered that the values of non-basic variables are always zero at each iteration.

Step 6. Test the initial B.F.S. for optimality. Compute the net evaluation Δ_j for each variable x_j by using the formula $\Delta_j = c_j - \mathbf{c}_B Y_j$.

Note that in the starting simplex table Δ_j 's are same as c_j 's. Also Δ_j 's corresponding to basic variables are zero.

Optimality test. (a) If $\Delta_j \leq 0$ for all j, the solution under consideration is optimal.

(i) Alternative optimal solution will exist if any Δ_j (for non-basic variable) is also zero.

(ii) If $\Delta_j < 0$ for all f, corresponding to non-basic variables, then the solution is unique optimal solution.

(b) If $\Delta j > 0$ for any f i.e, if at least one Δ is positive the solution under test is not optimal. In this case we must proceed to improve the solution (step 7).

(c) If corresponding to maximum positive Δ_j, all elements of the column Y_j are negative of zero, the solution under teat will be unbounded. ach) If optimality condition is satisfied but the value of at least one artificial variable present in the basis is non-zero, the problem will have no feasible solution.

step 7. Select the entering (incoming) vector and departing (outgoing) vector. To improve the initial B.F.S. we select the vector entering the basis matrix and the vector to be removed from the basis matrix by the following rules :

To find Incoming vector. The incoming vector α_k is always selected corresponding to the largest positive value of Δ_j.

If maximum value of Δ_j occurs for more than one α_j then we can select any of these vectors as incoming vector.

To find Outgoing vector. The departing vector β_r is selected corresponding to that value of r for which

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$$\frac{x_{Br}}{y_{rk}} = \text{m} \left\{\frac{x_{BI}}{y_{ik}}, y_{ik} > 0\right\}.$$

if α_k is the incoming vector. Note. If the above-mentioned minimum value is not unique then more than one variable will vanish in the next solution. As a result the next solution will be a degenerate B.F.S. for which the outgoing vector is selected in a different way.

Step 8. If α_k is the entering vector and β_r is the outgoing vector then the element y_{rk} which lies at the intersection of minimum ratio arrow $(\rightarrow)$ and incoming vector arrow $\uparrow$ is called the pivot element (key element). We put this element in $\square$.

In order to bring β_r in place of incoming vector Y_k, unity must occupy the place In other words key element y_{nk} should be 1 . If it is not so then divide all the elements of this row by the key element y_{rk}. Then subtract suitable multiples of the row containing the key element from all other rows and obtain zero at all other positions of this column Y_k. Now bring β_r in place of α_r and construct the revised simplex table.

Thus we get improved basic feasible solution.

Step 9. Test the improved B.F.S. for optimality.

If it is not optimum, repeat steps 7 and 8 until we obtain an optimum solution.

Illustration 8.6. Solve by simplex method the following L.P.P.

Maximise

$$Z = 2x_1 + 5x_2 + 7x_3$$
$$3x_1 + 2x_2 + 4x_3 \leq 100$$
$$x_1 + 4x_2 + 2x_3 \leq 100$$
$$x_1 + x_2 + 3x_3 \leq 100,$$
$$x_1, x_2, x_3 \geq 0.$$

Sol. The given problem is of maximization and all b_i 's are positive.

Introducing slack variables x_4, x_5, x_6 to convert constraint inequalities into equations, the given problem becomes

$$Z = 2x_1 + 5x_2 + 7x_3 + 0x_4 + 0x_5 + 0x_6$$

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subject to

$$3x_1 + 2x_2 + 4x_3 + x_4 = 100$$
$$x_1 + 4x_2 + 2x_3 + x_5 = 100$$
$$x_1 + x_2 + 3x_3 + x_6 = 100$$

The starting B.F.S. is

$x_1 = 0, x_2 = 0, x_3 = 0, x_4 = 100, x_5 = 100, x_6 = 100.$

The solution to the problem using simplex method is given below :

B C_B	C_j	2 5 7 0 0 0	Min. Ratio
	X_B	Y_1 Y_2 Y_3 Y_4 Y_5 Y_6	X_B/Y_3
Y_4 0	100	3 2 4 1 0 0	25(min)
Y_5 0	100	1 4 2 0 1 0	50
Y_6 0	100	1 1 3 0 0 1	100/3
Z = $C_B X_B$ =0	Δ_j	2 5 7 0 0 0	X_B/Y_2
Y_3 7	25	3/4 1/2 1 1/4 0 0	50
Y_5 0	50	-1/2 3 0 -1/2 1 0	50/3 (min)
Y_6 0	25	-5/4 -1/2 0 -3/4 0 1	Neg
Z = $C_B X_B$ =175	Δ_j	-13/4 3/2 0 -7/4 0 0	
Y_3 7	50/3	5/6 0 1 1/3 -1/6 0	
Y_2 5	50/3	-1/6 1 0 -1/6 1/3 0	
Y_6 0	100/3	-4/3 0 0 -5/6 1/6 1	
Z = $C_B X_B$ =200	Δ_j	-3 0 0 -3/2 -1/2 0	

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In the last table all delta j's are less than or equal to zero so solution is optimal and optimal solution is 0,50/3,50/3 and maximum value of objective function is 200.

8.4 DUAL PROGRAMMING PROBLEM

Every LPP called the **primal** is associated with another LPP called **dual**. Either of the problems is primal with the other one as dual. The optimal solution of either problem reveals the information about the optimal solution of the other

8.4.1 Primal to Dual Convertion

$\text{Max } Z_x = c_1x_1 + c_2x_2 + \cdots + c_nx_n$

Subject to restrictions

$$a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n \le b_1$$
$$a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n \le b_2$$
$$a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n \le b_n$$

and

$$x_1 \ge 0, x_2 \ge 0, \ldots, x_n \ge 0$$

The corresponding dual is defined as

$\text{Min } Z_w = b_1w_1 + b_2w_2 + \cdots + b_mw_m$

Subject to restrictions

$$a_{11}w_1 + a_{21}w_2 + \cdots + a_{m1}w_m \ge c_1$$
$$a_{12}w_1 + a_{22}w_2 + \cdots + a_{m2}w_m \ge c_2$$

. . . . ….. …… ……. …… ……..

$$a_{1n}w_1 + a_{2n}w_2 + \cdots \ldots \ldots + a_{mn}w_m \ge c_n$$

$w_1, w_2, \ldots, w_m \ge 0$

Matrix Notation of above problem will be

Primal Problem is

$\text{Max } Z_x = CX$

Subject to

$AX \le b$ and $X \ge 0$

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Dual

$$\text{Min } Z_w = b^{\top} W$$
Subjected to
$$A^{\top} W \geq C^{\top}$$
$$W \geq 0$$

8.4.2 Important characteristics of Duality :

1. Dual of dual is primal
2. If either the primal or dual problem has a solution, then the other also has a solution andtheir optimum values are equal.
3. If any of the two problems has an infeasible solution, then the value of the objectivefunction of the other is unbounded.
4. The value of the objective function for any feasible solution of the primal is less than thevalue of the objective function for any feasible solution of the dual.
5. If either the primal or dual has an unbounded solution, then the solution to the otherproblem is infeasible.
6. If the primal has a feasible solution, but the dual does not then the primal will nothave a finite optimum solution and vice versa.

8.4.3 Advantage and Application of Duality :

1. Sometimes dual problem solution may be easier than primal solution, particularly whenthe number of decision variables is considerably less than slack / surplus variables.
2. In the areas like economics, it is highly helpful in obtaining future decision in theactivities being programmed.
3. In physics, it is used in parallel circuit and series circuit theory.
4. In game theory, dual is employed by column player who wishes to minimize his maximum loss while his opponent i.e., Row player applies primal to maximize his minimum gains. However, if one problem is solved, the solution for other also can be obtained from the simplex tableau.
5. When a problem does not yield any solution in primal, it can be verified with dual.
6. Economic interpretations can be made, and shadow prices can be determined

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enabling the managers to take further decisions.

8.4.4 Step for a Standard Primal Form :

1 Change the objective function to Maximization form

2 If the constraints have an inequality sign '≥' then multiply both sides by -1 and convert the inequality sign to '≤'.

3 If the constraint has an '=' sign then replace it by two constraints involving the inequalities going in opposite directions. For example, $x_1 + 2x_2 = 4$ is written as

$x_1+2x_2 \leq 4$

$x_1+2x_2 \geq 4$ (using step2) $\rightarrow - x_1-2x_2 \leq - 4$

4 Every unrestricted variable is replaced by the difference of two non-negative variables.

5 We get the standard primal form of the given LPP in which.

All constraints have '≤' sign, where the objective function is of maximization form.

All constraints have '≥' sign, where the objective function is of minimization form.

8.4.5 Rules for Converting any Primal into its Dual :

1. Transpose the rows and columns of the constraint co-efficient.
2. Transpose the co-efficient ($c_1, c_2, \ldots c_n$) of the objective function and the right side constants ($b_1, b_2, \ldots b_n$)
3. Change the inequalities from '≤' to '≥' sign.
4. Minimize the objective function instead of maximizing it.

8.4.6 Problems :

Illustration 8.7

$\text{Min } Z_x = 2x_2 + 5x_3$

Subject to

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$$x_1 + x_2 \geq 2$$
$$2x_1 + x_2 + 6x_3 \leq 6$$
$$x_1 - x_2 + 3x_3 = 4$$
$$x_1, x_3 x_3 \geq 0$$

Solution

Primal

Max $Z_x{}' = -2x_2 - 5x_3$

Subject to

$$-x_1 - x_2 \leq -2$$

$$2x_1 + x_2 + 6x_3 \leq 6$$

$$x_1 - x_2 + 3x_3 \leq 4$$

$$-x_1 + x_2 - 3x_3 \leq -4$$

$$x_1, x_2 x_3 \geq 0$$

Dual is given by

$$\text{Min } Z_{ux} = -2w_1 + 6w_2 + 4w_3 - 4w_4$$
Subject to
$$-w_1 + 2w_2 + w_3 - w_4 \geq 0$$
$$-w_1 + w_2 - w_3 + w_4 \geq -2$$
$$6w_2 + 3w_3 - 3w_4 \geq -5$$
$$w_1, w_2, w_3, w_4 \geq 0$$

8.5 SUMMARY

The main points which we have covered in this lesson are what is LPP and how to represent it geometrically and find its solutions and later on we have discussed duality of Linear Programming Problem and how to convert primal to dual LPP.

8.6 SELF ASSESSMENT QUESTIONS

1) The ABC Electric Appliance Company produces two products; refrigerators and coolers. Production takes place in two separate departments. Refrigerators are produced in Department I and coolers produced in Department II. The company's two

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products are produced and sold on a weekly basis. The weekly production cannot exceed 25 refrigerators in Department I and 35 coolers in Department II, because of the limited available facilities in these two departments. The company regularly employs a total of 60 workers in the two departments. A Refrigerator requires 2 man-week of labour, while a cooler requires 1 man-week of labour. A refrigerator contributes a profit of Rs. 60 and a cooler contributes a profit of Rs. 40 . How many units of refrigerators and coolers should the company produce to realize maximum profit?

2) A firm manufactures two types of products A and B sells each of them at a profit of Rs. 2 per product. Each product is processed on two machines P and Q. Type A product requires one minute of processing time on machine P and two minutes on machine Q. Type B product requires one minute on machine P and one minute on machine Q. The machine P is available for not more than 6 hours and 40 minutes while machine Q is available for 10 hours during any working day. Formulate the given problem as a LPP and find how many products of each type should the firm produce each day in order to get maximum profit.

3) An automobile manufacturer manufacture automobiles and trucks in a factory that is divided into two shops. Shop A, which performs the basic assembly operation, must work 5 man-days on each truck but only 2 man-days on each automobile. Shop B, which performs finishing operation, must work 3 man-days for each automobile or truck that it produces. Because of men and machine limitations, shop A has 180 man-days per week available while shop B has 135 man-days per week. If the manufacturer makes a profit of Rs. 300 on each truck and Rs. 200 on each automobile, how many of ench should he produce to maximize his profit?

4) A company produces two types of leather belts, say type A and B. Belt A is of superior quality and belt B is of a lower quality. Profits on the two types of belts are 40 and 30 paise per belt, respectively. Each belt of type A requires twice as much time as required by a belt of type B. If all belts were of type B, the company would produce 1000 belts per day. But the supply of leather is sufficient only for 800 per day. Belt A requires a fancy buckle and 400 fancy buckles are available for this, per day. For belt of type B, only 700 buckles are available per day. How should the company manufacture the two types of belts in order to have maximum overall profit? (Rohilkhand 1983,84,89; Jodhpur 93)

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5) A publisher sells a hard cover edition of a text book for Rs. 72 and a paperback edition of the same text for Rs. 40. Costs to the publisher are Rs. 56 and Rs. 28 per book respectively in addition to weekly costs of Rs. 9600 . Both types of books require 5 minutes of printing time, although hard cover requires 10 minutes binding time and the paperback requires only 2 minutes. Both the binding and printing operations have 4800 minutes available each week. How many of each type of book should be produced in order to maximize profit?

6) A manufacture has employed 5 skilled men and 10 semi-skilled men and make an article in two qualities : deluxe model and an ordinary model. The making of a deluxe model requires 2 hrs work by a skilled man and 2 hrs work by a semi-skilled man. The ordinary model requires 1 hr by a skilled man and 3 hrs by a semi-skilled man. By union rules no man may work more than 8 hrs per day. The manufacturer's clear profit on deluxe model is Rs, 15 and on an ordinary model is Rs. 10. How many of each type should be made in order to maximize his total daily profit ?

Answer:

1) Refrigerator 12.5 , Cooler 35, Max Profit 2150
2) Maximum profit is Rs 800 when Products A And B are produced corresponding to the points on the corresponding to the points on the line segment MN.
3) Trucks 30, Automobiles 15 per week, Max profit 12000
4) 200 belts of type A, 600 belts of type B ; profit Rs 260.
5) Maximum profit is Rs 3072 when 288 books of hard cover edition and 672 books of paperback edition are sold.
6) Maximum profit is Rs 350 when 20 ordinary and 10 deluxe models are made.

Fill in the blanks and MCQ's Problems

Fill in the blanks "....." so that the following statements are complete and correct.

1 In L.P.P. the function which is to be optimized is called an ..... function.

2 The linear inequations (or equations)under which the objective function is to be optimized are called .....

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3 A set of values of the variables $x_1, x_2, \ldots\ldots, x_n$ satisfying the constraints and non-negative restrictions of a L.P.P. is called a ..... solution of the L.P.P.

4 If the value of the objective function Z can be increased or decreased indefinitely, such solutions are called ..... solutions.

5 A necessary and sufficient condition for the existence and non-degeneracy of all the basic solutions of $A\mathbf{x} = \mathbf{b}$ (m equations in n unknowns), is that every set of m columns of the augmented matrix $[A, \mathbf{b}]$ is .....

6 The positive variables which are added to L.H.S. to the constraints to convert them into equalities are called the ..... variables.

7 The positive variables which are subtracted from the L.H.S. of the constraints to convert them into equalities are called the ..... variables.

8 The non-basic variables in a basic solution are ..... valued variables.

9 A feasible solution to a L.P.P. in which the vectors associated to non-zero variables are ..... is called a B.F.S.

10 A L.P.P. of ..... variables can be solved graphically.

Multiple Choice Questions.

Indicate the correct answer for each question by writing the corresponding letter from (a), (b), (c) and (d).

11 The extreme points of the convex set of feasible solutions of the L.P.P.
$\text{Max } Z = 10x_1 + 15x_2$ s.t. $x_1 + x_2 = 2, 3x_1 + 2x_2 \leq 6, x_1, x_2 \geq 0$ are
(a) $(2,0), (0,2)$
(c) $(0,2), (0,3)$
(b) $(2,0), (0,3)$
(d) $(0,0), (0,3)$.

12. If there is no feasible region in a L.P.P. then we say that the problem has
(a) infinite solutions
(b) no solution
(c) unbounded solution
(d) none of these.

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13. The solution of the L.P.P. Max. $Z = 5x_1 + 7x_2$ s.t.
$3x_1 + 2x_2 \leq 12, 2x_1 + 3x_2 \leq 13, x_1, x_2 \geq 0$ is
(i) $x_1 = 2, x_2 = 3, Z = 31$
(b) $x_1 = 4, x_2 = 0, Z = 20$
(c) $x_1 = 0, x_2 = \frac{13}{3}, Z = \frac{91}{3}$
(d) none of these.

14. Given the following set of equations :

$$x_1 + 4x_2 - x_3 = 3, 5x_1 + 2x_2 + 3x_3 = 4$$

The B.F.S. involving x_1 and x_2 is

(a) $\left(\frac{5}{9}, \frac{11}{18}, 0\right)$

(b) $\left(\frac{5}{9}, 0, 0\right)$

(c) $\left(0, \frac{11}{18}, 0\right)$

(d) none of these.

15. The maximum number of basic solutions to a set of m simultaneous equations in n unknowns $(n \geq m)$ is

(a) m

(b) $n - m$

(c) ${}^{n}C_{m}$

(d) none of these.

True or False.

Write "T' for true and ' F ' for false statement.

16. A basic feasible solution is said to be optimum, if it optimizes the objective function.

17. A basic feasible solution is called degenerate if one or more basic variables are zero-valued.

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18. The L.P.P. optimize $Z = x_1 + x_2$, s.t. $x_1 + x_2 \leq 1, 3x_1 + x_2 \geq 3, x_1, x_2 \geq 0$ has single point as its feasible region.

19. The L.P.P. Max. $Z = x_1 + x_2$ s.t. $x_1 - x_2 \geq 0, 3x_1 - x_2 \leq -3, x_1, x_2 \geq 0$ has a feasible solution.

20. By graphical method any L.P.P. can be solved easily.

1.	objective	2.	constraints.	3.	feasible.
4.	unbounded	5.	linearly independent.	6.	slack.
7.	surplus	8.	zero.	9.	L.I.
10.	two.	11.	(a).	12.	(b).
13.	(a).	14.	(a).	15.	(c).
16.	T.	17.	*T*.	18.	*T*.
19.	F.	20.	*F*.		

8.7 REFERENCES

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8.8 SUGGESTED READINGS

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LESSON-9

SENSITIVITY ANALYSIS

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STRUCTURE

9.1 Learning Objectives
9.2 Introduction
9.2.1 Changes in Cj's
9.2.2 Change in $b_i's$
9.2.3 Change in the Coefficients a_{ij}'s
9.2.4 Addition of New Activity (Variable)
9.2.5 Addition of New Constraint
9.3 Summary
9.4 Self-Assessment Questions
9.5 Answers
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9.1 LEARNING OBJECTIVES

After studying this chapter, students should be able to identify situations in which sensitivity analysis can be applied. Understand fundamental concepts and mathematical structure of sensitivity model.

9.2 INTRODUCTION

In solving a linear programming problem after getting its optimal solution, sometimes it is desired to make some changes in some of the parameters of the problem. There are two ways to find the solution of a new problem. One is to solve the changed problem starting from the scratch, as the original problem has been solved and other way is to solve it using the optimal table already obtained. The second option saves time and labor and that is from where emerges the idea of sensitivity or post-optimality analysis. Some of the changes in the given problem which we shall consider are:

1. Changes in the objective function coefficients, Cj's i.e. profit (cost) per unit associated with decision variables.
2. Changes in the bi values (or right-hand side constants of the constraints), i.e., available of resources.
3. Changes in the coefficients of decision variables on the left-hand side of the constraints, $a_{ij}'s$ i.e., consumption of resources per unit of decision variables x_j.
4. Structural changes due to the addition of some variables.
5. Structural changes due to the addition of some linear constraints.

After the above-mentioned changes have been affected in an linear programming problem, we may have any of the following cases:

a) The optimal solution remains unaltered that is the basic variables and their values are essentially unchanged.

b) The basic variables remain the same but their values undergo changes.

c) The basic solution gets changed entirely.

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9.2.1 CHANGES IN CJ'S

The coefficient, Cj in the objective function of an LP model represents either the profit or the cost per unit of an activity (variable) Xj . The question that may now arise is: What happens to the optimal solution and the objective function value when this coefficient is changed? For example, let Rs 12 be the per unit profit coefficient of a particular variable in the objective function of an LP model. After obtaining an optimal solution, the decision-maker may realize that the true value of this coefficient might be any value between Rs 11 and Rs 13 per unit. The sensitivity analysis can help him to determine both lower and upper value (i.e., range) of this coefficient (or any other such coefficients) without affecting the current optimal solution. For this he may decide whether resources from other activities (variables) should be diverted to (diverted away from) a more profitable (or less profitable) activity.
Here, again two cases arise:

i. Cj is to be changed is the cost of a non-basic variable.
ii. Cj is to be changed is the cost of a basic variable.

In both cases, feasibility of new problem remains unchanged but the optimality may change. For case (i) only one entry $z_j - c_j$ is to be evaluated. If $z_j - c_j \geq 0$ then the solution of the existing problem remains optimal for the new problem also and write it down. In case (ii) calculate $z_j - c_j$ for all non-basic variables. If $z_j - c_j \geq 0, \forall j$ then the solution of the original problem remains optimal for the changed problem and write it down. If $z_j - c_j < 0$ for some j, then prepare new simplex table for the changed problem with new $z_j - c_j$ entries and use the regular simplex method till the optimality conditions are satisfied and write the solution of the changed problem from the optimal table thus obtained.

Evaluation Method

$$Max\left\{\frac{-(z_j-c_j)}{Y_{kj}>0}\right\} \leq \Delta c_k \leq Min\left\{\frac{-(z_j-c_j)}{Y_{kj}<0}\right\}$$

Where, k indicate the rows corresponding to basic variables.

Illustration 9.1: Solve the following linear programming problem:

$Max. Z = 3x_1 + 5x_2$

Subject to the constraints

$3x_1 + 2x_2 \leq 18$

$x_1 \leq 4$

$x_2 \leq 6$

$x_1, x_2 \geq 0$

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Discuss the change in C_j on the optimality of the optimal basic feasible solution.

Solution: Convert all constraints into equations by using slack variables $s_1 \geq 0, s_2 \geq 0, s_3 \geq 0$, we get

$Max. Z = 3x_1 + 5x_2 + 0s_1 + 0s_2 + 0s_3$

Subject to the constraints

$3x_1 + 2x_2 + s_1 = 18$

$x_1 + s_2 = 4$

$x_2 + s_3 = 6$

$x_1, x_2, s_1, s_2, s_3 \geq 0$

Table-9.1: Initial Simplex Table

B	C_B	C_j	3	5	5	0	0	$X_B/x_2 \quad x_2 > 0$
		X_B	x_1	x_2	s_1	s_2	s_3	
s_1	0	18	3	2	1	0	0	18/2=9
s_2	0	4	1	0	0	1	0	------
s_3	0	6	0	$\boxed{1}$	0	0	1	6/1=6→
Z = 0		Δ_j	-3	-5↑	0	0	0	
s_1	0	6	$\boxed{3}$	0	1	0	-2	6/3=2→
s_2	0	4	1	0	0	1	0	4/1=4
x_2	5	6	0	1	0	0	1	------
Z =30		Δ_j	-3↑	0	0	0	5	
x_1	3	2	1	0	1/3	0	-2/3	
s_2	0	2	0	0	-1/3	1	2/3	
x_2	5	6	0	1	0	0	1	
Z=36		Δ_j	0	0	1	0	3	

Since all $\Delta_j \geq 0$, so optimal solution is $x_1 = 2$, $x_2 = 6$ and Max Z=36

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Sensitivity Analysis

$C = (C_1, C_2, C_3, C_4, C_5) = (3,5,0,0,0)$

$C_B = (C_1, C_4, C_2) = (3,0,5)$

The coefficient of non-basic variables Y_3 and Y_5 are (C_3, C_5).

i) Change in C_3 and C_5 i.e. $C_j \notin C_B$. Let ΔC_3 and ΔC_5 be the change in C_3 and C_5 respectively. Then $\Delta C_3 = \Delta_3$, $\Delta C_5 = \Delta_5$. If $\Delta C_3 \leq 1$ and $\Delta C_5 \leq 3$.
Then, the value of the objective function and optimal solution will remain unchanged.

ii) Change in $C_j \in C_B$. Here, $C_B = (C_1, C_4, C_2) = (3,0,5)$. In general, $= (C_{B1}, C_{B2}, C_{B3})$
In this case, the solution X_B will remain optimal.

$$Max\left\{\frac{-\Delta_j}{Y_{kj}>0}\right\} \leq \Delta c_{BK} \leq Min\left\{\frac{-\Delta_j}{Y_{kj}<0}\right\}$$

Let C_1 be changed to $C_1 + \Delta C_1 (or C_{B1} + \Delta C_{B1})$, then $C_1 = 3$

$$Max\left\{\frac{-\Delta_j}{Y_{1j}>0}\right\} \leq \Delta c_{B1} \leq Min\left\{\frac{-\Delta_j}{Y_{1j}<0}\right\}, K = 1$$

$$Max\left\{\frac{-0}{1}, \frac{-1}{1/3}\right\} \leq \Delta c_{B1} \leq Min\left\{\frac{-3}{-2/3}\right\}$$

$$Max\{0, -3\} \leq \Delta c_{B1} \leq Min\{9/2\}$$

$0 \leq \Delta c_B \leq 9/2$ or $3 \leq c_1 \leq 3 + 9/2$ or $3 \leq c_1 \leq 15/2$

Let C_2 be changed to $C_2 + \Delta C_2 (or C_{B2} + \Delta C_{B2})$, then $K = 3$

$$Max\left\{\frac{-\Delta_j}{Y_{3j}>0}\right\} \leq \Delta c_{B3} \leq Min\left\{\frac{-\Delta_j}{Y_{3j}<0}\right\}$$

$$Max\left\{\frac{-0}{1}, \frac{-3}{1}\right\} \leq \Delta c_{B3} \leq Min\{-----\}$$

$$Max\{0, -3\} \leq \Delta c_{B3} \leq Min\{-----\}$$

$$\Delta c_{B3} \geq 0$$

The optimal solution will remain unchanged if changes in c_2 are infinite.

Illustration 9.2: A company wants to produce three products: A, B and C. The per unit profit on these products is Rs 4, Rs 6 and Rs 2, respectively. These products require two types of resources, manpower and raw material. The LP model formulated for determining the optimal product mix is as follows:

$$Max. Z = 4x_1 + 6x_2 + 2x_3$$

Subject to the constraints

Mainpower Constraint

$$x_1 + x_2 + x_3 \leq 3$$

Raw Material Constraint

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$x_1 + 4x_2 + 7x_3 \leq 9$

and $x_1, x_2, x_3 \geq 0$

Where, x_1, x_2, x_3 number of units of products A, B and C, respectively, to be produced.

(a) Find the optimal product mix and the corresponding profit of the company.

(b) Find the range of the profit contribution of products A and C in the objective function, such that current optimal product mix remains unchanged.

(c) What shall be the new optimal product mix when profit per unit from product C is Rs. 12 and not Rs. 2

Solution:

(a) Convert all constraints into equations by using slack variables $s_1 \geq 0, s_2 \geq 0$ and then solving the linear programming problem by usual simplex method, the optimum solution is given by

Table-9.2 Optimal Simplex Table

B	C_B	C_j	4	6	2	0	0
		X_B	x_1	x_2	x_3	s_1	s_2
x_1	4	1	1	0	-1	4/3	-1/3
x_2	6	2	0	1	2	-1/3	1/3
Z = 12		Δ_j	0	0	6	10/3	2/3

Since all $\Delta_j \geq 0$. So optimal solution is $x_1 = 1, x_2 = 2$ and Max. $Z = 16$ i.e. to get the maximum profit of Rs. 16 the company should produce one unit of product A and two units of product B, while the company should not produce product C.

(b) (i) From the optimum simplex table, we observe that $x_1$is the basic variable. This means that a further decrease in its profit contribution c_1 will make less profitable and the current optimal product mix will be affected. If increase the contribution of c_1, the product A will become more profitable. Thus, in either case the current product mix will be affected and hence we need to know the lower as well as upper limit on the value of c_1 within which the optimal solution will not be affected.

Let C_1 be changed to $C_1 + \Delta C_1 (or C_{B1} + \Delta C_{B1})$, then $C_1 = 4$

$$Max\left\{\frac{-\Delta_j}{Y_{1j}>0}\right\} \leq \Delta c_{B1} \leq Min\left\{\frac{-\Delta_j}{Y_{1j}<0}\right\}, K = 1$$

$$Max\left\{\frac{-0}{1}, \frac{-10/3}{4/3}\right\} \leq \Delta c_{B1} \leq Min\left\{\frac{-6}{-1}, \frac{-2/3}{-1/3}\right\}$$

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$Max\{0, -5/2\} \leq \Delta c_{B1} \leq Min\{6, 2\}$

$0 \leq \Delta c_{B1} \leq 2$ or $4 + 0 \leq c_1 \leq 4 + 2$ or $4 \leq c_1 \leq 6$

(ii) Change in C_3 i.e., $C_3 \notin C_B$. Let ΔC_3 be the change in C_3. Then $\Delta C_3 = \Delta_3$. If $\Delta C_3 \leq 6$ or $C_3 \leq C_3 + \Delta C_3$ or $C_3 \leq 2 + 6 (= 8)$

This implies that as long as the profit contribution per unit of product C is less than Rs. 8 (i.e., change should not be more that Rs. 8), it is not profitable to produce it and the current optimum solution will remain unchanged.

(c) Increase the value of C_3 is Rs. 12 in place of Rs. 2 then new optimal table

Table-9.3 Updated Table

B	C_B	C_j	4	6	12	0	0	$X_B/x_2 \quad x_2 > 0$
		X_B	x_1	x_2	x_3	s_1	s_2	
x_1	4	1	1	0	-1	4/3	-1/3	---------
x_2	6	2	0	1	$\boxed{2}$	-1/3	1/3	2/2=1→
Z = 12		Δ_j	0	0	-4 ↑	10/3	2/3	
x_1	4	2	1	½	0	11/6	-1/6	
x_3	12	1	0	½	1	-1/6	1/6	
Z=20		Δ_j	0	2	0	16/3	4/3	

Since all $\Delta_j \geq 0$. So the solution is optimal. Then new optimal solution is $x_1 = 2, x_2 = 0, x_3 = 1$ and Max. $Z = 20$ i.e., company should produce 2 units of product A, 1 unit of product C and no unit of product B to get the maximum profit of Rs. 20.

9.2.1 CHANGES IN $b_i's$

Because of any change in $b_i's$, solution of the changed problem may become infeasible as $X_B = B^{-1}b$. If the new basic solution is feasible, then the same simplex table will be the optimal table for the changed problem also and write the new solution. If new X_B gives infeasible solution, then use dual simplex method to restore feasibility of the solution and write the solution of the changed problem. In this method, the evaluation criteria are as follows:

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$$\max_i\left\{\frac{-x_{Bi}}{\beta_{ie}>0}\right\} \le \Delta b_e \le \min_i\left\{\frac{-x_{Bi}}{\beta_{ie}<0}\right\}$$

Where, β_{ie} is the (i, e)th element of B^{-1}

Illustration 9.3: Consider the following linear programming problem:

$Max. Z = -x_1 + 2x_2 - x_3$

Subject to the constraints

$3x_1 + x_2 - x_3 \le 10$

$-x_1 + 4x_2 + x_3 \ge 6$

$x_2 + x_3 \le 4$

$x_1, x_2 \ge 0$

Determine the range for discrete changes in the component b_2 and b_3 of the requirement vector so as to maintain the feasibility of the current optimum solution.

Solution: Convert all constraints into equations by using slack and surplus variables$s_1 \ge 0, s_2 \ge 0, s_3 \ge 0$ and artificial variableA_1 we get

$Max. Z = -x_1 + 2x_2 - x_3 + 0s_1 + 0s_2 + 0s_3 - MA_1$

Subject to the constraints

$3x_1 + x_2 - x_3 + s_1 = 10$

$-x_1 + 4x_2 + x_3 - s_2 + A_1 = 6$

$x_2 + x_3 + s_3 = 4$

$x_1, x_2, x_3, s_1, s_2, s_3, A_1 \ge 0$

Table-9.4 Initial Simplex Table

B	C_B	C_j	-1	2	-1	0	0	0	-M	$X_B/x_2 \quad x_2 > 0$
		X_B	x_1	x_2	x_3	s_1	s_2	s_3	A_1	
s_1	0	10	3	1	-1	1	0	0	0	10/1=10
A_1	0	6	-1	$\boxed{4}$	1	0	-1	0	1	6/4=3/2→
s_3	0	4	0	1	1	0	0	1	0	4/1=4
Z=0		Δ_j	M+1	-4M-2↑	-M+1	0	M	0	0	
s_1	0	17/2	13/4	0	-5/4	1	¼	0	-1/4	34
x_2	2	3/2	-1/4	1	1/4	0	-1/4	0	¼	------
s_3	0	5/2	¼	0	3/4	0	$\boxed{¼}$	1	-1/4	10→

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Z=3	Δ_j	½	0	3/2	0	-1/2↑	0	M+1/2	
s_1 0	6	3	0	-2	1	0	-1	0	
x_2 2	4	0	1	1	0	0	1	0	
s_2 0	10	1	0	3	0	1	4	-1	
Z=8	Δ_j	1	0	3	0	0	2	M	

Since all $\Delta_j \geq 0$ and no artificial variable appear in column of B. So optimal solution is $x_1 = 0, x_2 = 4$ and Max. $Z = 8$

Sensitivity Analysis

$X_B = [6, \quad 4, \quad 10] = [X_{B1}, \quad X_{B2}, \quad X_{B3}]$

And $B^{-1} = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 0 & 1 \\ 0 & -1 & 4 \end{bmatrix}$

The individual effects of changes in b_2 and b_3 where, $b = [b_1, \quad b_2, \quad b_3]$ such that the optimality of the basic feasible solution is not violated are given by:

Let b_2 is change $b_2 + \Delta b_2$

$$\begin{array}{cc} & \begin{array}{ccc} \beta_1 & \beta_2 & \beta_3 \end{array} \\ B^{-1} = & \begin{bmatrix} 1 & 0 & -1 \\ 0 & 0 & 1 \\ 0 & -1 & 4 \end{bmatrix} \end{array}$$

$$\max_i \left\{ \frac{-X_{Bi}}{\beta_{i2} > 0} \right\} \leq \Delta b_2 \leq \min_i \left\{ \frac{-X_{Bi}}{\beta_{i2} < 0} \right\}$$

$$max\{- - - - - - - -\} \leq \Delta b_2 \leq \min_i \left\{ \frac{-10}{-1} \right\}$$

$$\Delta b_2 \leq 10$$

Let b_3 is change $b_3 + \Delta b_3$

$$\max_i \left\{ \frac{-X_{Bi}}{\beta_{i3} > 0} \right\} \leq \Delta b_3 \leq \min_i \left\{ \frac{-X_{Bi}}{\beta_{i3} < 0} \right\}$$

$$max \left\{ \frac{-4}{1}, \frac{-10}{4} \right\} \leq \Delta b_3 \leq \min_i \left\{ \frac{-6}{-1} \right\}$$

$$\frac{-5}{2} \leq \Delta b_3 \leq 6$$

Now, since $b_2 = 6$ and $b_3 = 4$, the required range of variation is $b_2 \leq 10 + 6 = 16$ and

$4 - \frac{5}{2} \leq b_3 \leq 4 + 6 \quad = \frac{3}{2} \leq b_3 \leq 10$

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Illustration 9.4: A factory manufactures three products A, B and C for which the data is given in the table below. Find the optimal product mix if the profit/unit is Rs. 32, Rs. 30 and Rs. 40 for product A, B and C respectively.

	Product			Available Resources
	A	B	C	
Material Required (kg/unit)	5	4	3	2,500 kg.
Machine Hours required /unit	2	3	1	1,275 hours
Labour hours require/unit	3	2	4	2,100 hours

(a) Find the optimal solution if machine hours available become 1,350 instead of 1,275.
(b) Find the optimal solution if labour hours become 2,000 instead of 2,100

Solution: Formulation of Linear Programming Problem

$Max. Z = 32x_1 + 30x_2 + 40x_3$

Subject to the constraints

Material required Constraint

$5x_1 + 4x_2 + 3x_3 \leq 2{,}500$

Machine hour required Constraint

$2x_1 + 3x_2 + x_3 \leq 1{,}275$

Labour hour required Constraint

$3x_1 + 2x_2 + 4x_3 \leq 2{,}100$

and $x_1, x_2, x_3 \geq 0$

Where, x_1, x_2, x_3 number of units of products A, B and C, respectively.

Convert all constraints into equations by using slack variables $s_1 \geq 0, s_2 \geq 0, s_3 \geq 0$ and then solving the linear programming problem by usual simplex method, the optimum solution is given by in the following table:

Table-9.5 Optimum Simplex Table

B	C_B	C_j	32	30	40	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3
s_1	0	125	3/2	0	0	1	-1	-1/2
x_2	30	300	½	1	0	0	2/5	-1/10

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x_2	40	375	½	0	1	0	-1/5	3/10
Z =	24,000	Δ_j	3	0	0	0	4	9

Since all $\Delta_j \geq 0$. So optimal solution is $x_1 = 0, x_2 = 300, x_3 = 375$ and Max. $Z = 24{,}000$

(a) Machine hours available become 1,350 instead of 1,275 i.e., change in b_2

$$B^{-1} = \begin{bmatrix} 1 & -1 & -1/2 \\ 0 & 2/5 & -1/10 \\ 0 & -1/5 & 3/10 \end{bmatrix} \begin{bmatrix} 2500 \\ 1350 \\ 2100 \end{bmatrix} = \begin{bmatrix} 100 \\ 330 \\ 360 \end{bmatrix}$$

Table-9.6 Updated Table

B	C_B	C_j	32	30	40	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3
s_1	0	100	3/2	0	0	1	-1	-1/2
x_2	30	330	½	1	0	0	2/5	-1/10
x_2	40	360	½	0	1	0	-1/5	3/10
Z =	24,300	Δ_j	3	0	0	0	4	9

Since all $\Delta_j \geq 0$. So optimal solution is $x_1 = 0, x_2 = 330, x_3 = 360$ and Max. $Z = 24{,}300$

If machine hours increased by 75 (1350-1275), the product B will increase by 30 units and product C will decrease by 15 units. Thus, the optimal solution will be $x_2 = 330, x_3 = 360$ and Max. $Z = 24{,}300$.

(b) Labour hours become 2,000 instead of 2,100 i.e., change in b_3

$$B^{-1} = \begin{bmatrix} 1 & -1 & -1/2 \\ 0 & 2/5 & -1/10 \\ 0 & -1/5 & 3/10 \end{bmatrix} \begin{bmatrix} 2500 \\ 1275 \\ 2000 \end{bmatrix} = \begin{bmatrix} 225 \\ 310 \\ 345 \end{bmatrix}$$

Table-9.7 Updated Table

B	C_B	C_j	32	30	40	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3
s_1	0	225	3/2	0	0	1	-1	-1/2

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x_2	30	310	½	1	0	0	2/5	-1/10
x_3	40	345	½	0	1	0	-1/5	3/10
Z =	24,300	Δ_j	3	0	0	0	4	9

If labour hours decreased by 100 (2100-2000), the machine hours will increase by 10 units and product C will decrease by 30 units. Thus, the optimal solution will be $x_2 = 310, x_3 = 345$ and Max. $Z = 23{,}100$.

9.2.3 CHANGE IN THE COEFFICIENTS aij's

Suppose that the elements of coefficient matrix A are changed. Then two cases arise:

i. Change in a coefficient, when variable is not a basic variable.
ii. Change in a coefficient, when variable is a basic variable.

Evaluation criteria for case-I

When a non-basic variable column $a_k \notin$B is changed to a_k^*, the only effect of such change will be on the optimality condition. Thus the solution will remain optimal, if

$$z_k^* - c_k = c_B B^{-1} a_k^* - c_k \geq 0$$

However, the range for the discrete change Δa_{ij} in the coefficients of non-basic variable x_j in constraint, i can be determined by solving following linear inequalities:

$$\max_i \left\{ \frac{-\Delta_j}{C_B \beta_k > 0} \right\} \leq \Delta a_{rk} \leq \min_i \left\{ \frac{-\Delta_j}{C_B \beta_k < 0} \right\}$$

Here, β_k is the kth column unit matrix B. if $C_B \beta_k = 0$, then Δa_{ij} is unrestricted in sign.

Evaluation Criteria for Case-II

Suppose a basic variable column $a_k \in$B is changed to a_k^*. Then conditions to maintain both feasibility and optimality of the current optimal solution are:

a) $\max_{k \neq p} \left\{ \frac{-x_{Bi}}{x_{Bi}\beta_{kr} - x_{Bk}\beta_{ir} > 0} \right\} \leq \Delta a_{rk} \leq \min_{i \neq p} \left\{ \frac{-x_{Bi}}{x_{Bi}\beta_{kr} - x_{Bk}\beta_{ir} < 0} \right\}$

b) $max \left\{ \frac{-\Delta_j}{\Delta_j \beta_{kr} - x_{kj} C_B \beta_r > 0} \right\} \leq \Delta a_{rk} \leq min \left\{ \frac{-\Delta_j}{\Delta_j \beta_{kr} - x_{kj} C_B \beta_r < 0} \right\}$

Illustration 9.5: Given the following linear programming problem:

$Max. Z = 3x_1 + 4x_2 + x_3 + 7x_4$

Subject to the constraints

$8x_1 + 3x_2 + 4x_3 + x_4 \leq 7$

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$2x_1 + 6x_2 + x_3 + 5x_4 \leq 3$
$x_1 + 4x_2 + 5x_3 + 2x_4 \leq 8$
$x_1, x_2, x_3, x_4 \geq 0$

The following table gives the optimum solution

B	C_B	C_j	3	4	1	7	0	0	0
		X_B	x_1	x_2	x_3	x_4	x_5	x_6	x_7
x_1	3	16/19	1	9/38	1/2	0	5/38	-1/38	0
x_4	7	5/19	0	21/19	0	1	-1/19	8/38	0
x_7	0	126/19	0	59/38	9/2	0	-1/38	-15/38	1
Z	83/19	83/19	0	169/38	1/2	0	1/38	53/38	0

Discuss the effect of discrete changes in the activity co-efficient a_{ij} of 'A' on the current basic feasible solution to the given linear programming problem.

Solution: From the above table, we have

$$B^{-1} = \begin{array}{c} \begin{array}{ccc} \beta_1 & \beta_2 & \beta_3 \end{array} \\ \begin{bmatrix} 5/38 & -1/38 & 0 \\ -1/19 & 8/38 & 0 \\ 1/38 & -15/38 & 1 \end{bmatrix} \end{array}$$

Thus, we have

$$C_B\beta_1 = 3\left(\frac{5}{38}\right) + 7\left(-\frac{1}{38}\right) + 0\left(-\frac{1}{38}\right) = \frac{1}{38}$$
$$C_B\beta_2 = 3\left(\frac{-1}{38}\right) + 7\left(\frac{8}{38}\right) + 0\left(-\frac{15}{38}\right) = \frac{53}{38}$$
$$C_B\beta_3 = 3(0) + 7(0) + 0(1) = 0$$

Let the element a_{rk} or A changed to $a_{rk}^* = a_{rk} + \Delta a_{rk}$

Case-I: a_{rk} is not the basis B

In the optimum table x_2, x_3, x_5 and x_6 are not the basis, therefore, the ranges for discrete changes in the coefficient a_{ij} corresponding to these non-basis vectors are given by the following inequations:

Evaluation Criteria

$$\max_i\left\{\frac{-\Delta_j}{C_B\beta_k>0}\right\} \leq \Delta a_{rk} \leq \min_i\left\{\frac{-\Delta_j}{C_B\beta_k<0}\right\}$$
$$\frac{-169/38}{1/38} \leq \Delta a_{12} \Rightarrow \Delta a_{12} \geq -169$$

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$\frac{-169/38}{53/38} \leq \Delta a_{22} \Rightarrow \Delta a_{22} \geq -169/53$

$\frac{-169/38}{0} \leq \Delta a_{32} \leq \infty \Rightarrow -\infty \leq \Delta a_{32} \leq \infty$

$\frac{-1/2}{1/38} \leq \Delta a_{13} \Rightarrow \Delta a_{13} \geq -19$

$\frac{-1/2}{53/38} \leq \Delta a_{23} \Rightarrow \Delta a_{23} \geq -19/53$

$\frac{-1/2}{0} \leq \Delta a_{33} \leq \infty \Rightarrow -\infty \leq \Delta a_{33} \leq \infty$

Hence, $a_{12} \geq 6 - 169$ or $a_{12} \geq -163$

$a_{22} \geq \frac{-169}{53} + 6$ or $a_{22} \geq \frac{149}{53}$

$\Rightarrow -\infty \leq a_{33} \leq \infty$

$a_{13} \geq 4 - 19$ or $a_{13} \geq -15$

$a_{23} \geq 1 - \frac{19}{53}$ or $a_{23} \geq \frac{34}{53}$

$\Rightarrow -\infty \leq a_{33} \leq \infty$

Case-II: a_{rk} is in the basis B

In the optimum table x_1, x_4 and x_7 are in the basis, therefore, any discrete change in a_{rk} belonging to any of these vectors may affect the feasibility as well as the optimality of the original optimum basic feasible solution X_B.

Consider the discrete changes in a_{rk}

Evaluation Criteria

$$\beta_{22}(z_2 - c_2) - x_{22}c_B\beta_2 = \left(\frac{8}{38}\right)\left(\frac{169}{38}\right) - \left(\frac{21}{38}\right)\left(\frac{53}{38}\right) = -23/38$$

$$\beta_{22}(z_3 - c_3) - x_{23}c_B\beta_2 = \left(\frac{8}{38}\right)\left(\frac{1}{2}\right) - (0)\left(\frac{53}{38}\right) = -2/19$$

$$\beta_{22}(z_5 - c_5) - x_{25}c_B\beta_2 = \left(\frac{8}{38}\right)\left(\frac{1}{38}\right) - \left(\frac{-1}{19}\right)\left(\frac{53}{38}\right) = 3/38$$

$$\beta_{22}(z_6 - c_6) - x_{26}c_B\beta_2 = \left(\frac{8}{38}\right)\left(\frac{53}{38}\right) - \left(\frac{8}{38}\right)\left(\frac{53}{38}\right) = 0$$

The range for the change in the element in a_{24} in order to maintain the optimality of the solution is therefore given by

$$max\left\{\frac{-1/2}{2/19}, -\frac{1/38}{3/38}\right\} \leq \Delta a_{24} \leq min\left\{\frac{-169/38}{-23/38}\right\} \Rightarrow -\frac{1}{3} \leq \Delta a_{24} \leq \frac{169}{23}$$

Further, since for the element a_{24}, r=2 and k=4, therefore, we have

$$X_{B1}\beta_{22} - X_{B2}\beta_{31} = \left(\frac{16}{19}\right)\left(\frac{8}{38}\right) - \left(\frac{5}{19}\right)\left(-\frac{1}{38}\right) = \frac{7}{38}$$

$$X_{B3}\beta_{22} - X_{B2}\beta_{32} = \left(\frac{126}{19}\right)\left(\frac{8}{38}\right) - \left(\frac{5}{19}\right)\left(-\frac{15}{38}\right) = \frac{3}{2}$$

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The range for the discrete change in the element a_{24} in order to maintain the feasibility of the solution is, therefore, given by

$$max\left\{\frac{-16/10}{7/38}, -\frac{126/19}{3/2}\right\} \leq \Delta a_{24}$$

i.e. 84/19 $\leq \Delta a_{24}$

Hence, 5-84/19 $\leq a_{24} \leq \infty$ or 11/19$\leq a_{24} < \infty$ (since $a_{24} = 5$)

Similarly, the ranges for changes in the elements a_{14}, a_{34}, etc. can also be obtained.

9.2.4 ADDITION OF NEW ACTIVITY (VARIABLE)

Addition of new activity, adds one more column in the given optimal table of the problem which may or may not affect the optimality condition. If optimality condition Δ_j is not affected, the solution of the given table will remain optimal for the changed problem also. If optimality condition $\Delta_j$are affected then use the usual simplex method to find the optimal solution.

Illustration 9.6: Consider the following linear programming problem:

$Max. Z = 3x_1 + 5x_2$

Subject to the constraints

$x_1 \leq 4$

$3x_1 + 2x_2 \leq 18$

$x_1, x_2 \geq 0$

If a new variable x_5 is introduced with cost coefficient $C_5 = 7$ and with column $a_5 = [1,2]^T$. Discuss the effect of adding the new variable and find out its revised solution, if any.

Solution: Convert all constraints into equations by using slack variables $s_1, s_2 \geq 0$, we get

$Max. Z = 3x_1 + 5x_2 + 0s_1 + 0s_2$

Subject to the constraints

$x_1 + s_1 \leq 4$

$3x_1 + 2x_2 + s_2 \leq 18$

$x_1, x_2, s_1, s_2 \geq 0$

Table-9.8 Initial Simplex Table

B	C_B	C_j	3	5	0	0	$X_B/x_2 \quad x_2 > 0$
		X_B	x_1	x_2	s_1	s_2	

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s_1	0	4	1	0	1	0	-----
s_2	0	18	3	$\boxed{2}$	0	1	18/2→
Z=0		Δ_j	-3	-5↑	0	0	
s_1	0	4	1	0	1	0	
x_2	5	9	3/2	1	0	1/2	
Z=45		Δ_j	9/2	0	0	5/2	

Since all $\Delta_j \geq 0$, So optimal solution is $x_1 = 0, x_2 = 9$ and Max. $Z = 45$

Sensitivity Analysis

From the above table, we observe that

$X_B = [4,9]$ and $B^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & 1/2 \end{bmatrix}$

Since a new variable x_5 is introduced, we compute $x_5 = B^{-1}a_5 = \begin{bmatrix} 1 & 0 \\ 0 & 1/2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$

Table-9.9 Updated Table

B	C_B	C_j	3	5	0	0	7	X_B/x_5 $x_5 > 0$
		X_B	x_1	x_2	s_1	s_2	X_5	
s_1	0	4	1	0	1	0	$\boxed{1}$	4/1=4→
x_2	5	9	3/2	1	0	1/2	1	9/1=9
Z=45		Δ_j	9/2	0	0	5/2	-2↑	

Since all $\Delta_j \ngeq 0$, So the solution under test is not optimal. This indicates that the conditions of optimality are violated. Therefore, a new optimum solution can easily be obtained.

Table-9.10 Updated Table

B	C_B	C_j	3	5	0	0	7
		X_B	x_1	x_2	s_1	s_2	x_5
x_5	7	4	1	0	1	0	1

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x_2 5	9	½	1	-1	1/2	0
Z=53	Δ_j	13/2	0	2	5/2	0

Since all $\Delta_j \geq 0$, so the optimal solution is $x_1 = 0, x_2 = 5$ and Max. Z=53

9.2.5 Addition of New Constraint

Addition of a constraint in the given problem means addition of one more row in the given optimal simplex table which may affect the feasibility of the solution. While adding the new constraint, first check whether the given optimal solution satisfies the constraint. If it satisfies then the same solution remains optimal for the new problem also and write it. If it does not satisfy the constraint, the current optimum solution become infeasible. In this situation, dual simplex method is used to find the new optimum solution.

Illustration 9.7: Consider the following linear programming problem:

$Max. Z = 60x_1 + 30x_2 + 20x_3$

Subject to the constraints

$8x_1 + 6x_2 + x_3 \leq 48$

$4x_1 + 2x_2 + \frac{3}{2}x_3 \leq 20$

$2x_1 + \frac{3}{2}x_2 + \frac{1}{2}x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

If add a new constraint $x_1 + x_2 + x_3 \leq 10$. Then discuss the effect of adding this constraint and find out its revised solution if any.

Solution: Convert all constraints into equations by using slack variables $s_1, s_2, s_3 \geq 0$, we get

$Max. Z = 60x_1 + 30x_2 + 20x_3 + 0s_1 + 0s_2 + 0s_3$

Subject to the constraints

$8x_1 + 6x_2 + x_3 + s_1 = 48$

$4x_1 + 2x_2 + \frac{3}{2}x_3 + s_2 = 20$

$2x_1 + \frac{3}{2}x_2 + \frac{1}{2}x_3 + s_3 = 8$

$x_1, x_2, x_3, s_1, s_2, s_3 \geq 0$

Table-9.11 Initial Simplex Table

B C_B	C_j	60	30	20	0	0	1	X_B/x_1 $x_1 > 0$

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		X_B	x_1	x_2	x_3	s_1	s_2	s_3	
s_1	0	48	$\boxed{8}$	6	1	1	0	0	48/8=6→
s_2	0	20	4	2	3/2	0	1	0	20/4=5
s_3	0	8	2	3/2	½	0	0	1	8/2=4
Z=0		Δ_j	-60↑	-30	-20	0	0	0	$X_B/x_3 \quad x_3 > 0$
s_1	0	16	0	0	-1	1	0	-4	-----
s_2	0	4	0	-1	$\boxed{½}$	0	1	-1/2	8→
x_1	60	4	1	¾	¼	0	0	1/2	240
Z=240		Δ_j	0	15	-5↑	0	0	30	
s_1	0	24	0	-2	0	1	2	-5	
x_3	20	8	0	-2	1	0	2	-1	
x_1	60	2	1	5/4	0	0	-1/2	3/2	
Z=280		Δ_j	0	5	0	0	10	10	

Since all $\Delta_j \geq 0$, so the optimal solution is $x_1 = 2, x_2 = 0, x_3 = 8$ and Max. Z=280

Sensitivity Analysis

New constraint $x_1 + x_2 + x_3 \leq 10$

$2 + 0 + 8 \leq 10$ (Satisfied)

Thus, optimal solution of the original problem does not change if we introduce the above constraint to it.

9.3 SUMMARY

Sensitivity analysis provides the ranges within which a linear programming model can vary without changing the optimality of the current optimal solution. The formulation to conduct sensitivity analysis followed by numerical examples have been solved how changes in the parameters specially:

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- The change in the objective function coefficients
- Requirement vector i.e., right hand side value of the constraint
- Addition of variables
- Addition of constraints, etc.

9.4 SELF-ASSESSMENT QUESTIONS

1. $Max. Z = 3x_1 + 5x_2$

Subject to the constraints

$3x_1 + 2x_2 \leq 18$

$x_1 \leq 4$

$x_2 \leq 6$

$x_1, x_2 \geq 0$

Discuss the effect on the optimality of the solution, when the objective function is changed to $3x_1 + x_2$

2. Consider the linear programming problem

$Max. Z = 5x_1 + 6x_2$

Subject to the constraints

$3x_1 + 4x_2 \leq 18$

$2x_1 + x_2 \leq 7$

$x_1, x_2 \geq 0$

The optimal table of this linear programming problem x_3, x_4 as slack variables added to constraints (1) and (2) respectively is

B C_B	C_j	5	6	0	0
	X_B	x_1	x_2	x_3	x_4
x_2 6	3	0	1	2/5	-3/5

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x_1 5	2	1	0	-1/5	4/5
	Δ_j	0	0	7/5	2/5

Use the sensitivity analysis, find the optimal solution with the following changes in above linear programming problem:

a) Change C_1 from 5 to 1

b) Change C_1 from 5 to 1 and C_2 from 6 to 1

c) Change b_2 from 7 to11 and 7 to 15.

3. Consider the following linear programming problem:

$Max.Z = x_1 + 2x_2$

Subject to the constraints

$-x_1 + x_2 \leq 1$

$x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$

The optimal table of this linear programming problem with x_3, x_4 as slack variables added to constraints (1) and (2) respectively is:

B C_B	C_j	1	2	0	0
	X_B	x_1	x_2	x_3	x_4
x_2 2	3/2	0	1	1/2	½
x_1 1	½	1	0	-1/2	½
	Δ_j	0	0	1/2	3/2

i) If a new variable x_5 is introduced with cost coefficient $C_5 = 2$ and with column $a_5 = [1,2]^T$. Discuss the effect of adding the new variable and find out its revised solution, if any.

ii) If adding the following new constrains:

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a) $x_1 - x_2 \leq 1$.

b) $x_1 - x_2 \geq 1$

Then discuss the effect of adding this constraint and find out its revised solution if any.

4. Given the LPP

$$Max.Z = 4x_1 + 3x_2 + 4x_3 + 6x_4$$

Subject to the constraints

$$x_1 + 2x_2 + 2x_3 + 4x_4 \leq 8$$

$$2x_1 + 2x_3 + x_4 \leq 6$$

$$3x_1 + 3x_2 + x_3 + x_4 \leq 8$$

$$x_1, x_2, x_3, x_4 \geq 0$$

Determine the separate ranges for discrete changes in a_{12}, a_{22} and a_{23} consistent with the optimum solution of the given LPP.

5 Consider the following linear programming problem to determine optimal product-mix of the products A, B and C which require processing in three departments:

$$Max.Z = 5x_1 + 10x_2 + 8x_3$$

Subject to the constraints

Fabrication hours

$$3x_1 + 5x_2 + 2x_3 \leq 60$$

Finishing hours

$$4x_1 + 4x_2 + 4x_3 \leq 72$$

Packaging hours

$$2x_1 + 4x_2 + 5x_3 \leq 100$$

$$x_1, x_2, x_3 \geq 0$$

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The application of simplex algorithm to solve the problem for optimal solution in the following table is given by

B	C_B	C_j	5	10	8	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3
x_2	10	8	1/3	1	0	1/3	-1/6	0
x_3	8	10	2/3	0	1	-1/3	5/12	0
s_3	0	18	-8/3	0	0	1/3	-17/12	1
Z=160		Δ_j	11/3	0	0	2/3	5/3	0

In context of this problem, determine whether the current basis would change for each of the following independent changes:

(a) Profit for A increases by Rs. 2 per unit and profit for B increases by Rs. 3 per unit.

(b) New profit value of product B is Rs. 14 and product C is Rs. 6.

(c) Profit rate for each product decreases by rupees two

(d) Availability becomes 80 hours in each department.

(e) Fabrication hours increased by 10 and finishing hours decreased by 10.

6. A manufacturer produces four products A, B, C and D each of which is processed on three machines X, Y and Z. The time required to manufacture one unit of each of the four products and the capacity of each of three are indicated in the following table:

Product	Processing time (in hrs.)		
	Machine X	Machine Y	Machine Z
A	1.5	4	2
B	2	1	3
C	4	2	1

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D	3	1	2
Capacity hrs.	550	700	200

The profit contribution per unit of the four products A, B, C and D is Rs. 4, 6, 3 and 1 respectively. The manufacturer wants to determine its optimal product-Mix.

(a) Formulate the above linear programming problem

(b) Find out the optimal product-mix and total maximum profit contribution.

(c) Which constraints are binding?

(d) If the profit contribution from product Y increase by Rs. 2 per unit, will the optimal product-mix change?

(e) If machine X is to be shut down for 50 hours due to repair, will the product-mix change?

9.5 ANSWERS

1. $x_1 = 3,\ x_2 = 1$ and Max.Z=12
2. $a)\ x_1 = 0,\ x_2 = 6$ and Max.Z=36

   b) $x_1 = 2,\ x_2 = 3$ and Max.Z=5

   c) $x_1 = 26/5,\ x_2 = 3/5$ and Max.Z=148/5 and $x_1 = 6,\ x_2 = 0$ and Max.Z=30

3. i) $x_1 = 1/2,\ x_2 = 3/2$ and Max.Z=7/2

ii) (a) $x_1 = 1/2,\ x_2 = 3/2$ and Max.Z=7/2

ii) (b) $x_1 = 3/2,\ x_2 = 1/2$ and Max.Z=5/2

4. 15/16$\leq a_{12}$, -17/6$\leq a_{22}$ and -1/8$\leq a_{23}$

5. (a) Current basis does not change

(b) No change

(c) Current basis will change

(d) Current basis may not remain optimum

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(e) No change in the current basis.

6. (a) $Max.Z = 4x_1 + 6x_2 + 3x_3 + x_4$

Subject to the constraints

$1.5x_1 + 2x_2 + 4x_3 + 3x_4 \leq 550$

$4x_1 + x_2 + 2x_3 + x_4 \leq 700$

$2x_1 + 3x_2 + x_3 + 2x_4 \leq 200$

and $x_1, x_2, x_3, x_4 \geq 0$

$(b) x_1 = 0, x_2 = 25, x_3 = 125 \; and \; x_4 = 0$, Maximum Profit Z=525

(c) First and third constraints

(d) Product-mix will not change.

(e) Product-mix will not change.

9.6 MULTIPLE CHOICE QUESTIONS

1. Sensitivity analysis

   (a) is also called post-optimality analysis as it is carried out after the optimal solution is obtained

   (b) allows the decision-maker to get more meaningful information about changes in the LP model parameters

   (c) provides the range within which a parameter may change without affecting optimality

   (d) all of the above

2. When an additional variable is added in the LP model, the existing optimal solution can further be improved if

   (a) $z_j - c_j \leq 0$

   (b) $z_j - c_j \geq 0$

   (c) both (a) and (b)

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(d) none of the above

3. Addition of an additional constraint in the existing constraints will cause a

   (a) change in objective function coefficients (c_j)

   (b) change in coefficients a_{ij}

   (c) both (a) and (b)

   (d) one of the above

4. If the additional constraint added is an equation and an artificial variable appears in the basis of the new problem, the new optimal solution is obtained by

   (a) assigning zero cost coefficient to the artificial variable if it appears in the basis at negative value

   (b) assigning – M cost coefficient to the artificial variable if it appears in the basis at positive value

   (c) either (a) and (b)

   (d) none of the above

5. To ensure the best marginal increase in the objective function value, a resource value may be increased whose shadow price is comparatively

   (a) larger

   (b) smaller

   (c) neither (a) nor (b)

   (d) both (a) and (b)

6. While performing sensitivity analysis, the upper bound infinity on the value of the right-hand side of a constraint means that

   (a) there is slack in the constraint

   (b) the constraint is redundant

   (c) the shadow price for that constraint is zero

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(d) none of the above

7. The entering variable in the sensitivity analysis of objective function coefficients is always a

   (a) decision variable

   (b) non-basic variable

   (c) basic variable

   (d) slack variable

8. In sensitivity analysis of the coefficient of the non-basic variable in a cost minimization LP problem, the upper sensitivity limit is

   (a) original value + Lowest positive value of improvement ratio

   (b) original value – Lowest absolute value of improvement ratio

   (c) positive infinity

   (d) negative infinity

9. If the RHS value of a constraint is changed to another value within specified limits, then the new optimal solution would have

   (a) same optimal solution

   (b) a lower objective function value

   (c) a higher objective function value

   (d) same set of variables in the solution mix

10. A change in the objective function for a non-basic variable can affect

    (a) $z_j - c_j$ values of all non-basic variables

    (b) $z_j - c_j$ values of all basic variables

    (c) Only the $z_j - c_j$ value of that variable

    (d) none of the above

11. The right-hand side range is often referred to as the range of

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(a) improvement

(b) feasibility

(c) infeasibility

(d) optimality

12. The shadow price for a constrain is the value of an

(a) additional unit of the resource

(b) Same value of the resource

(c) both (a) and (b)

(d) none of these

13. To maintain optimality of current optimal solution for a change Δc_k in the coefficient ck of non-basic variable xk, we must have

(a) $\Delta c_k = c_k - z_k$

(b) $\Delta c_k = z_k$

(c) $c_k + \Delta c_k = z_k$

(d) $\Delta c_k \geq z_k$

14. The 100 per cent rule for RHS values says that if the sum of the percentage change is less than or equal to 100%, then

(a) dual prices do not change

(b) different dual prices may exist

(c) both (a) and (b) may occur

(d) none of the above

15. The 100 per cent rule for objective function coefficients says that if the sum of the percentage change is less than or equal to 100%, then

(a) optimal solution does not change

(b) a different optimal solution may exist

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(c) both (a) and (b) may occur

(d) none of the above

ANSWERS

1 (d) 2 (a) 3 (c) 4 (c) 5 (a) 6 (d) 7 (d) 8 (c) 9 (d) 10 (c) 11 (b) 12 (a)

13 (a) 14 (a) 15 (a)

9.7 CASE STUDY

A stainless-steel utensil manufacturer makes three types of items. The restrictions, profit and requirements are tabulated below:

Utensil Type	I	II	III
Raw material requirement (kg per unit)	6	3	5
Welding and finishing time (hours per unit)	3	4	5
Profit per unit (Rs.)	3	1	4

If stainless steel (raw material) available is 25 kg and welding and finishing time available is 20 hours per day, then the optimum product mix problem is expressed as:

$$Max.Z = 3x_1 + x_2 + 4x_3$$

Subject to the constraints

Raw material restriction

$$6x_1 + 3x_2 + 5x_3 \leq 25$$

Time restriction

$$3x_1 + 4x_2 + 5x_3 \leq 20$$

$$x_1, x_2, x_3 \geq 0$$

Questions for Discussion

a) The second type of utensil would change the current optimal basis if its profit per unit is: ≥ 1; ≥ 1.02; ≥ 1.06; ≥ 2; ≥ 3.

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b) The simplex multiplier associated with the machine time restriction of 20 hours is (–3/5). Thus, the multiplier remains unchanged for the upper limit on the machine time availability of 25; 27.5; 35; 42.5; 32.5 hours.

c) The increase in the objective function for each unit availability of machine time higher than the upper limit indicated in part (b) is ... (show calculations).

d) The profit of the third type of utensil is Rs. 4 per unit. The lower unit on its profitability such that the current basis is still optimal is 4; 3; 2.5; 2; < 2.

9.8 GLOSSARY

Linear Programming

A mathematical technique used to help management decide how to make the most effective use of an organization's resources.

Objective function

A mathematical statement of the goal of an organization, stated as an intent to maximize or minimize some important quantity such as profit or cost.

Inequality

A mathematical expression containing a greater than or equal to relation or less than or equal to relation between the left-hand side and the right-hand side of expression.

Constraint

A restriction that inhibits the value that can be achieved by the objective function.

Non negativity Constraints

A set of constraints that requires each decision variable to be nonnegative; that is, each decision variable must be greater than or equal to zero.

Solution of a Linear Programming Problem

A set of values of the variables satisfying the constraints of a linear programming problem is called a solution of the linear programming problem.

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Feasible solution of a Linear Programming Problem

A set of values of the variables satisfying the constraints and the non-negative restrictions of a linear programming problem is called a feasible solution of the linear programming problem.

Optimal Solution of a Linear Programming Problem

A feasible solution of a linear programming problem is said to be optimal if it also optimized the objective function of the problem.

Optimality Test

A test of whether the solution obtained by the current iteration of an iterative algorithm is an optimal solution.

Slack Variable

The positive variable which is add to left hand side of the constraints to convert into equations is called the slack variable.

Surplus Variable

The positive variable which is subtract from left hand side of the constraints to convert into equations is called the surplus variable.

Simplex Method

An iterative procedure for solving linear programming problems.

Iterative Procedure

A process that repeats the same steps over and over.

Sensitivity Analysis

Analysis of how sensitive the optimal solution is to the value of each parameter of the model. Analysis of how the recommendations of a model might change if any of the estimates providing the numbers in the model eventually need to be corrected. The study of how other plausible values for the probabilities of the states of nature would affect the recommended decision alternative.

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Range of Optimality

The range of values over which an objective function coefficient may vary without causing any change in the optimal solution.

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LESSON-10

APPLICATION OF LP MARKETING, FINANCE, OPERATIONS MANAGEMENT

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STRUCTURE

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10.1 LEARNING OBJECTIVES

The purpose of chapter is to

1. Imparts the learning about linear programming applications encountered in practice.
2. Familiar with the wide range of problems that can be modelled as linear programs.
3. Experiencing and developing linear programming models to solve a problem or improve a business process including media portfolio selection, production scheduling and operations management.

10.2 LINEAR PROGRAMMING

Linear programming is a mathematical technique for allocating scarce resources. The technique is frequently used to maximise the value of a goal, such as minimising costs or increasing profits while dealing with constraints. In layman's terms, this means that the technique is intended to assist marketers or managers in planning and making better resource allocation decisions. In fact, linear programmes enable marketers to make the best use of limited resources, such as money, manpower, materials, time, or skills, to name a few.

Marketers must convert the given problem into a linear programming model, using the appropriate variables and standard techniques to solve the real-world problem. The model includes the following components:

1) Variables representing the available options
2) The mathematical expression relating to the variables and conditions at hand.

According to Bazaraa, Jarvis, and Sherali (2011), linear programming is a mathematical model with a goal function and constraints that can be used to help a business decide how to best utilise its current market and generate sustainable profits.

Linear programming generates solutions based on the characteristics and characteristics of the actual situation or problem. As a result, the application of linear programming is very broad, and it can find solutions in a variety of fields such as marketing. In fact, this technique has proven to be extremely effective in marketing and distribution management, among other areas. A marketing manager, for example, can use linear programming to distribute a fixed advertising budget across multiple media channels in order to maximise audience exposure.

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Thousands of decision variables and constraints are used in the model to solve practical problems in marketing research. The underpinning strength is the use of the extreme point of a function to satisfy certain constraints (Bazaraa et al., 2011). In this situation, the constraints on the problem are linear, and the function in the linear equation that is used to optimise solutions for the marketing research problem is known as the objective function.

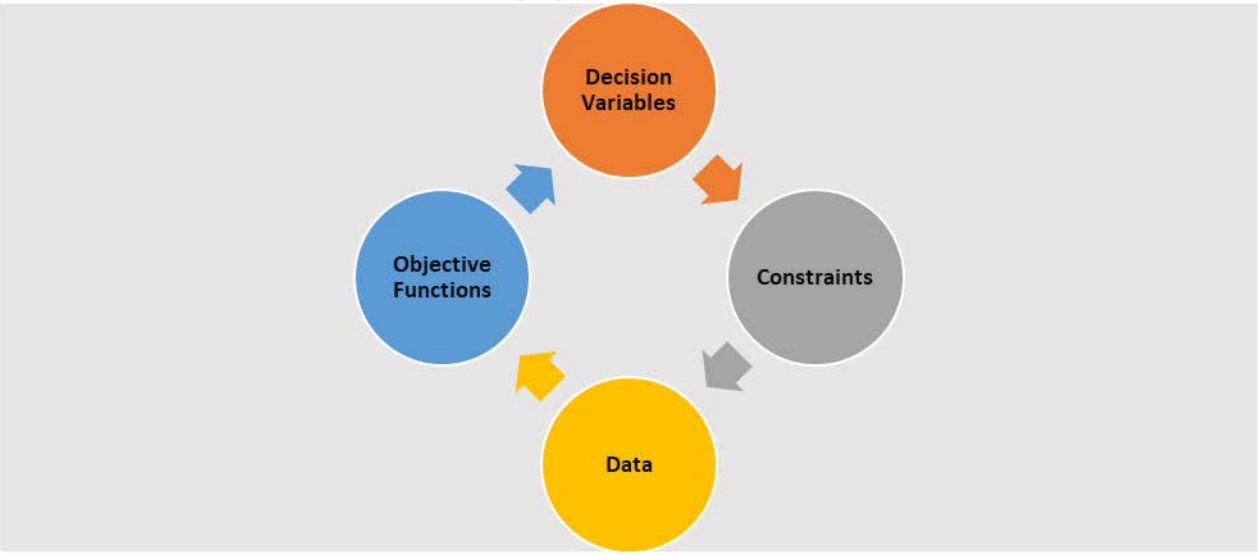
Canonical nature of LP

The linear programming problem typically has a canonical form that involves maximisation and minimization. Decisions involving certainty, uncertainty, and risk can be made using the model. Maxima criteria, which offer the suitable optimistic decision criterion, can be used to make decisions in uncertain situations. Given the unpredictable nature of the situation, the payoffs must be taken into account. This same value can be calculated as follows:

$$\alpha(\text{maximum reward}) + (1-\alpha)(\text{minimum payoff})$$

10.2.1 Components of Linear Programming

The basic components of the LP are as follows:



10.2.2 Characteristics of Linear Programming

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Linear programming problems share four key characteristics:

1) The goal of linear programming is to find an expression that minimises or maximises some quantity, such as cost to profit, known as the objective function.

2) The constraints or restrictions limit the extent to which the goal can be pursued and achieved.

3) When it comes to linear programming, there must be more than one alternative course of action to take because it is a tool that determines which decision is the best course of action for allocating resources.

4) Finally, both the objective and the constraints must be expressed in terms of linear equation inequalities.

Linear Programming Problems (LPP) are problems that are concerned with determining the best value for a given linear function. The optimal value can be either the maximum or the minimum. The given linear function is regarded as an objective function in this context. The objective function can have multiple variables that are subject to conditions, and it must satisfy a set of linear inequalities known as linear constraints. Linear programming problems can be used to find the best solution for a variety of scenarios, including manufacturing problems, diet problems, transportation problems, allocation problems, and so on.

10.2.3 History of Linear Programming

The problem of solving a system of linear inequalities dates back at least as far as Fourier, after whom the method of Fourier-Motzkin elimination is named. Linear a mathematical planning model created during World War II gave rise to programming to plan expenditures and returns to decrease army costs and increase enemy losses enemy. It wasn't made public until 1947. Following the war, numerous industries used it in their daily planning.

Russian mathematician Leonid Kantorovich, who created linear programming problems in 1939, George B. Dantzig, who published the simplex method in 1947, and John von Neumann, who created the theory of duality in the same year, are the subject's creators. Leonid Khachiyan demonstrated that the linear programming problem could be solved in polynomial time for the first time in 1979, but Narendra Karmarkar's introduction of a new interior point method in 1984 marked a more significant theoretical and application-based advancement in the field.

The original example by Dantzig of determining the optimal assignment of 70 individuals to 70 jobs serves as an illustration of the value of linear programming. The number of possible configurations exceeds the number of particles in the universe, so it takes a significant

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amount of computing power to test every combination in order to choose the best assignment. However, by framing the issue as a linear programme and using the Simplex algorithm, the best answer can be found in a matter of seconds. The number of potential optimal solutions that must be checked is drastically reduced by the linear programming theory.

10.2.4 Area of Application of LP

Product Mix

Use to decide which products to include in the production plan and in what quantities those products should be produced in order to make the best use of the machines and machine hours that are available while maximising profit.

Blending Issues

Use for choosing different raw material mixtures to create the best products at the lowest possible cost, such as food, drinks, etc.

Production Schedule

Utilize to create a production schedule that will meet future product demand while reducing production and inventory costs.

Production Quantity

Use in figuring out how many different grades of petroleum products to produce, say, in order to make the most money.

Distribution System

Use the distribution system to choose one that will reduce the overall shipping costs from numerous warehouses to various market locations.

Minimal Advertising

In order to maximise returns on investment, use in allocating a small advertising budget among radio, TV, and newspaper spots.

Investment

Using a variety of available stocks and bonds to build an investment portfolio in order to maximise returns on the investment

Scheduled Work

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Use in creating a work schedule that enables a large restaurant to accommodate staff needs at all times of the day while reducing the overall staff size.

10.2.5 Prerequisite of Linear Programming

1. A clearly stated goal must be set for either increasing revenue or reducing expenses.
2. The objective function must be linear, and the number of resources available for the objective functions must be constrained.
3. To choose the best course of action, alternate options must be available.
4. It is necessary to express an objective function mathematically**.**

10.2.6 Formulation of Linear Programming Problem

Linear programming problems typically consist of three components:

1. Decision variables, the value of which is determined by the problem to be solved.
2. The objective function, which must be maximised or minimised (e.g., maximisation of profits or minimisation of total costs, as the case may be).
3. Decision variables-related constraints, limitations, or conditions

A Linear Programming problem is solved by:

1. First listing the goal in algebraic form, including the decision variables, but in algebraic expression. This expression is known as the objective function, and it can be maximised or minimised.
2. Using algebraic notations to express the constraints as algebraic inequalities involving the decision variables.
3. The above steps complete the development of the Linear Programming problem.

10.2.7 Assumptions

Linear Programming is based on the following assumptions:

1. Purpose All of the relationships between function and constraints are linear.

This assumption has the following corollaries:

(a) We assume no economies of scale or diseconomies of scale; six units of product T require six times the amount of raw material as one unit of T.

(b) We assume that the decision variables do not interact; the total raw material required for X and T is simply the sum of the individual requirements for X and K 2.

There is only one goal function. There was only one goal in our product-mix problem, and that was to maximise profit. However, it is not easy in practise. An organisation may have a

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number of objectives for a specific decision, with possibly some priorities in between, all of which must be considered together.

10.3 APPLICATION OF LP IN MARKETING

Linear programming has numerous advantages as a tried-and-true problem-solving method that can improve decision-making, from media selection to market research.

This technique is especially useful when making a decision in certain marketing applications where there are constraints or restrictions.

Marketing research is a statistical process that businesses use to collect data and identify customer requirements and wants, along with the finest ways to satisfy them while ensuring long-term profits (Zopounidis & Pardalos, 2010). The objectives are to enable the company operations to fine-tune the marketing mix so as to address the requirements of customers through an equitable product supply based on customer demands.

The right decisions can be made by managers through descriptive, diagnostic, and predictive research at the strategic, tactical, and operational levels using the right market research information. Making decisions depending on the needs and prerequisites of the target market can be advantageous for the organisation if management optimises the linear programming model.

For instance, to carry out a marketing/consumer research programme, a company might decide to use a variety of techniques to reach the target audience and decide on the best combination of product characteristics to address the needs and desires of the customer using the suitable media outlet (Zopounidis & Pardalos, 2010). The available budget, restrictions, and total amount of money are what determine which media options are available. Media outlets include, but are not limited to, magazines, radio, social media, and other platforms that can be tailored to reach the target audience. The linear programming method can also be used to choose the best advertising budget from a variety of advertising channels.

A common example is the use of linear programming to determine the effectiveness of available advertising alternatives using the formula:

WAA = Adjusted audience (AA) x Exposure factor (E x F) x Evaluation Factor (E v F)

In the above formula, AA is the target audience, E × F is the fraction of the audience that reads the advertisement, and (E v F) is a subjective weight that is based on a scale of 0-1

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score. Assume that 4 advertising vehicles have been considered, the objective function is expressed as:

Maximize total WAA=

$(x + a)^n = \sum_{i=2}^{19} CiDi$

To determine the best advertising vehicle, enter the formula into Excel and run an excel solver.

Illustration 10.1

The Dyson Company, which recently launched a new line of hair appliances, has $282,000 to spend on advertising. The product will first be tested in the Dallas area. The funds will be used for a TV advertising blitz over one weekend in November (Friday, Saturday, and Sunday).Daytime advertising, evening news advertising, and Sunday game-time advertising are the three options available. A mix of one-minute TV spots is preferred.

Ad Type	Reached With Each Ad	Cost Per Ad
Daytime	3,000	$5,000
Evening News	4,000	$7,000
Sunday Game	75,000	$100,000

Dyson intends to display at least one ad of each type (daytime, evening-news, and game-time). Furthermore, only two game-time ad spots are available. Every day, ten daytime and six evening news spots are available. SMM wants to run at least five ads per day, but only spend $50,000 on Friday and $75,000 on Saturday.

Define the Decision Variables

DFR = number of daytime ads on Friday

DSA = number of daytime ads on Saturday

DSU = number of daytime ads on Sunday

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EFR = number of evening ads on Friday

ESA = number of evening ads on Saturday

ESU = number of evening ads on Sunday

GSU = number of game-time ads on Sunday

Define the Objective Function

Maximize the total audience reached:

Max (audience reached per ad of each type) x (number of ads used of each type)

Max 3000DFR +3000DSA +3000DSU +4000EFR+4000ESA +4000ESU +75000GSU

Define the Constraints

Take out at least one ad of each type:

(1) DFR + DSA + DSU > 1

(2) EFR + ESA + ESU > 1

(3) GSU > 1

Ten daytime spots available:

(4) DFR < 10

(5) DSA < 10

(6) DSU < 10

Six evening news spots available:

(7) EFR < 6

(8) ESA < 6

(9) ESU < 6

Only two Sunday game-time ad spots available:

(10) GSU < 2

At least 5 ads per day:

(11) DFR + EFR > 5

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(12) DSA + ESA > 5

(13) DSU + ESU + GSU > 5

Spend no more than $50,000 on Friday:

(14) 5000DFR + 7000EFR < 50000

Spend no more than $75,000 on Saturday:

(15) 5000DSA + 7000ESA < 75000

Spend no more than $282,000 in total:

(16) 5000DFR + 5000DSA + 5000DSU + 7000EFR

+ 7000ESA + 7000ESU + 100000GSU7 < 282000

Non-negativity:

DFR, DSA, DSU, EFR, ESA, ESU, GSU > 0

The Management Scientist Solution

Objective Function Value= 199000.000		
Variable	Reduced Costs	Value
DFR	0.000	8.000
DSA	0.000	5.000
DSU	0.000	2.000
EFR	0.000	0.000
ESA	0.000	0.000
ESU	0.000	1.000
GSU	0.000	2.000

Solution Summary
Total new audience reached = 199,000

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Number of daytime ads on Friday	8
Number of daytime ads on Saturday	5
Number of daytime ads on Sunday	2
Number of evening ads on Friday	0
Number of evening ads on Saturday	0
Number of evening ads on Sunday	1
Number of game-time ads on Sunday	2

10.4 APPLICATION OF LP IN FINANCE

LP can be used in capital budgeting, make-or-buy, asset allocation, portfolio selection, financial planning, and other financial decisions. Portfolio selection problems entail selecting specific investments, such as stocks and bonds, from a pool of investment options. Managers of banks, mutual funds, and insurance companies face similar challenges. The goal function is usually to maximise expected return or minimise risk.

Illustration 10.2

The investment funds available to Xtrend Savings total $20 million. It intends to invest over the subsequent four months to maximise total interest earned, and at the start of the following month, it will have at least $10 million available for a high-rise building project in which it will be involved. Xtrend currently only plans to invest in 3-month construction loans (earning 6% monthly interest) and 2-month government bonds (earning 2% monthly interest). Every month, you can invest in any of these. Money not used for these two investments can be invested locally and earns a monthly return Construct a linear programme to assist Xtrend Savings in determining how to invest over the next four months if it does not want to have more than $8 million in either government bonds or construction loans at any time.

Solution:

Define the Decision Variables

Gi[1] = amount of new investment in government bonds in month i (for i = 1, 2, 3, 4)

[1]

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Ci = amount of new investment in construction loans in month i (for i = 1, 2, 3, 4)

Li = amount invested locally in month i,(for i = 1, 2, 3, 4)

Define the Objective Function

Maximize total interest earned in the 4-month period:

Max (interest rate on investment) X (amount invested)

Max .02G1 + .02G2 + .02G3 + .02G4+ .06C1 + .06C2 + .06C3 + .06C4 + .0075L1 + .0075L2 + .0075L3 +

.0075L4

Define the Constraints

Month 1's total investment limited to $20 million:

(1) G1 + C1 + L1 = 20,000,000

Month 2's total investment limited to principal and interest invested locally in Month 1:

(2) G2 + C2 + L2 = 1.0075L1 or G2 + C2 - 1.0075L1 + L2 = 0

Month 3's total investment amount limited to principal and interest invested in government

bonds in Month 1 and locally invested in Month 2:

(3) G3 + C3 + L3 = 1.02G1 + 1.0075L2 or - 1.02G1 + G3 + C3 - 1.0075L2 + L3 = 0

Month 4's total investment limited to principal and interest invested in construction loans in Month 1,

government bonds in Month 2, and locally invested in Month 3:

(4) G4 + C4 + L4 = 1.06C1 + 1.02G2 + 1.0075L3 or - 1.02G2 + G4 - 1.06C1 + C4 - 1.0075L3 +L4 = 0

$10 million must be available at start of Month 5:

(5) 1.06C2 + 1.02G3 + 1.0075L4 > 10,000,000

No more than $8 million in government bonds at any time:

(6) G1 < 8,000,000

(7) G1 + G2 < 8,000,000

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(8) G2 + G3 < 8,000,000

(9) G3 + G4 < 8,000,000

No more than $8 million in construction loans at any time:

(10) C1 < 8,000,000

(11) C1 + C2 < 8,000,000

(12) C1 + C2 + C3< 8,000,000

(13)C2 + C3 + C4 < 8,000,000

Non-negativity:

Gi, Ci, Li > 0 for i = 1, 2, 3, 4

The Management Scientist Solution

Objective Function Value= 1429213.7987		
G1	0.0000	8000000.0000
G2	0.0000	0.0000
G3	0.0000	5108613.9228
G4	0.0000	2891386.0772
C1	0.0000	8000000.0000
C2	0.0453	0.0000
C3	0.0076	0.0000
C4	0.0000	8000000.0000
L1	0.0000	4000000.0000
L2	0.0000	4030000.0000
L3	0.0000	7111611.0772
L4	0.0000	4753562.0831

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10.5 APPLICATION OF LP IN OPERATIONS MANAGEMENT

10.5.1 Definition of Operations Management

The management of the department within an organisation tasked with producing goods and/or services is known as operations management. Examples of these products and services can be found all around you. Every publication you read, every film you watch, every email you send, every phone call you make, and every medical procedure you undergo. The operations function of one or more organisations are involved in the treatment you receive.

One needs to understand "Operating Systems" in order to understand Operations Management clearly. A configuration of resources combined for the delivery of goods or services is referred to as an operating system.

Operating systems can be found in businesses like retail stores, hospitals, bus and taxi companies, tailors, hotels, and dental offices. Any operating system converts inputs while utilising physical resources to produce outputs that serve the purpose of meeting customer demands. The process of transforming or converting inputs into finished goods or services outputs. One uses a variety of inputs, including capital, labour, and information, to create goods and services or additional transformation procedures (e.g., storing, transporting, and cutting). To make sure the desired results are at various stages of the transformation process, an organisation collects data (feedback) and then determines whether corrective action is required by comparing them to previously established standards(control).

10.5.2 Objectives of Operations Management

Customer service and resource utilisation are two categories into which operations management goals can be divided.

1. **Customer service**

The first goal is to provide excellent customer service, which is defined as meeting all of the needs of the client. So, one of operations management's main goals is to provide excellent customer service. The Operations Management must deliver a product that meets the customer's requirements for quality, cost, and delivery time. Consequently, by offering the "right thing at the right price at the right time," the primary objective can be satisfied.

Typically, an organisation will strive to achieve specific standards, or levels, on these dimensions, and operations managers will have a significant impact on these efforts. Thus, in order to provide the necessary customer service, this objective will affect the operations manager's choices.

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2. Resource Utilisation

Utilizing resources effectively to satisfy customer needs is another important goal. To achieve effective operations through efficient resource use, customer service must be provided. Operating system failure due to ineffective resource management or poor customer service.

Utilizing resources effectively, that is, getting the most out of them or reducing their loss, underutilization, or waste, is the main focus of operations management. The percentage of time that is used or occupied, the amount of space used, the intensity of activity, etc. can all be used as indicators of how fully the resources are being used. Each metric shows how much of these resources' potential or capacity is actually being used. This is referred to as the resource utilisation objective.

The achievement of the both satisfactory customer service and resource utilisation is a concern of operations management. A change in one will frequently result in a decline in the other. Often, neither can be maximised, so both must be accomplished with a satisfactory level of performance. These two goals must be the focus of all operations management activities, and operations managers will encounter many issues as a result of this conflict. Therefore, operations managers need to try to balance these fundamental goals.

1.5.3 Application of Linear Programming

Operations managers use linear programming (LP), a mathematical modelling technique, to find alternative solutions to decision-making issues. Prior uses include figuring out the best trucking and airline routes, chemical and oil blends, staffing plans, and patient case mixtures.

The primary objective of operations management is to increase an organization's operational systems' productivity. The supply chain transformation process is the main focus of operations management.

The terms variables, constraints, and objective function are used in linear programming. Additionally, the variables are possible inputs for the problem.

The limitations are mathematical equations that restrict the values of the solutions. The objective function is also the equation that stipulates the performance metric. Processes, operations, and supply chain activities are terms used in operations management. Processes are actions that both humans and machines take part in.

Operations are specific actions that convert raw materials into finished goods. The management of resources, information, and finances between the supplier and the customer is another aspect of supply chain activities.

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By minimising costs, linear programming seeks to maximise profits. Additionally, increasing an organization's operational systems' productivity is a goal of operations management. The supply chain transformation process is the main focus of operations management.

Demand planning is primarily done to reduce overall costs. Demand planning will also lessen stock-outs and enhance customer service. You can make sure you have enough inventory to satisfy your customers' needs by employing this method. In this situation, you will require less inventory. You must forecast demand, which is the business's projection of future consumer demand for a good or service, in order to accomplish this. The lead time is another important consideration. The lead time is the amount of time that passes between placing an order and having it delivered to the customer. We can make a buffer stock if we take into account these variables. We will be able to manage supply and demand fluctuations thanks to this buffer stock.

We want to try as hard as we can to cut costs as much as we can. Additionally, we aim to make the most money possible. Demand planning can be used in this situation to collaborate with our supply chain partners. With this approach, we can ensure that we have enough stock while also lowering costs. We can also ensure that we have the appropriate amount of inventory by cooperating with our supply chain partners. We will be able to lower expenses and raise the calibre and customer service by doing this. Without having too much or too little inventory, we can accomplish our objectives.

Additionally, the majority of businesses strive for increased operational efficiency. Reducing the amount of inventory required achieves this. If this happens, then we can increase our profits.

1. **Production Planning Problem**

Illustration 10.2

A product is produced in a factory in units of 5 units of part A and 4 units of part B. There are 120 and 240 units, respectively, of different raw materials, needed for parts A and B. Three different processes can be used to make these components. The quantity of raw materials needed for each production run and the number of units produced for each part are listed below

Method	Input per run (units)		Output per run (units)	
	Raw material 1	Raw material 2	Part A	Part B

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1	7	5	6	4
2	4	7	5	8
3	2	9	7	3

Formulate a L.P. model to determine the number of production run for each method so as to maximize the total number of complete units of the final product.

Solution:

Formulation of Linear Programming Model

Let X_1, X_2, X_3 represent the number of production run for method 1,2 and 3 respectively. The objective is to maximize the total number of units of the final product. Now, the total number of units of part A produced by different method is $6X_1$, $5X_2$, $7X_3$ and for part B is $4X_1$, $8X_2$, $3X_3$ .Since each unit of the final product requires 5 unit of part A and 4 unit of part B, it is evident that the maximum number of the final product cannot exceed the smaller value of

$\frac{6X_1+5X_2+7X_3}{5}$ and $\frac{4X_1+8X_2+3X_3}{4}$

Thus, the objective is to maximize

Z = Minimum of ($\frac{6X_1+5X_2+7X_3}{5}$ and $\frac{4X_1+8X_2+3X_3}{4}$)

Constraints are on the availability of raw materials. They are, for

Raw material 1, $7X_1 + 4X_2 + 2X_3 \leq 120$

Raw material 2, $5X_1 + 7X_2 + 9X_3 \leq 240$

The above formulation violates the linear programming properties since the objective function is non-linear. (Linear relationship between two or more variable is the one in which the variable are directly and precisely proportional). However, the above model can be easily traduced to the generally acceptable linear programming format.

Let, y= Min ($\frac{6X_1+5X_2+7X_3}{5}$ and $\frac{4X_1+8X_2+3X_3}{4}$)

It follows that $\frac{6X_1+5X_2+7X_3}{5} \geq$ y and $\frac{4X_1+8X_2+3X_3}{4} \geq$ y

i.e., $6X_1 + 5X_2 + 7X_3 \geq 0$ and $4X_1 + 8X_2 + 3X_3 \geq 0$

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Thus, mathematical model for the problem is Maximize Z= y

Subject to constraints,

$$7X_1 + 4X_2 + 2X_3 \leq 120,$$

$$5X_1 + 7X_2 + 9X_3 \leq 240.$$

$$6X_1 + 5X_2 + 7X_3 \geq 0,$$

$$4X_1 + 8X_2 + 3X_3 \geq 0,$$

Where, $X_1, X_2, X_3, y \geq 0$

2. **Product mix problem**

A company produces two things. It buys casting, which is then drilled, polished, and machined. The cost of casting for items a and b is Rs. 2 and Rs. 3, respectively, and they are sold for Rs. % and Rs. 6 each. Three machines have hourly operating costs of Rs. 20, Rs. 14, and Rs. 17.50, respectively. The machine's capacities are

	Part A	Part B
Machining Capacity	25/hr	40/hr
Boring Capacity	28/hr	35/hr
Polishing Capacity	35/hr	25/hr

Formulate the L. P. model to determine the product mix that maximizes the profit.

Solution

Formulation of L.P. Model Let x1 and x2 represent the number of units of A and b to be manufactured per hour. The objective is to maximize the profit. Profit per part of item A and B is calculated as:

	Part A (Rs.)	Part B (Rs.)
Machining Capacity	$\frac{20}{25}$=0.80	$\frac{20}{40}$=0.50

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Boring Capacity	$\frac{14}{28}$=0.50	$\frac{14}{35}$=0.40
Polishing Capacity	$\frac{17.50}{35}$=0.50	$\frac{17.50}{25}$=0.70
Casting Cost ∴ Total Cost Selling Price ∴ Profit 3.00 4.60 6.00 1.40	2.00 3.80 5.00 1.20	3.00 4.60 6.00 1.40

Therefore, objective is to

$$\text{Maximize } z = 1.2X_1 + 1.4X_2$$

Constraints are on the capacities of the machine. For one hour running of each machine, they are

$$\frac{1X_1}{25} + \frac{1X_2}{40} \leq 1,$$

$$\frac{1X_1}{28} + \frac{1X_2}{35} \leq 1,$$

$$\frac{1X_1}{35} + \frac{1X_2}{25} \leq 1,$$

$$\text{OR } 8X_1 + 5X_2 \leq 200,$$

$$5X_1 + 4X_2 \leq 140,$$

$$5X_1 + 7X_2 \leq 175,$$

$$\text{Where, } X_1 \geq 0, X_2 \geq 0$$

3. Transportation Problem

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Supply		Demand	
Dehradun	200	Ambala	300
Ludhiana	600	Noida	400

Prestige Equipment transports refrigerator units from Dehradun and Ludhiana factories to distribution centres in Ambala and Noida. The following table summarises transportation costs:

Transportation of product from source of production to distribution centre:

Source	**Destination**	**Transportation Cost (Rs)**
Dehradun	Ambala	30
	Noida	40
Ludhiana	Ambala	60
	Noida	50

The supply and demand, in number of units, is shown below:

Capacity of supply and demand of refrigerator:

How should transportation from Dehradun and Ludhiana be organised save the money?

Solution

The information of this problem can be summarized by the following map which is referred as figure:

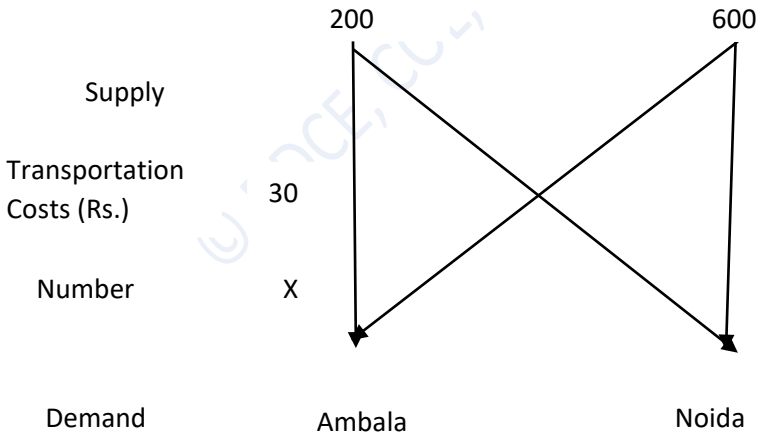

Figure: Map of no of supply and demand of refrigerator along with transportation cost

Table : Source of supply to destinations with number and transportation cost

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Source	Destination	Number	Transportation Cost (Rs)
Dehradun	Ambala	X	30x
	Noida	Y	40y
Ludhiana	Ambala	Z	60z
	Noida	W	50w

Thus, the LP model is as follows:

Minimize: $C = 30x + 40y + 60z + 50w$

Subject to:

$x + y \leq 200$ [Supply]

$z + w \leq 600$ [Supply]

$x + z \geq 300$ [Demand]

$y + w \geq 400$ [Demand]

$x \geq 0$, $y \geq 0$, $z \geq 0$, $w \geq 0$ [Non-negativity]

10.6 SUMMARY

Marketing Application

Media Selection

- Media selection is one application of linear programming in marketing.
- LP can assist marketing managers in allocating a set budget to various advertising media.
- The goal is to maximise exposure reach, frequency, and quality.
- Restrictions on allowable allocations typically arise as a result of company policy, contract requirements, and media availability.

Marketing Research

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- Marketing research is conducted by a company to learn about consumer characteristics, attitudes, and preferences.
- Marketing research services include creating the study, conducting surveys, analysing the data gathered, and making recommendations to the client.
- Targets or quotas for the number and types of respondents to be surveyed may be established during the research design phase.
- The marketing research firm's goal is to conduct the survey in such a way that it meets the client's needs at the lowest possible cost.

Financial Application

- LP can be used in capital budgeting, make-or-buy, asset allocation, portfolio selection, financial planning, and other financial decisions.
- Portfolio selection problems entail selecting specific investments, such as stocks and bonds, from a pool of investment options.
- Managers of banks, mutual funds, and insurance companies face similar challenges.
- Typically, the objective function is to maximise expected return or minimize risk.

Operations Management Applications

- In operations management, LP can be used to help make decisions about product mix, production scheduling, staffing, inventory control, capacity planning, and other issues.
- Multi-period planning, such as production scheduling, is an important application of LP.
- Typically, the goal is to develop an efficient, low-cost production schedule for one or more products over a number of time periods.
- Typical constraints include production capacity, labour capacity, storage space, and others.

10.7 PRACTICE QUESTIONS

1. What are essential characteristics of linear programming model
2. Discuss briefly the steps to formulate a linear programming problem. Explain with an example
3. Write short note on the limitations of linear programming
4. In relation to Linear Programming, explain the implication of the following assumptions of the model:

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a. Linearity of the objective function and constraints

b. Certainty and

c. Decision variables

d. Non negativity constraints in LPP.

5. Explain the following terms

   a. Linearity

   b. Feasible solution

   c. Objective function

   d. Unbounded solution

   e. Optimal solution

6. Orient Paper Mills produces two grades of paper X and Y Because of raw material restrictions not more than 400 tons of grade X and not more than 300 tons of grades Y can be produced in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hour to produce a ton of products X and Y respectively with corresponding profit of Rs 20 and Rs 50 per ton. Formulate a LPP to optimize the product mix for maximum profit.

7. Vitamin A and B is found in foods F1 and F2. One unit of food F1 contains 3 units of vitamin A and 4 units of vitamin B and that of F2 contains 6 units of vitamin A and 3 units of vitamin B One unit of vitamin F1 and F2 cost Rs 4 and Rs 5 respectively. The minimum daily need per person of vitamin A and B is 80 and 100 units respectively. Assuming that anything in excess of daily minimum requirement is harmful. Find out the optimum mixture of F1 and F2 at the minimum cost which meets the minimum requirement of vitamin A and B. Formulate this as a LP problem.

8. A transport company has two types of trucks, Type A and Type B. Type A has a refrigerated capacity of 20 m3 and a non-refrigerated capacity of 40 m3 while Type B has the same overall volume with equal sections for refrigerated and non-refrigerated stock. A grocer needs to hire trucks for the transport of 3,000 m3 of refrigerated stock and 4 000 m3 of non-refrigerated stock. The cost per kilometer of a Type A is $30, and $40 for Type B. How many trucks of each type should the grocer rent to achieve the minimum total cost?

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9. A school is preparing a trip for 400 students. The company who is providing the transportation has 10 buses of 50 seats each and 8 buses of 40 seats, but only has 9 drivers available. The rental cost for a large bus is $800 and $600 for the small bus. Calculate how many buses of each type should be used for the trip for the least possible cost.

10. A store wants to liquidate 200 of its shirts and 100 pairs of pants from last season. They have decided to put together two offers, A and B. Offer A is a package of one shirt and a pair of pants which will sell for $30. Offer B is a package of three shirts and a pair of pants, which will sell for $50. The store does not want to sell less than 20 packages of Offer A and less than 10 of Offer B. How many packages of each do they have to sell to maximize the money generated from the promotion?

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LESSON-11

TRANSPORTATION PROBLEM, TRANSHIPMENT PROBLEM AND ASSIGNMENT PROBLEMS

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11.1 LEARNING OBJECTIVES

After studying this lesson, you will be able to:

- Understand the purpose of this lesson is to impart knowledge about problems with transportation, transshipment, and assignment;
- Learn how to use the transportation simplex method to solve transportation problems;
- Define, recognize, and formulate an assignment problem. Know how to solve assignment problems using the Hungarian algorithm;
- Understand why it is important to balance transportation problems and be able to balance a problem instance;
- Explain the three models in this chapter (the models for transportation, assignment, and transshipment) can each be written as linear programmes and solved using general-purpose linear programming tools;
- Identify the best solution for each of the three models will be expressed in terms of integer values for the decision variables if the right-hand side of the linear programming formulations is all an integer.

11.2 INTRODUCTION

This chapter facilitates an overview of the notion about transshipment issue is a special Linear Programming Problem (LLP) because it takes into account the presumption that all sources and sinks can simultaneously accept and distribute shipments (function in both directions). The goal of the transportation model, a special form of linear programming issues, is to reduce the overall cost of moving commodities from the various supply origins to the various demand destinations and the basic goal of an assignment problem is to reduce the overall amount of time needed to accomplish a group of activities, or to increase skill ratings, or to reduce the cost of the assignments.

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11.3 TRANSPORTATION PROBLEM

The main goal of solving a transportation problem is to determine the most efficient way to use the resources of m supply sites to meet the needs of n demand places. A variable cost of moving the goods from one supply point to another or a comparable constraint should be taken into account while trying to discover this ideal combination.

Important definitions of Transportation problem are:

Determining the quantity to be transported from each origin to each destination while minimising the overall transportation cost is the goal of the transportation problem.

There should be n destinations and m origins. Let ai be the supply volume at the I th origin. Let bj be the demand at j's destination. It is known for all combinations that the price of shipping one unit of an item from origin I to destination j is equal to cij (i,j). Transported quantity from point I to point j will be xij. In order to reduce the overall transportation cost, the quantity xij to be delivered over all routes (i,j) must be determined. Both the origins' supply constraints and the destinations' demand demands must be met.

The above transportation problem can be written in the following tabular form:

		Destinations					supply
		1	2	3	…	n	
Origins	1	(x_{11}) C_{11}	(x_{12}) C_{12}	(x_{13}) C_{13}	…	(x_{1n}) C_{1n}	a_1
	2	(x_{21}) C_{21}	(x_{22}) C_{22}	(x_{23}) C_{23}	…	(x_{2n}) C_{2n}	a_2
	⋮		⋮	⋮	⋮	⋮	⋮
	m	(x_{m1}) C_{m1}	(x_{m2}) C_{m2}	(x_{m3}) C_{m3}	…	(x_{mn}) C_{mn}	a_m
	demand	b_1	b_2	b_3	…	b_n	

:

Now the linear programming model representing the transportation problem is given by

A feasible solution to a transportation issue is a set of non-negative numbers xij(i=1,2,..,m, j=1,2,...n) that meets the conditions.

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Basic Variable Solution: If a feasible solution to a transportation problem only requires m+n-1 allocations, where m is the number of rows and n is the number of columns, then the solution is said to be basic.

The phrase "optimal solution" describes a practical (though not always "basic") strategy that lowers the overall cost of transportation.

Non degenerate basic feasible solution: If a transportation problem's basic viable solution has precisely m+n-1 allocations in independent positions, it is not degenerate. In this example, there are m rows and n columns in a transportation problem.

Degeneracy: If a fundamentally workable solution to a transportation problem has fewer allocations than m+n-1, it is said to be degenerate. The transportation issue in this instance consists of m rows and n columns.

11.3.1 Types of Transportation Problem

Transportation issues of several kinds:

Balanced: When both supplies and demands are equal, a transportation issue is said to be balanced. When supply and demand are not equal, a transportation issue is said to be out of balance. Depending on what is required to make the problem balanced, either a dummy row or dummy column is introduced in this type of problem. After then, it can be addressed similarly to the balanced problem.

11.3.2 Method to solve Transportation Problem

To find the initial basic feasible solution there are three methods:

1. NorthWest Corner Cell Method.
2. Least Call Cell Method.
3. Vogel's Approximation Method (VAM).

Northwest Corner Method

Least Cost Method

Vogel's Approximation Method

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11.3.3 Transportation Problem

The transportation issue was introduced in the section before; in this section, the NorthWest Corner Cell Method will be used to find the first simple, practical answer.

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
Source	**Q1**	3	1	7	4	**300**
	Q2	2	6	5	9	**400**
	Q3	8	3	3	2	**500**
	Demand	**250**	**350**	**400**	**200**	**1200**

Explained: Given three origins (O1, O2, and O3) and four destinations (D1, D2, D3, and D4) For the sources O1, O2, and O3, the supplies are 300, 400, and 500, respectively. Demands are respectively 250, 350, 400, and 200 for the destinations D1, D2, D3, and D4.

Solution: According to the North West Corner approach, the beginning point must be the north-western corner of the table, or (O1, D1). When determining the price per transportation, every single value in a cell is taken into consideration. After evaluating the supply from source O1 and demand for column D1 in the figure, a minimum of two should be awarded to the cell (O1, D1). Since there is no longer any requirement for Column D1, the entire Column D1 will be cancelled. The quantity coming from source O1 is still 300 – 250 = 50.

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
Source	**Q1**	250 ~~3~~	1	7	4	~~**300**~~ **50**
	Q2	~~2~~	6	5	9	**400**
	Q3	~~8~~	3	3	2	**500**
	Demand	~~**250**~~ **0**	**350**	**400**	**200**	**1200**

Examine the northwestern quadrant of the table, which is (O1, D2), but leave off column D1. Then, distribute the bare minimum of supply among the corresponding column and rows. The

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sourceO1 should only allocate 50 to the cell, which is less than what is required for D2 (i.e., 350). (O1, D2).

Cancel row O1 because the supply from row O1 is finished. Column D2 still has a demand of 350 - 50 = 50.

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	250 ~~3~~	50 ~~1~~	~~7~~	~~4~~	**~~300~~ ~~50~~ 0**
	Q2	~~2~~	6	5	9	**400**
Source	**Q3**	~~8~~	3	3	2	**500**
		~~250~~	**~~350~~**			
	Demand	**0**	**300**	**400**	**200**	**1200**

Finding the north-west corner of the remaining table, O2, D3, now compare the O2supply (100) to the D2 demand (400) and assign the smaller (100) to the cell (O2, D2). Cancel the row O2 since the supply from O2 has been fully satisfied. 400 - 100 = 300 is the remaining demand for column D3.

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	250 ~~3~~	50	100 ~~7~~	~~4~~	**~~300~~ ~~50~~ 0**
	Q2	~~2~~	300 ~~6~~	~~5~~	~~9~~	**~~400~~ ~~100~~ 0**
Source	**Q3**	~~8~~	~~3~~	3	2	**500**
		~~250~~	**~~350~~**	**~~400~~**		
			~~300~~	**300**		
	Demand	**0**	**0**		**200**	**1200**

Proceeding in the same way, the final values of the cells will be:

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		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	250 ~~3~~	50	100 ~~7~~	300 ~~4~~	~~300~~ ~~50~~ **0**
	Q2	~~2~~	300 ~~6~~	300 ~~5~~	~~9~~	~~400~~ ~~100~~ **0**
Source	**Q3**	~~8~~	~~3~~	~~3~~	~~2~~	~~500~~ ~~200~~ **0**
			~~350~~	~~400~~	~~200~~	
		~~250~~	~~300~~	~~300~~	**0**	
	Demand	**0**	**0**	**0**		**1200**

Note that in the last remaining cell, which was cell, the demand for the pertinent columns and rows is equal (O3, D4). Since O3 was in supply and D4 was in demand, the cell in this case received 200. The last item was that neither a row nor a column contained anything.

To get the basic solution, which is (250 * 3) + (50 * 1) + (300 * 6) + (100 * 5) + (300 * 3) + (200 * 2) = 4400, just multiply the value of each cell by the assigned value.

11.3.4 Transportation Problem: (Least Cost Cell Method)

The North-West Corner approach was covered at the prior session. The Least Cost Cell technique will be covered in this session.

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	3	1	7	4	**300**
	Q2	2	6	5	9	**400**
Source	**Q3**	8	3	3	2	**500**
	Demand	**250**	**350**	**400**	**200**	**1200**

The Least Cost Cell approach requires that the least expensive cell in the table be identified, and that cell is 1 (cell (O1, D2)).

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Now contrast the supply in row O1 with the demand in column D2 and assign the cell with the lower number. Give the cell 300 because it is the lesser value. As the supply from O1 is exhausted, the demand for column D2 is 350 - 300 = 50, hence this row should be cancelled..

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~**300**~~ **0**
Source	**Q2**	2	6	5	9	**400**
	Q3	8	3	3	2	**500**
			~~**350**~~			
	Demand	**250**	**50**	**400**	**200**	**1200**

Find the cell with the lowest cost among the remaining cells next. Cells (O2, D1) and (O3, D4) are the two least expensive, both costing 2. Let's decide (O2, D1). Next, ascertain the supply and demand for the relevant cell. Then, allocate the smallest sum between the two to the cell. Finally, remove the row or column whose supply or demand is now zero as a result of the allocation

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~**300**~~ **0**
Source	**Q2**	250 ~~2~~	6	5	9	~~**400**~~ **150**
	Q3	~~8~~	3	3	2	**500**
		~~**250**~~	~~**350**~~			
	Demand	**0**	**50**	**400**	**200**	**1200**

Now, (O3, D4), with a cost of 2, is the cell with the lowest cost. As the supply is greater than the demand, assign 200 to this cell. Therefore, the column is removed.

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		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~**300**~~ **0**
Source	**Q2**	250 ~~2~~	6	5	200 ~~9~~	~~**400**~~ **150**
	Q3	~~8~~	3	3	~~2~~	~~**500**~~ **300**
		~~**250**~~	~~**350**~~		~~**200**~~	
	Demand	**0**	**50**	**400**	**0**	**1200**

The two unallocated cells with the lowest costs are the other two. Please choose any at random (O3, D2). From the supply in the corresponding row and the demand in the corresponding column, enter the smallest amount you can into this cell. Remove the row or column with a value of zero.

		Destination				
		D1	**D2**	**D3**	**D4**	**Supply**
	Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~**300**~~ **0**
Source	**Q2**	250 ~~2~~	6	5	200 ~~9~~	~~**400**~~ **150**
	Q3	~~8~~	50 3	3	~~2~~	~~**500**~~ ~~**300**~~ **250**
		~~**250**~~	~~**350**~~ ~~**50**~~		~~**200**~~	
	Demand	**0**	**0**	**400**	**0**	**1200**

Currently, the cheapest cell is (O3, D3). Eliminate the row or column with a value of zero and distribute the minimum of supply and demand.

Destination

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		D1	D2	D3	D4	Supply
Source	Q1	250 ~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ 0
	Q2	~~2~~	~~6~~	5	200 ~~9~~	~~400~~ 150
	Q3	~~8~~	50 ~~3~~	250 ~~3~~	~~2~~	~~500~~ ~~300~~ ~~250~~ 0
		~~250~~	~~350~~ ~~50~~	~~400~~	~~200~~	
	Demand	0	0	150	0	1200

There is only one cell left, (O2, D3), and it costs $5. Its supply is 150 and demand is 150, hence demand is 150 and both are equal in quantity. Allocate it to this cell.

Destination

	D1	D2	D3	D4	Supply
Q1	250 ~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ 0
Q2	~~2~~	~~6~~	150 ~~5~~	200 ~~9~~	~~400~~ ~~150~~ 0
Q3	~~8~~	50 ~~3~~	250 ~~3~~	200 ~~2~~	~~500~~ ~~300~~ ~~250~~ 0
	~~250~~	~~350~~ ~~50~~	~~400~~ ~~150~~	~~200~~	
Demand	0	0	0	0	1200

11.3.5 Transportation Problem: (Vogel's Approximation Method)

Simply multiply the cost of the cell by the values assigned to it, then add the results to get the fundamental solution, which is (300 * 1) + (25 * 2) + (150 * 5) + (50 * 3) + (250 * 3) + (200 * 2) = 2400.

The Least Cost Cell method and the North-West Corner method were discussed in the prior session. In this session, the Vogel's Approximation method will be discussed.

Destination

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		D1	D2	D3	D4	Supply
Source	**Q1**	3	1	7	4	**300**
	Q2	2	6	5	9	**400**
	Q3	8	3	3	2	**500**
	Demand	**250**	**350**	**400**	**200**	**1200**

The answer is to first identify the lowest value for each row, then the next lowest. The corresponding row difference should then be filled in with the absolute difference between these two lowest values, as seen in the image below. The second-least value, 3, and the two least values in row O1 are separated by an absolute difference of 2. Rows O2 and O3 have identical absolute differences of 3 and 1, respectively.

The lowest value should be found for each column, then the next lowest. The corresponding column difference should then be filled in with the absolute difference between these two lowest values, as shown in the image. Column D1's least value is 2, followed by its second-least value, 3, and their absolute difference is 1. Columns D2, D3, and D3 all have absolute differences of 2, 2, and 2, respectively

		Destination					
		D1	**D2**	**D3**	**D4**	**Supply**	**Row difference**
Source	**Q1**	3	1	7	4	**300**	2
	Q2	2	6	5	9	**400**	3
	Q3	8	3	3	2	**500**	1
	Demand	**250**	**350**	**400**	**200**	**1200**	
	Column Difference	1	2	2	2		

These numbers for the row and column disparity are also known as penalties. Pick the most severe penalty right now. Three strikes, or row O2, is the maximum penalty. Then, by

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choosing the cell in row O2 with the lowest cost, divide the minimal amount between the supply of the corresponding row and the demand of the corresponding column. Since demand is lower than supply, put 250 in the cell to reflect the desire for the column. Delete column D1 next.

Destination

		D1	D2	D3	D4	Supply	Row difference
	Q1	250 ~~3~~	1	7	4	**300**	2
Source	**Q2**	~~2~~	6	5	9	**~~400~~ 150**	**3**
	Q3	~~8~~	3	3	2	**500**	1
	Demand	**~~250~~ 0**	**350**	**400**	**200**	**1200**	
	Column Difference	1	2	2	2		

From the remaining cells, find out the row difference and column difference.

Destination

		D1	D2	D3	D4	Supply	Row difference	
	Q1	~~3~~	1	7	4	**300**	2	3
Source	**Q2**	250 ~~2~~	6	5	9	**~~400~~ 150**	**3**	1
	Q3	~~8~~	3	3	2	**500**	1	1
	Demand	**~~250~~ 0**	**350**	**400**	**200**	**1200**		
	Column Difference	1	2	2	2			
		-	2	2	2			

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Select row O1 to correlate with the maximum penalty of 3, once more. The cheapest cell in row O1 is (O1, D2), with a cost of 1. Distribute from the relevant row and column the least quantity of supply and demand to the cell. Remove the row or column with a value of zero.

Destination

		D1	D2	D3	D4	Supply	Row difference	
Source	Q1	~~3~~	~~1~~ 300	~~7~~	~~4~~	~~300~~ 0	2	3
	Q2	250 ~~2~~	6	5	9	~~400~~ 150	3	1
	Q3	~~8~~	3	3	2	500	1	1
	Demand	~~250~~ 0	~~350~~ 50	400	200	1200		
	Column Difference	1	2	2	2			
		-	2	2	2			

Now find the row difference and column difference from the remaining cells.

Destination

		D1	D2	D3	D4	Supply	Row difference		
Source	Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ 0	2	3	-
	Q2	250 ~~2~~	6	5	9	~~400~~ 150	3	1	1
	Q3	~~8~~	3	3	2	500	1	1	1
	Demand	~~250~~ 0	~~350~~ 50	400	200	1200			

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Column Difference	1	2	2	2			
	-	2	2	2			
	-	3	2	7			

You should now select the maximum penalty, which is 7 and falls under column D4. The cheapest cell in column D4 is (O3, D4), which costs 2. More cell phones are available than are needed (O3, D4).
Remove the column and give the cell $200.

Destination

		D1	**D2**	**D3**	**D4**	**Supply**	**Row difference**		
Source	**Q1**	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ **0**	2	**3**	-
	Q2	250 ~~2~~	6	5	~~9~~	~~400~~ **150**	**3**	1	1
	Q3	~~8~~	3	3	200 ~~2~~	~~500~~ **300**	1	1	1
	Demand	~~250~~ **0**	~~350~~ **50**	**400**	~~200~~ **0**	**1200**			
	Column Difference	1	2	2	2				
		-	2	2	2				
		-	3	2	**7**				

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- Find the row difference and the column difference from the remaining cells.

Destination

		D1	**D2**	**D3**	**D4**	**Supply**	**Row difference**			
Source	**Q1**	~~3~~	~~1~~	~~7~~	~~4~~	~~300~~ **0**	2	**3**	-	-

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		300							
Q2	250 ~~2~~	6	5	200 ~~9~~	~~400~~ 150	3	1	1	1
Q3	~~8~~	3	3	~~2~~	~~500~~ 300	1	1	1	0
Demand	~~250~~ 0	~~350~~ 50	400	~~200~~ 0	1200				
Column Difference	1	2	2	2					
	-	2	2	2					
	-	3	2	7					
	-	3	2						

The maximum punishment at this time is three, which corresponds to column D2. The cell in D2 with the smallest value is (O3, D2). Select the supply and demand that is least balanced, then remove the column.

Destination

	D1	D2	D3	D4	Supply	Row difference			
Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ 0	2	3	-	-
Q2	250 ~~2~~	~~6~~	5	~~9~~	~~400~~ 150	3	1	1	1
Q3	~~8~~	50 ~~3~~	3	200 ~~2~~	~~500~~ ~~300~~ 250	1	1	1	0
Demand	~~250~~ 0	~~350~~ ~~50~~ 0	400	~~200~~ 0	1200				
Column Difference	1	2	2	2					
	-	2	2	2					
	-	3	2	7					

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	-	3	2	-				

- Now there is only one column so select the cell with the least cost and allocate the value.

Destination

	D1	D2	D3	D4	Supply	Row difference			
Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ 0	2	3	-	-
Q2	250 ~~2~~	~~6~~	5	~~9~~	~~400~~ 150	3	1	1	1
Q3	~~8~~	50 ~~3~~	250 ~~3~~	200 ~~2~~	~~500~~ ~~300~~ ~~250~~ 0	1	1	1	0
Demand	~~250~~ 0	~~350~~ ~~50~~ 0	~~400~~ 150	~~200~~ 0	1200				
Column Difference	1	2	2	2					
	-	2	2	2					
	-	3	2	7					
	-	3	2	-					

- Now there is only one cell so allocate the remaining demand or supply to the cell

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Destination

	D1	D2	D3	D4	Supply	Row difference			
Q1	~~3~~	300 ~~1~~	~~7~~	~~4~~	~~300~~ **0**	2	**3**	-	-
Q2	250 ~~2~~	~~6~~	150 ~~5~~	~~9~~	~~400~~ ~~150~~ **0**	**3**	1	1	1
Q3	~~8~~	50 ~~3~~	250 ~~3~~	200 ~~2~~	~~500~~ ~~300~~ ~~250~~ **0**	1	1	1	0
Demand	~~250~~ **0**	~~350~~ ~~50~~ **0**	~~400~~ ~~150~~ **0**	~~200~~ **0**	**1200**				
Column Difference	1	2	2	2					
	-	2	2	2					
	-	3	2	**7**					
	-	**3**	2	-					

There is no equilibrium left. Therefore, multiply each cell's assigned value by its associated cell cost, then sum them all up to get the total cost, which is (300 * 1) + (250 * 2) + (50 * 3) + (250 * 3) + (200 * 2) + (150 * 5) = 2850.

11.4 Transhipment Problem

Transporting goods or containers to one site, then from there to another is known as transshipment, also spelled transshipment. One possible explanation is transloading, sometimes known as switching from one method of transportation to another while travelling (for example, from a ship to a vehicle on the road). Another contributing factor is separating the enormous shipment at the opposite end after bundling small shipments into one giant package (deconsolidation). Transshipment often takes place at transport hubs. Additionally, a

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sizeable portion of international transshipment takes place in designated customs zones to avoid the need for customs checks or duties, which would otherwise pose a considerable obstacle to efficient shipping. When a package travels via intermediary nodes (transshipment nodes) before reaching a specified destination node, transportation concerns called transshipment problems take place. Transshipment problems can develop into more serious transportation problems that can be fixed by a focused programme. Concerns about transshipment can also be addressed using general-purpose linear programming techniques.

In this work, the author presents a method to solve a linear transshipment problem with impaired and increased flow. The literature research shows that there is no systematic technique to find the best solution to the same problem. We consider a modification of the conventional transshipment model in which the origin and destination limitations could be both unequal and unequal. It is shown that the models may be transformed into a similar common transportation problem by adding one extra row and column. Both balanced and imbalanced transshipment situations have challenges that need to be addressed, and we have come up with solutions for both. The methods and transformations are easy to understand and apply. The method of solving the issue may be helpful.

11.4.1 Formulation of the Transhipment Problem

Several fundamental presumptions are required in order to adequately describe the transshipment problem, including:

- The system's indexing is as follows: display style i=1, l dots, m, display style j=1, l dots, n, for the m origins and n destinations, respectively.
- The quantity of the good produced at the origins is identical to the quantity required at the destinations; There is only one uniform good that needs to be conveyed.
- Shipping from one node to another is possible and can start simultaneously at the sources (also to and from a destination). The cost of shipping is independent of the weight of the shipment.

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- The transshipment problem is a unique Linear Programming Problem (LLP) since it assumes that all sources and sinks may accept and distribute shipments concurrently (function in both directions).

11.4.2 Mathematical formulation of Transhipment Problem

Assume you have n destinations and m origins. It may be useful to number the sources and destinations consecutively, with the origins numbered from 1 to m and the destinations numbered from m + 1 to m + n. This is because every origin and destination in a transshipment problem may ship to any other origin and destination.

Let the quantities available at the origins be ai and the demands at the destinations be i=1mai=j=m+1m+nbj.

Let cij represent the per-unit cost of shipping from station I to station j and let xij represent the amounts transferred from station I to station j. Cji and Cij don't have to be identical.

According to our definition, a supply point is one that can deliver goods to another location but cannot take goods from any other points. Demand points are points, like supply points, that can accept goods from other points but cannot send goods to any other places. A transshipment point is a location that has the ability to both accept products from other locations and send them to other locations. As a result, the Transshipment Problem is defined as

Minimize z=∑i=1m+n∑j=1j≠im+ncijxij
subject to
∑j=1j≠im+nxij−∑j=1j≠im+nxji=ai∀i=1,2,……,m∑i=1i≠jm+nxij−∑i=1i≠jm+nxji=bj∀j=m+1, m+2,……,m+nxij≥0∀i,j=1,2,……..,m+n;i≠j

The aforementioned formulation is a linear programming problem, which is somewhat similar to a transportation problem because the coefficients of the xji's are 1. In this circumstance, there are initially m supply points and n demand sites. Nevertheless, all of the

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supply and demand locations are transformed into transshipment sites, yielding m + n transshipment points.

However, the problem can be easily reduced to a standard transportation

$$\text{Let} \quad t_i = \sum_{\substack{j=1 \\ j \neq i}}^{m+n} x_{ji} \quad \forall i = 1, 2, \ldots\ldots, m \ \ and \ \ t_j$$

$$= \sum_{\substack{i=1 \\ i \neq j}}^{m+n} x_{ji} \quad \forall j = m+1, m+2, \ldots\ldots, m+n$$

problem.

$$Let\ t_i \sum_{\substack{j=1 \\ j \neq i}}^{m+n} x_{ji} \quad \forall \mathrm{i} = 1,2 \ldots\ldots\ldots\ldots\ldots\ldots, \mathrm{m\ and\ t}_j$$

$$Let\ t_i \sum_{\substack{j=1 \\ i \neq j}}^{m+n} x_{ji} \quad \forall \mathrm{i} = \mathrm{m}+1, \mathrm{m}+2 \ldots\ldots\ldots\ldots\ldots\ldots, \mathrm{m}+\mathrm{n}.$$

Where t_j is the total quantity shipped as a result of a transshipment from the jth destination and it is the total amount shipped as a result of a transshipment through the ith origin. Consider that T > 0 is a big enough number to guarantee that ti T for all I and tj T for all j. Now that ti + xii = T has been defined, the nonnegative slack variable xii is used to reflect the discrepancy between T and the actual quantity of transshipment through the ith origin. If we assume that tj + xjj = T, then the nonnegative slack variable xjj represents the difference between T and the actual quantity of transshipment through the jth destination.

Thus, the transshipment problem reduces to

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$$\text{Minimize} \quad z = \sum_{i=1}^{m+n} \sum_{\substack{j=1 \\ j \neq i}}^{m+n} c_{ij} x_{ij}$$

$$\text{Minimize } z = \sum_{i=1}^{m+n} \sum_{\substack{j=1 \\ j \neq i}}^{m+n} c_{ij} x_{ij}$$

subject to

$$\sum_{j=1}^{m+n} x_{ij} = T \quad \forall i = 1, 2 \ldots\ldots\ldots\ldots\ldots\ldots m \text{ and } tj$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall i = m+1, m+2, \ldots\ldots\ldots\ldots m+n$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall j = 1, 2, \ldots\ldots\ldots\ldots\ldots\ldots m$$

$$\sum_{i=1}^{m+n} x_{ij} = bj + T \qquad \forall j = m+1, m+2, , \ldots\ldots\ldots\ldots\ldots\ldots m + n$$

$x_{ij} \geq 0$ $\qquad$ $\forall i,j = 1, 2, \ldots\ldots\ldots\ldots\ldots\ldots m + n;\ i \neq j$

$C_{ii} = 0$ $\qquad$ $\forall i = 1, 2, \ldots\ldots\ldots\ldots\ldots\ldots m + n$

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The above mathematical model represents a standard transportation problem with (m + n) origins and (m + n) destinations.

For the aforementioned problem (P2), we will put together the transportation tableau as follows: Each supply point and transshipment point will require a row in the tableau, while each demand point and transshipment point will require a column. Every point of supply will have an amount equal to its initial amount, and every point of demand will have an amount equal to its initial amount of demand.

Let T stand in for the total supply. Then, the supply and demand at each transshipment point will be equal to the point's initial supply plus T and the point's initial demand plus T, respectively. Every transshipment point that is a net supplier, for example, will have a net outflow equal to the point's initial supply, and every transshipment site that is a net demander, for example, will have a net inflow equal to the point's initial demand. Although we do not yet know how much will be transferred through each transshipment point, the total volume will not exceed T. This explains why the supply and demand at each transshipment site are modified by T. We promise that each transshipment's net outflow.

Note 1: An origin's total shipment must include both its production and its transshipment. Similar to this, a destination's total revenue must equal both its demand and any transshipped goods.

Note 2: T can also be thought of as an origin and destination buffer stock. T need to be big enough to handle all transshipments since we believe that any quantity of items can be transshipped at any point. Given that it is obvious that the volume of products transshipped at any given location cannot exceed that which is produced or received, we take

$$\mathrm{T} = \max\left(\sum_{i=1}^{m} a_i, \sum_{j=m+1}^{m+n} b_j\right) = \text{Buffer stock.}$$

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$$T = Max\left(\sum_{i=1}^{m+n} a_{i,} \sum_{j=m+1}^{m+n} b_j)\right) = Buffer\ stock.$$

Note3: The problem's (P2) solution uses the basic variables 2m + 2n-1. In contrast, m + n of these variables that occur in the diagonal cells indicate the leftover buffer stock, and if they are removed, we are left with (m + n-1) basic variables that are of importance to us.

Remark 1: A transportation problem with an optimal solution (P2) leads to a transshipment problem with an optimal solution (P1) that has the same objective function value.

11.4.3 Transhipment Problem with impaired flow

It may occasionally be necessary to maintain reserve stockpiles at the sources, say for emergencies, in order to limit the overall transit flow to a certain level, say P. Next, we have

$$\sum_{i=1}^{m} \sum_{j=m+1}^{m+n} x_{ij} = P \qquad or \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} x_{ij} = P'$$

where P ′ = P + (m + n)T

The transshipment problem with impaired flow is given by

$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{\substack{j=1 \\ j \neq i}}^{m+n} c_{ij} x_{ij}$$

subject to

$$\sum_{j=1}^{m+n} x_{ij} \leq a_i + T \qquad \forall i = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots m \qquad \sum_{j=1}^{m+n} x_{ij} = T$$

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$$\forall i = \mathrm{m}+1, \ldots\ldots\ldots\ldots, \mathrm{m} + \mathrm{n} \sum_{j=1}^{m+n} x_{ij} = T$$

$$\forall j = 1,2, \ldots\ldots, \mathrm{m} \sum_{i=1}^{m+n} x_{ij} \leq b_j + T$$

$$\forall j = \mathrm{m}+1, \ldots\ldots\ldots\ldots, \mathrm{m} + \mathrm{n} \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} x_{ij} = P'$$

$$\left(P' < min \left\{ \sum_{i=1}^{m} a_i + (m+n)T, \sum_{j=m+1}^{m+n} b_j + (m+n)T \right\} \right) x_{ij} \geq 0$$

$$\forall i,j = 1,2, \ldots\ldots\ldots\ldots, \mathrm{m} + \mathrm{n} \, (\mathrm{i} \neq \mathrm{j}) c_{ii} = 0$$

$$\forall i = 1,2, \ldots\ldots\ldots\ldots, \mathrm{m} + \mathrm{n}$$

According to the flow constraint in the problem (P3), a total amount of source reserves (i=1mai+(m+n)T)P′) and destination slacks (j=m+1m+nbj+(m+n)T)P′) must be held at the various sources and destinations, respectively. As a result, an additional destination is created to receive the source reserves and an additional source is added to fill the destination slacks. As a result, the linked transportation issue with limited flow is shown below.

$$Minimize\ z = \sum_{i=1}^{m+n+1} \sum_{\substack{j=1 \\ j \neq i}}^{m+n+1} c'_{ij} y_{ij}$$

Subject to

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$$\sum_{j=1}^{m+n+1} y_{ij} = a'_i \qquad \forall i = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots m + n, \qquad m+n+1$$

$$\sum_{i=1}^{m+n+1} y_{ij} = b'_j \qquad \forall j = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots m + n, \qquad m+n+1$$

$$\sum_{i=1}^{m+n} \sum_{j=1}^{m+n} x_{ij} = P'$$

$$a'_i = \begin{cases} ai+T & \forall i=1,\ldots\ldots\ldots\ldots m \\ T & \forall i=m+1,\ldots\ldots\ldots\ldots m+n \\ \sum_{j=1}^{m+n} b'_j - P & for\ i = m+n+1 \end{cases}$$

$$a'_i = \begin{cases} T & \forall i=1,\ldots\ldots\ldots\ldots m \\ bj+T & \forall j=m+1,\ldots\ldots\ldots\ldots m+n \\ \sum_{i=1}^{m+n} a'_j - P' & for\ j = m+n+1 \end{cases}$$

$$C'_{ij} = C'_{ij} \qquad \forall i,j = 1,2, \ldots \ldots \ldots \ldots m + n$$

$$C'_{i,m+n+1} = C'_{m+n+1j} = 0 \qquad \forall i,j = 1,2, \ldots \ldots \ldots \ldots m + n$$

$$C'_{m+n+1,m+n+1} = M$$

$$y_{ij} \geq 0 \qquad \forall i,j = 1,2, \ldots \ldots \ldots \ldots m + n + 1$$

Note 4: We assign a cost zero to all the cells in the additional row and column except the (m + n + 1, m + n + 1) th cell, where we assign a cost M, where M is a large positive number.

11.4.4 Algorithm to solve transhipment problem with impaired flow

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Step 1: Take into account the linear envelope issue. The envelope issue is balanced if i=1mai=j=m+1m+nbj, in which case take T=i=1mai; otherwise, take T=max(i=1mai, j =m+1m+nbj), and end.

Step 2: The second step is to limit the flow to P′, where P′="" b="" style="margin: 0px; padding: 0px;"> a transit desk like this: Each supply point and transshipment point must have a table row, and each demand point and transshipment point must have a column.

Step 3: Add a fake demand point or sequence with the formula: demand = ((i=1mai+(m+n)T)P′) or supply = ((j=m + 1m+nbj+(m+n) T)-P'). Shipments from a point to itself and to dummy are both regarded as zero. The supply at each transshipment point is equal to the initial supply (ai, I = 1, 2,..., m) + T, which is equal to the original demand (bj, j = m). There is a need. + 1, m + 2,..., m + n) + T. Additionally, each supply point's supply is the same as the original supply T I = m + 1, m + 2,..., m + n, and each demand point's demand is the same as the original demand T (for j = 1, 2,..., m). This ensures that at transshipment sites that are net suppliers, net suppliers have a net outflow equal to the point's original supply and net consumers have a net inflow equal to the point's original the total amount that will be transported at each transshipment site is unknown.

Step 5: Find the best elementary feasible solution of the transformed transport problem (P4).

Step 6: Ignoring diagonal cell assignments, the solution obtained is the optimal basic feasible solution of the envelope problem (P3).

11.4.5 Unbalanced capacitated transhipment problems

If in a given problem, the total availability ∑i=1m+nai∑i=1m+nai is not equal to the total demand ∑j=1m+nbj∑j=1m+nbj, then some of the source and/or destination constraints are satisfied as inequalities. This gives rise to an unbalanced capacitated transshipment problem (UCTsP) whose related balanced capacitated transportation problem is given below.

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$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad (P7)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} = a_i + T \qquad \forall \mathrm{i} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{i} = \mathrm{m}+1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{i} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}$$

$$\sum_{i=1}^{m+n} x_{ij} = bj + T \qquad \forall \mathrm{j} = \mathrm{m}+1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+n$$

$$c_{ii} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}$$

$$x_{ij} \geq 0 \qquad \forall i,j = 1,2, \ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}$$

There are different cases of UCTsP depending on the circumstance. We go over the different UCTsP cases in the section after that.

Case I: Due to high storage costs at some sources, there are occasionally circumstances where it is desirable to maintain supplies at the sources for emergencies and/or an excess supply to destinations. The resulting UCTP is as follow

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$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad (P8)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} \leq a_i + T \qquad \forall \mathrm{i} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{i} = \mathrm{m}+1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{j} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}$$

$$\sum_{i=1}^{m+n} x_{ij} \geq bj + T \qquad \forall \mathrm{j} = \mathrm{m}+1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+n$$

$$c_{ii} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots.. \mathrm{m}+\mathrm{n}$$

$$x_{ij} \geq 0 \qquad \forall i,j = 1,2, \ldots\ldots\ldots.. \mathrm{m}+\mathrm{n}$$

Solving (P8) can be solved by solving the following transportation problem

$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n+1} c'_{ij} x_{ij} \qquad (P9)$$

Subject to

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$$\sum_{j=1}^{m+n+1} x_{ij} = a'_i \qquad \forall \mathrm{i} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+n$$

$$\sum_{i=1}^{m+n} x_{ij} = b'_i \qquad \forall \mathrm{j} = 1,2 \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}, \mathrm{m}+\mathrm{n}+1$$

$$x_{ij} \geq 0 \qquad \forall i = 1,2, \ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}; \mathrm{j} = 1,2, \ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}+1$$

where

$$a'i = \begin{cases} ai + T & \forall \mathrm{i} = 1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m} \\ T & \forall \mathrm{i} = \mathrm{m}+1,, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n} \end{cases}$$

$$b'i = \begin{cases} T & \forall \mathrm{j} = 1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m} \\ bj + T & \forall \mathrm{i} = \mathrm{m}+1,, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n} \\ \sum_{i=1}^{m} a'_i - \sum_{j=m+1}^{m+n} b_j, & j = m+n+1 \end{cases}$$

$$c'_{im+n+1} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots\ldots, \mathrm{m}+\mathrm{n}$$

$$c'_{ij} = c_{ij} \qquad \forall i,j = 1,2, \ldots\ldots\ldots\ldots, \mathrm{m}+\mathrm{n}$$

$$c'_{ii} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots\ldots, \mathrm{m}+\mathrm{n}$$

Which is of the form (P2).

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In a different scenario, sources might need to overproduce and some destinations might still be undersupplied since the entire material supply at sources is less than the total demand at various destinations. As a result, the problem is as follows:

$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad (P10)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} \geq a_i + T \qquad \forall \mathrm{i} = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m}$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{i} = \mathrm{m}+1, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m}+\mathrm{n}$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{j} = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m}$$

$$\sum_{i=1}^{m+n} x_{ij} \leq bj + T \qquad \forall \mathrm{j} = \mathrm{m}+1, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m}+n$$

$$x_{ij} \geq 0 \qquad \forall i, j = 1,2, \ldots \ldots \ldots . . \mathrm{m}+\mathrm{n}$$

The Problem can also be reduced to the form (P2) as follows

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$$Minimize\ z = \sum_{i=1}^{m+n+1} \sum_{j=1}^{m+n} c'_{ij} x_{ij} \qquad (P11)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} = a'_i \qquad \forall\, i = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots m+n+1$$

$$\sum_{j=1}^{m+n+1} x_{ij} = b'_i \qquad \forall\, j = 1,2 \ldots\ldots\ldots\ldots\ldots\ldots m+n$$

$$x_{ij} \geq 0 \qquad \forall i = 1,2, \ldots\ldots\ldots..m+n+1; j = 1,2, \ldots\ldots.m+n$$

where

$$a_i' = \begin{cases} ai + T & \forall i = 1, \ldots\ldots\ldots\ldots\ldots\ldots.m \\ T & \forall i = m+1,, \ldots\ldots\ldots\ldots\ldots\ldots.m+n \\ \sum_{j=m+1}^{m+n} b_j - \sum_{i=1}^{m} a_j, & i = m+n+1 \end{cases}$$

$$b_j = \begin{cases} T & \forall j = 1, \ldots\ldots\ldots\ldots\ldots\ldots.m \\ bj + T & \forall j = m+1,, \ldots\ldots\ldots\ldots\ldots\ldots.m+n \end{cases}$$

$$c'_{m+n+1j} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots..,m+n$$

$$c'_{ij} = c_{ij} \qquad \forall i,j = 1,2, \ldots\ldots\ldots..,m+n$$

$$c'_{ii} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots..,m+n$$

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Which is simply resolved. Additionally, the flow-constrained problem (P9) can be simplified to the form problem (P3).

Case II: The issue appears as follows when the entire supply at the sources is less than the total demand at the destinations and the problem must be solved by generating more than enough at the sources:

$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad (P12)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} \geq a_i + T \qquad \forall\, \mathrm{i} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall\, \mathrm{i} = \mathrm{m}+1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{j} = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}$$

$$\sum_{i=1}^{m+n} x_{ij} = bj + T \qquad \forall \mathrm{j} = \mathrm{m}+1, \ldots\ldots\ldots\ldots\ldots\ldots \mathrm{m}+n$$

$$x_{ij} \geq 0 \qquad \forall\, i,j = 1,2, \ldots\ldots\ldots\ldots \mathrm{m}+\mathrm{n}$$

This issue can be simply reduced to problem (P11) form and resolved.

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Consider, too, the scenario in which the issue takes the following form.

$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad (P13)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} = a_i + T \qquad \forall \mathrm{i} = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m}$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall\, \mathrm{i} = \mathrm{m} + 1, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m} + \mathrm{n}$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall \mathrm{j} = 1,2, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m}$$

$$\sum_{i=1}^{m+n} x_{ij} \geq bj + T \qquad \forall \mathrm{j} = \mathrm{m} + 1, \ldots \ldots \ldots \ldots \ldots \ldots \mathrm{m} + n$$

$$x_{ij} \geq 0 \qquad \forall i, j = 1,2, \ldots \ldots \ldots . . \mathrm{m} + \mathrm{n}$$

1. Here, total availability is greater than total requirement, no storage is allowed at sources and over supply to destinations is allowed, can be solved by reducing it to the form (P9).
2. Case III:
   Certain situations, where storage is allowed at sources and demands are to be exactly met at destinations give rise to UCTP of the form:

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$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad \text{(P14)}$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} \leq a_i + T \qquad \forall i = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots m$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall i = m+1, \ldots\ldots\ldots\ldots\ldots\ldots m+n$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall j = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots m$$

$$\sum_{i=1}^{m+n} x_{ij} = bj + T \qquad \forall j = m+1, \ldots\ldots\ldots\ldots\ldots\ldots m+n$$

$$x_{ij} \geq 0 \qquad \forall i,j = 1,2, \ldots\ldots\ldots\ldots m+n$$

$$c_{ii} = 0 \qquad \forall i = 1,2, \ldots\ldots\ldots\ldots, m+n$$

3. The only new column that is required to solve this problem (P14) is one whose variables represent the sources' stored amounts. Here, the issue is reduced to the form (P9), making it simple to resolve.
4. The issue is that short supplies are permitted at destinations, precise amounts must be delivered, and there are restrictions of the following kind:

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$$Minimize\ z = \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} c_{ij} x_{ij} \qquad (P15)$$

Subject to

$$\sum_{j=1}^{m+n} x_{ij} = a_i + T \qquad \forall\, i = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots m$$

$$\sum_{j=1}^{m+n} x_{ij} = T \qquad \forall\, i = m+1, \ldots\ldots\ldots\ldots\ldots\ldots m+n$$

$$\sum_{i=1}^{m+n} x_{ij} = T \qquad \forall j = 1,2, \ldots\ldots\ldots\ldots\ldots\ldots m$$

$$\sum_{i=1}^{m+n} x_{ij} \leq bj + T \qquad \forall j = m+1, \ldots\ldots\ldots\ldots\ldots\ldots m+n$$

$$x_{ij} \geq 0 \qquad \forall\, i = 1,2, \ldots\ldots\ldots\ldots m+n$$

$$c_{ii} = 0 \qquad \forall\, i = 1,2, \ldots\ldots\ldots\ldots, m+n$$

can also be resolved in a similar manner by turning it into a problem (P11).

Unbalanced capacitated transshipment issue algorithm

Transform the unbalanced transshipment problems of forms P8, P10, P12, P13, P14, and P15 into the corresponding transportation problems as shown in Step 1. P9, P9, P9, P11, P11, and P11.

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Step 2: Problem P9 and P11 have the same fundamental structure as Problem P2, which has an optimal basic feasible solution that can be found. This is covered in Section 2.

11.4.6 Numerical Examples

Illustration 1. A transshipment issue with a flow issue

Think about the following Two origins and two destinations are involved in the unbalanced transshipment problem (P16). Table 1 below lists the availability at the sources, the requirements at the destinations, and the cost of transportation.

Table1 (Cost matrix of unbalanced transhipment problem (P16))

I j➡	O_1	O_2	D_1	D_2	a_j
O_1	0	1	5	4	3
O_2	1	0	2	6	4
D_1	5	2	0	2	..
D_2	4	6	2	0	..
b_j	-	-	6	3	

Since ∑j=34bj>∑i=12ai∑j=34bj>∑i=12ai we take buffer stock, T = max (∑i=12ai, ∑j=34bj) = 9T = max (∑i=12ai,∑j=34bj) = 9 and convert the problem into a balanced transshipment problem by adding 9 units to each ai and bj; i, j = 1,2,3,4. The transformed transportation problem is given in Table 2.

Table 2 (Transformed transportation problem)

I j➡	0_1	O_2	D_1	D_2	a_i

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0_1	0	1	5	4	12
O_2	1	0	2	6	13
D_1	5	2	0	2	9
D_2	4	6	2	0	9
dO_3	0	0	0	0	2
b_j	9	9	15	12	

Let P ′ be the total flow, restricted to 40.

Here you add a dummy row dO3 and a dummy column dO3 with each cell having a cost 0 except c55 having cost M. And we take demand=∑i=14ai−P′=43−40=3demand=∑i=14ai−P′=43−40=3 and supply=∑j=14bj−P′= 45−40=5supply=∑j=14bj−P′=45−40=5.

Next you have to find out the initial basic feasible solution by any of the regular method and check its optimality. The optimal solution is given in the Table 3 below.

Table 3 Optimal solution of transformed transportation problem with impaired flow

i j➡	O_1	O_2	D_1	D_2	dO_3	a_i
O_1	0(9)	1	5	4	0(3)	12
O_2	1	0(9)	2(4)	6	0	13
D_1	5	2	0(9)	2	0	9
D_2	4	6	2	O(9)	0	9

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dO_3	0	0	0(2)	0(3)	M	5
b_j	9	9	15	12	3	

To achieve the best fundamental viable solution for the transshipment problem with hindered flow by disregarding the allocations in the diagonal cells. The ideal schedule is O1 ——dO3, 3 units; O2——D1, 4 units; O3——D1, 2 units; and dO3——D2, 3 units, with a minimum Z value of 8. Alternatively, you can state that x15 = 3, x23 = 4, x53 = 2, and x54 = 3.

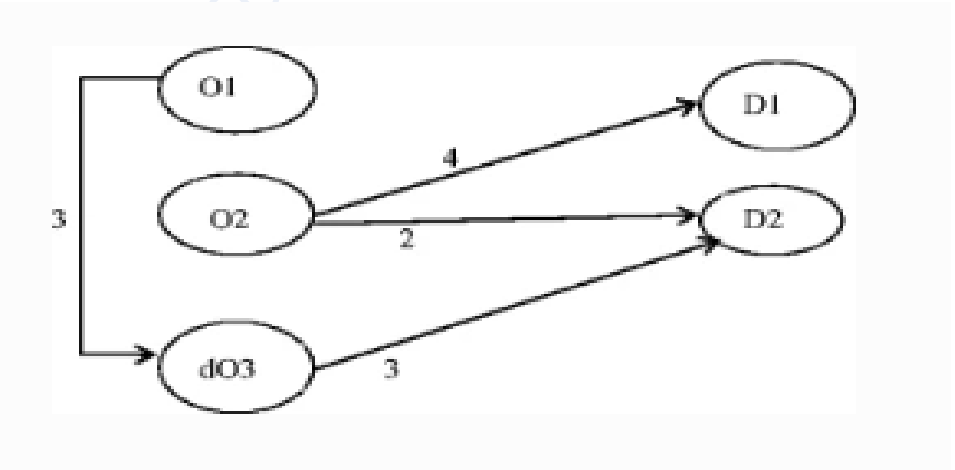
The flow chart describes the ideal schedule for the transshipment problem with impaired flow (Fig. 1)

Since the allocations in the diagonal cells in Fig. 1 have no physical significance, i.e., no transportation, they are disregarded. The following is a summary of the remaining allocations.

a) O1 moves three units to the dummy point source/destination, increasing dO3's supply capacity to five units, including the two units that were initially available.

(b) Of the five units that dO3 can supply, dO3 transports two to D1 and three to D2.

In case (c), O2 moves 4 units to D1.



As a result, the initial need for 6 units of D1 and 3 units of D2 is met.

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11.5 Assignment Problem

You now understand the fundamental ideas related to linear programming problems and how to solve them. Above, we talked about the transportation and transhipment problems. You will now study the assignment's problem and debate alternative solutions.

Giving various resources (items) to various actions (receivers) one-to-one is the goal of the assignment issue; that is, assigning the same number of operations to an equal number of operators, with each operator performing only one operation. Think about an account officer who has four employees and four tasks. It depends on the subordinates' effectiveness whether they finish each task more swiftly or more slowly. If you need to give one task to one person while keeping the total number of person hours to a minimum, you have an assignment problem. Despite being a specific instance of the transportation problem, the approaches taught in Unit 4 do not address the assignment problem. We use a different approach, the Hungarian approach, to resolve an assignment problem.

As It is quicker and easier than other approaches to finding the optimum solution to a transportation problem. The travelling salesman problem is just one of the assignment problem kinds that are covered in this section along with methods for their Hungarian approach resolution.

In the unit that follows, a single server M/M/1 queueing model with Poisson input and exponential service time will be explained along with the basic structure and operation of a queueing system.

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Fig;1.4 Solving Transhipment and Assignment

https://www.imsl.com/blog/solving-transshipment-assignment-problems

11.5.1 Objectives of an Assignment Problem

You should be able to do the following after finishing this unit:

- formulate an assignment problem; use the Hungarian method to find the best solutions to assignment problems;
- find solutions for unique cases of assignment problems, such as the maximization problem, unbalanced assignment problem, alternative optimal solutions,
- Assignment restrictions; address the issue of the travelling salesman as an assignment issue.

If the number of sources and destinations is equal, a transportation issue can be seen as an assignment issue. Each source's capacity and each destination's needs are multiplied by one. For an assignment problem, the supplied matrix must be a square matrix; however, not for a transportation problem.

Consider a situation where there are n people and n jobs, and a specific role needs to be assigned to each person. This assignment problem can be represented using the

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cost matrix, also referred to as a matrix of real numbers, as shown in the accompanying table.:

Person	**Job**
1 **2** **.** **.** **I** **.** **.** **n**	**1** **2 …** **j…** **n** C_{11} C_{12} **….** C_{1j}**….** C_{1n} C_{21} C_{22}**…** C_{2i} **…** C_{2n} **.** **.** C_{il} C_{i2}**…** C_{ii}**…** C_{in} . . $C_{n1}C_{n2}$**…**C_{nj}**…** C_{nm}

Where cij is the time, it took for the ith individual to do the jth job. Let xij stand for the ith person's jth job assignment. Thus, the assignment problem can be expressed mathematically as follows:

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$$\text{Minimise } Z = \sum_{i=1}\sum_{j=1} c_{ij}x_{ij}, \quad \text{where } i = 1, 2, \ldots, n \text{ and } j = 1, 2, \ldots, n.$$

subject to

1 if the ith person isassigned the jth job

0 if the ith person is not assigned the j job

$x_{i1} + x_{i2} + \ldots + x_{in} = 1, \quad i = 1, 2, \ldots, n$ (one job is done by the ith person)

$x_{1j} + x_{2j} + \ldots + x_{nj} = 1, \; j = 1, 2, \ldots n$ (only one person is assigned the jth job)

The constant cij served as the representation of time in the prior issue. Cost or another parameter could be the one that needs to be minimized in the assignment problem under discussion.

Transportation issues in general can be resolved using the same approach as an assignment problem. The Hungarian approach, an alternative strategy, is how we resolve it. This approach is more expedient and straightforward than other approaches to figuring out the best solution to a transportation problem. Let's talk about the Hungarian method for finding the correct response to a homework question.

11.5.2 Hungarian Method of Solving an Assignment Problem

The following steps can be used to solve an assignment problem in the best possible way:

1. Verify the squareness of the supplied matrix. If not, add an appropriate number of dummy rows (or columns) with 0 cost/time components to make it square.
2. In each row of the cost matrix, find the smallest cost component. Take out the smallest element from each row's other elements.
3. Find the smallest element in each column of the resulting cost matrix, and then subtract it from each element in that column.

Find the best assignment in the resulting matrix by using the following criteria:

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a) Examine the rows one by one until you find a row that contains exactly one zero. In the corresponding column, circle this zero (written as 0) and cross out all other zeros. Continue in this manner until every row has been looked at. Do not touch any row that contains more than one zero; move on to the next row instead.

b) Repetition of step I above for the cost matrix's columns.

c) If a reduced matrix row or column has more than one zero, arbitrarily select the row or column with the fewest zeroes. Choose at random any zero in the given row or column. All the zeros in the relevant row and column should be crossed out before drawing a rectangle around it. Continue performing steps I (ii), and (iii) until every zero has been assigned (by tracing a rectangle around it) or crossed.

d) The best assignment is done in the cells that correspond to 0 if each row and each column of the resulting matrix has one and only one assigned 0. You can now quit because the best possible solution to the issue has been found. If not, move on to the next action.

5. Execute the following by drawing the least amount of horizontal and/or vertical lines through all the zeros:

a) Check the boxes next to the rows where assignments haven't been created.

b) Mark with an asterisk (*) any columns that have zeros in the designated rows.

c) Check the boxes next to any rows that contain assignments in marked columns but have not yet been marked.

d) Then, if any, check the boxes next to any columns that include zeros in the newly designated rows. Mark with a checkmark ( ) any rows that have assignments in the newly indicated columns.

e) Make straight lines through each designated column and each unmarked row.

6. Change the cost matrix to read:

a) Determine the tiniest element that is not enclosed by any of the lines.

b) Add it to the elements at the intersection of the two lines after deducting it from all the uncovered elements.

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c) All other components bounded by the lines are unaltered.

7. Continue the process till the best result is obtained.

11.5.3 Assignment Problem

Illustration 1: A computer Centre needs to create four application programs and has four professional programmers available. The director of the computer Centre provides the following estimate for the amount of computer time (in minutes) needed by the relevant experts to create the application programs:

		Programmes			
		A	**B**	**C**	**D**
Programmes	1	120	100	80	90
	2	80	90	110	70
	3	110	140	120	100
	4	90	90	80	90

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Find the assignment structure that reduces the amount of time needed to create the application programmes.

Solution: Subtract the minimum element of each row from the sum of its other elements.

Notably, the first row must have at least 80 entries. The elements of the first row must therefore have 80 subtracted from each of them, from 120, 100, 80, and 90, respectively. The resulting matrix would thus have the following elements in its first row: 40, 20, 0, and 10, respectively. In a manner similar to this, the elements of the additional rows of the resulting matrix are also obtained. The matrix that results is as follows:

	A	**B**	**C**	**D**
	40	**20**	**0**	**10**

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1	**10**	**20**	**40**	**0**
2	**10**	**40**	**20**	**0**
3	**10**	**10**	**0**	**10**
4				

Now, let's split each component of the resulting matrix by the smallest member in that column. The first column must have at least 10 entries. Therefore, each of the 40, 10, 10, and 10 components in the first column must have 10 subtracted from it. The resulting matrix has the following elements in its first column: 30, 0, 0, and 0. In a manner similar to this, the elements of the other columns of the resulting matrix are also obtained. The matrix that results is as follows:

	A	**B**	**C**	**D**
1	**30**	**10**	**0**	**10**
2	**0**	**10**	**40**	**0**
3	**0**	**30**	**20**	**0**
	0	**0**	**0**	**10**

Starting with the first row, we now cross all other zeros in the corresponding column and draw a rectangle around the 0 in each row with a single zero. Here, there is only one zero in the first row. Therefore, we cross all other zeros in the appropriate column and draw a rectangle around it.

We get

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	A	B	C	D
1	30	10	$\boxed{0}$	10
2	0	10	40	0
3	0	30	20	0
4	0	0	$\cancel{0}$	10

There is not a single zero in the second, third, or fourth row. We therefore proceed column-wise. One zero appears in the second column. As a result, we outline it with a rectangle and cross every other zero in the same row. We get

	A	B	C	D
1	30	10	$\boxed{0}$	10
2	$\boxed{0}$	10	40	$\cancel{0}$
3	$\cancel{0}$	30	20	$\boxed{0}$
4	$\cancel{0}$	$\boxed{0}$	$\cancel{0}$	10

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The aforementioned matrix doesn't have a single zero in any row or column. Therefore, we initially advance row-wise in order to discover the row having more than one zero. The second row contains two zeros.

So, we arbitrarily draw a rectangle around one of these zeros and cross one of them. In cell (2, A), let's cross the zero and draw a rectangle around it (2, D). The first column's extra zeros are crossed out. Remember that we could have just as easily selected the zero in cell (2, D),

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drawn a rectangle around it, and crossed all the other zeros. A different result would have resulted from this.

The aforementioned matrix doesn't have a single zero in any row or column.

As a result, we initially, in every row and column where a rectangle has been drawn, all that is left is one zero. This indicates that we have only given one operator control over one operation. As a result, the following is the best solution:

	A	B	C	D
1	30	10	$\boxed{0}$	10
2	0	10	40	0
3	0	30	20	0
4	~~0~~	$\boxed{0}$	~~0~~	10

Keep in mind that task assignments should be based on the cells that correspond to the zeroes around which rectangles have been drawn. Consequently, the optimum response to the issue is:

B ➡ D 4 ➡ A, 3 ➡ C, 2 ➡ 1

Programmer 1 receives program C in this manner, whereas Programmer 2 receives programmer A, etc. The minimum development time for the programs is 350 minutes, or 80 + 80 + 100 + 90. You should pause here and try to solve the following assignment problem to check your understanding.

11.6 Glossary

Term	Full Form/Formulae/Meaning

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Destination	It is the location to which shipments are transported
Unit Transportation cost	It is the cost of transporting one unit of the consignment from an origin to a destination
Feasible Solution	A solution that satisfies the row and column sum restrictions and also the non-negativity restrictions is a feasible solution
Optimal Solution	A feasible solution is said to be optimal solution when the total transportation cost will be the minimum cost.
Transshipment point	What is a transhipments point? A location where material is transferred between vehicles. Dictionary of Military and Associated Terms
Transshipment discharged	Transfer of a shipment from one carrier, or more commonly, from one vessel to another whereas in transit
Hungarian method	The method used for solving an assignment problem is called Hungarian method
Simplex method	Simplex method is an approach to solving linear programming models by hand using slack variables, tableaus, and pivot variables
Slack and surplus variable	Slack and Surplus variables represent the distinction between left and right side of a constraint
Standard form of LPP	The standard form of linear programming is. max $z = \sum c_i x_i$. Subject to. $x_i > 0$.
FOB	Free on Board

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PRACTICE QUESTIONS

11.7 SELF ASSESSMENT QUESTIONS

(III) MCQ Questions:

1. In a transportation problem where the demand or requirement is equal to the available resource is known as
   a) Balanced transportation problem
   b) Regular transportation problem
   c) Resource allocation transportation problem
   d) Simple transportation model

2. In the Hungarian method of solving an assignment problem, the row reduction is obtained by
   a) Dividing each row by the elements of the row above it
   b) Subtracting the elements of the row from the elements of the row above it
   c) Subtracting the smallest element from all other elements of the row
   d) Subtracting all the elements of the row from the highest element in the matrix.

3. The Assignment Problem is solved by
   a) Complex method
   b) Graphical method
   c) Vector method
   d) Hungarian method

4. The assignment matrix is always a
   a) Rectangular matrix
   b) Square matrix
   c) Identity matrix
   d) None of the above

5. The similarity between Assignment Problem and Transportation Problem is
   e) Both are rectangular matrices
   f) Both are square matrices
   g) Both can be solved by graphical method
   h) Both have objective function and non-negativity constraints.

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6. An alternative optimal solution to a minimization transportation problem exists whenever opportunity cost corresponding to unused route of transportation is:
   a) Positive and greater than zero
   b) Positive with at least one equal to zero
   c) Negative with at least one equal to zero
   d) None of the above

7. One disadvantage of using the North-West Corner Rule to find initial the solution to the transportation problem is that
   a) It is complicated to use
   b) It does not take into account the cost of transportation
   c) It leads to a degenerate initial solution
   d) All of the above

8. When total supply is equal to total demand in a transportation problem, the problem is said to be
   a) Balanced
   b) Unbalanced
   c) Degenerate
   d) None of these

9. Which of the following methods is used to verify the optimality of the current solution of the transportation problem
   a) Least cost method
   b) Vogel's approximation method
   c) Modified distribution method
   d) all of these

10. In the optimal solution, more than one empty cell has their opportunity cost as zero, it indicates
    a) The solution is not optimal
    b) The problem has alternate solution
    c) Something wrong in the solution
    d) The problem will cycle

11. An assignment problem is considered as a particular case of
    a) Transportation problem
    b) Sequencing problem

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c) Queuing problem
d) Game theory

12. Dummy row or column is added in an assignment problem
    a) To balance total activities and total resources
    b) To prevent a solution from becoming degenerate
    c) To prevent a solution from becoming degenerate
    d) To increase the profit function

13. While solving an assignment problem, an activity is assigned to a resource with zero opportunity cost because objective is to _____
    a) minimize total cost of assignment
    b) reduce total cost of assignment to zero
    c) reduce cost of that assignment to zero
    d) maximize total cost of assignment

14. Maximization assignment problem is transformed into a minimization problem by____.
    a) adding each entry in a column from the maximum value in that column
    b) subtracting each entry in a column from the maximum value in that column
    c) subtracting each entry in the table from the maximum value in that table
    d) adding each entry in the table from the maximum value in that table

15. The transshipment issue is a
    a) unique Linear Programming Problem (LLP)
    b) assumption of all sources
    c) function in both directions
    d) Transportation

Answer of MCQ questions

1. Balanced transportation problem
2. Subtracting the smallest element from all other elements of the row
3. Hungarian method
4. Square matrix
5. Both have objective function and non-negativity constraints
6. Positive with at least one equal to zero
7. It does not take into account the cost of transportation
8. Balanced

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9. Modified distribution method
10. The problem has alternate solution
11. Transportation problem
12. To prevent a solution from becoming degenerate
13. Minimize total cost of assignment
14. Subtracting each entry in the table from the maximum value in that table
15. Unique Linear Programming Problem (LLP)

(IV) Short Answer Questions:

1. What is the transportation problem, and how can it be resolved?
2. Describe the transportation model.
3. What is the most effective way to tackle TP?
4. What method of transportation is used?
5. Why is transshipment crucial in shipping?
6. What distinguishes transshipment from transit?
7. Which method of transport minimizes transshipment and delay?
8. Describe the assignment problem with two examples.
9. What are the unique traits of an assignment problem?
10. How do you resolve a condition of assignment problem that is unbalanced?

(II)Long Answer Questions:

1. Compare and contrast the stepping stone method with the MODI method for resolving a transportation issue.
2. **A** factory has four stores, S1, S2, S3, and S4, which are supplied by three warehouses, W1, W2, and W3. The warehouses have monthly capacities of W1 = 100 units, W2 = 40 units, and W3 = 60 units. S1 = 30 units, S2 = 50 units, S3 = 65 units, and S4 = 55 units are the monthly requests at the stores.

The following table lists the transportation costs from warehouses to stores in Indian rupees:

Stores				
Warehouses	**S1**	**S2**	**S3**	**S4**
W1	14	16	12	20
W2	12	14	10	08
W3	10	16	08	15

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The problem here is to determine the optimum distribution for the factory to minimize shipping costs.

3. What distinguishes transshipment problems from transportation problems?
4. How do you solve an assignment problem with a zero? Describe using an example
5. How do you resolve the issue if the assignment's objective is to maximize profits? If the goal of the assignment is to maximize profits, how do you solve the problem?
6. What distinguishes the transshipment node from the origin node in the shortest route problem?
7. There are five people available to do four tasks. Table 65 provides the duration of each worker's time on each job. The objective is to distribute labor so that the four projects can be completed in the shortest amount of time possible. Apply the Hungarian approach to the issue.
8. What distinguishes a transportation issue from an assignment issue?

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LESSON-12

INTEGER PROGRAMMING PROBLEM

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STRUCTURE

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12.1 LEARNING OBJECTIVES

After studying this chapter, students should understand the limitations of the simplex method in deriving integer solutions to linear programming problems. Applying cutting plane and branch and bound methods to obtain optimal integer solutions of the variables in a linear programming problem.

12.2 INTRODUCTION

Integer Programming Problem (IPP) is a special class of linear programming problems where some or all variables are constrained to assume non-negative integer values. Such problems are called all integer or mixed integer problems. In business and industry, it occurs frequently where quite often discrete nature of variables is involved in many decision variables. One might think it sufficient to obtain an integer solution to this special class of linear programming problem by using the usual simplex method ad then rounding off the fractional values thus occurring in the optimal solution. However in some cases, the deviation from the exact optimal integer values may become large enough to given an infeasible solution. Hence, there was a need to develop a systematic procedure in order to identify the optimal integer solution to such types of problems.

12.3 MATHEMATICAL MODEL OF INTEGER PROGRAMMING PROBLEM PROPROBLEM

The linear programming problem with the additional requirements that the variables can take only, integer values may have the following mathematical form:

Max./Min. Z= $c_1x_1 + c_2x_2 + \cdots \ldots + c_nx_n$

Subject to the constraints:

$a_{i1}x_1 + a_{i2}x_2 + \cdots \ldots + a_{in}x_n = b_i, \qquad i = 1,2, \ldots., m$

and $x_j \geq 0, \qquad j = 1,2, \ldots., n$

where, x_j are integer valued for $\qquad j = 1,2, \ldots., p\ (p \leq n)$

12.3.1 PURE INTEGER PROGRAMMING PROBLEM

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An integer programming problem in which all variables are required to be integers is called a pure or all integer programming problem. For example, the linear programming problem:
Max/$Min.\quad z = 9x_1 + 10x_2$
Subject to the constraints
$4x_1 + 3x_2 \geq 4$
$x_1 \leq 8$
$x_2 \leq 8$
Where, $x_1, x_2 \geq 0 \; and \; x_1, x_2 \; are \; integers$ is a pure integer linear programming problem.

12.3.2 MIXED INTEGER PROGRAMMING PROBLEM

On the other hand, an integer linear programming problem in which only some of the variables are required to be integers is known as a mixed integer programming problem. For example, the linear programming problem:

$Max/Min.\quad z = -3x_1 + x_2 + 3x_3$

Subject to the constraints

$-x_1 + 2x_2 + x_3 \leq 4$

$4x_2 - 3x_3 \leq 8$

Where, $x_1, x_2 and \; x_3 \geq 0 \; and \; x_1 \; and \; x_3 \; are \; integers$
is a mixed integer linear programming problem. Here x_2 is not required to be an integer.

12.3.3 ZERO-ONE INTEGER PROGRAMMING PROBLEM

An integer programming problem in which all the variables must have integer values only zero or unity, is called the zero-one integer programming problem. For example, the linear programming problem:

$Max/Min.\quad z = 3x_1 + 4x_2$

Subject to the constraints

$7x_1 + 16x_2 \leq 52$

$3x_1 - 2x_2 \leq 18$

where $x_1, x_2 and \; x_3 \geq 0 \; and \; x_1, x_2 \; \in 0,1$

12.4 TECHNIQUES FOR SOLVING INTEGER PROGRAMMING PROBLEM

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There are many algorithms for solving the integer programming problem. Here, we shall discuss the following two methods:
12.4.1 Gomory's Cutting Plane Method
12.4.2 Branch and Bound Technique

12.4 .1.1 CONSTRUCTION OF GOMORY'S CONSTRAINTS

To illustrate construction of a Gomory's constraint, let us consider a linear programming problem in which an optimum non-integer basic feasible solution has been attained as

y_B	x_B	y_1	y_2	y_3	y_4
y_2	y_{10}	y_{11}	y_{12}	y_{13}	y_{14}
y_3	y_{20}	y_{21}	y_{22}	y_{23}	y_{24}
Z	y_{00}	y_{01}	y_{02}	y_{03}	y_{04}

displayed in the simplex table below:

Clearly, the optimum basic feasible solution is given by
$x_B = [x_2, x_3] = [y_{10}, y_{20}]; \max z = y_{00}$

Since x_B is a non-integer solution, we assume, for the sake of exposition only, that y_{10} is fractional.
Now, the constraint equation
$y_{10} = y_{11}x_1 + y_{12}x_2 + y_{13}x_3 + y_{14}x_4$
Reduces to
$y_{10} = y_{11}x_1 + x_2 + y_{14}x_4$ ……..(1)

Because x_2 *and* x_3 are basic variables, we must have B=$I_2 = (y_2, y_3)$ This implies that $y_{12} = 1$ and $y_{13} = 0$.

Now, since $y_{10} \geq 0$ the fractional part of y_{10} must also be non-negative. We split over each of the y_{ij} in (1) into an integral part of I_{ij} , and a non-negative fractional part , f_{ij} for j-=0,1,2,3,4. After this decomposition ,(1) may be written as

$I_{10} + f_{10} = (I_{11} + f_{11})x_1 + x_2 + (I_{14} + f_{14})x_4$

Or $-f_{11}x_1 + f_{10} = (I_{11})x_1 + x_2 + (I_{14} + f_{14})x_4 - I_{10}$ ……..(2)

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A comparison between (1) and (2) suggests that if we add an additional constraint in such a way that the L.H.S of (2) is an integer, then we shall be forcing the non- integer y_{10} towards an integer.
The desired Gomory's constraint is $-(f_{14})x_4 - f_{11}x_1 + f_{10} \leq 0$

12.4.1.2 FRACTIONAL CUT METHOD-ALL INTEGER LPP

An iterative procedure for the solution of an all-integer linear programming problem by Gomory's fractional cut method (or cutting plane method) may be summarized in the following steps:
Step 1: Express the give linear programming problem into its standard form and determine an optimum feasible solution by using simplex method ignoring the integer value restriction.
Step 2: Test the integrity of all the optimum solution.

a) If the optimum solution admits all-integer values, an optimum basic feasible solution is attained.
b) If the optimum solution does not include all- integer values, then move on to next step.

Step 3: Choose the largest fractional value of the basic variables. Let it be f_{10}.
Step 4: Express each of the negative fractions, if any, in the kth row of the optimum simplex table as the sum of a negative integer and a non- negative fraction.
Step 5: Generate the Gomorian constraint (fractional cut) in the form
$G_1 = -f_{k0} + f_{k1}x_1 + f_{k2}x_2 + \cdots \ldots \ldots \ldots + f_{kn}x_n$
Where $0 \leq f_{kj} < 1 \; and \; 0 < f_{k0} < 1$
Step 6: Add the Gomorian constraint generated in step 5 at the bottom of the optimum simplex table. Use dual simplex method to find an improved optimum solution.
Step 7: Go to step 2 and repeat the procedure until as optimum basic feasible all-integer solution is obtained.
Example-1: Find the optimum integer solution to the following linear programming problem:

$Max. \quad z = x_1 + x_2$

Subject to the constraints

$3x_1 + 2x_2 \leq 5$

$x_2 \leq 2$

where $x_1, x_2 \geq 0 \; and \; x_1, x_2 \; are \; integers$
Solution: Convert all constraints into equations by using slack variables$s_1 \geq 0, s_2 \geq 0$, we get
$Max. Z = 3x_1 + 5x_2 + 0s_1 + 0s_2$

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Subject to the constraints

$3x_1 + 2x_2 + s_1 = 5$

$x_2 + s_2 = 2$

$x_1, x_2, s_1, s_2 \geq 0$

Table-12.1: Initial Simplex Table

B	C_B	C_j	1	1	0	0	$X_B/x_1 \quad x_1 > 0$
		X_B	x_1	x_2	s_1	s_2	
s_1	0	5	$\boxed{3}$	2	1	0	5/3→
s_2	0	2	0	1	0	1	------
Z = 0		Δ_j	-1↑	-1	0	0	$X_B/x_1 \quad x_1 > 0$
x_1	1	5/3	1	2/3	1/3	-2/3	5/2
s_2	0	2	0	$\boxed{1}$	0	1	2→
Z = 0		Δ_j	0	-1/3↑	1/3	1/3	
x_1	1	1/3	1	0	1/3	-2/3	
x_2	1	2	0	1	0	1	
Z = 7/3			0	0	1/3	1/3	

Since all $\Delta_j \geq 0$, so the optimal solution is $x_1 = 1/3, x_2 = 2$ and Max. Z=7/3

To obtain an optimum integer solution, we have to add Gomorian Constraints:

$x_1 = \frac{1}{3}, \quad x_2 = 2$

Max. Fractional $\left(\frac{1}{3}, 0\right) = \frac{1}{3}$

Since, $\frac{1}{3}$ corresponding to the first row i.e. x_1 is the source row.

Now, expressing the negative fraction $\frac{-2}{3}$ in the source row as a sum of negative integer and positive fraction.

$\frac{-2}{3} = -1 + \frac{1}{3}$

Since, x_1 is the source row, we have

$\frac{1}{3} = x_1 + 0x_2 + \frac{1}{3}s_1 + \left(-1 + \frac{1}{3}\right)s_2$

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$\frac{1}{3} = x_1 + 0x_2 + \frac{1}{3}s_1 - s_2 + \frac{1}{3}s_2$

$\frac{s_1}{3} + \frac{s_2}{3} \geq \frac{1}{3}$

The fractional cut constraint is given by

$\frac{s_1}{3} + \frac{s_2}{3} \geq \frac{1}{3} \Rightarrow -\frac{s_1}{3} - \frac{s_2}{3} + G_1 = -\frac{1}{3}$

Where, G_1 is the Gomory Slack. Adding Gomory Constraint at the bottom of optimum simplex table 12.1.

Table-12.2

B	C_B	C_j	1	1	0	0	0
		X_B	x_1	x_2	s_1	s_2	G_1
x_1	1	1/3	1	0	1/3	-2/3	0
x_2	1	2	0	1	0	1	0
G_1	0	-1/3	0	0	$\boxed{-1/3}$	-1/3	1
Z =	7/3	Δ_j	0	0	1/3↑	1/3	0

Apply Dual Simplex Method:

Outgoing Vector

$$x_{Bk} = \underset{i}{Min}\{x_{Bi};\ x_{Bi} < 0\} = Min\{-1/3\} = -1/3(x_{B1})$$

Incoming Vector

$$x_{Br} = \underset{j}{Max}\left\{\frac{\Delta_j}{x_{Bj}}; x_{Bj<0}\right\} = Max\{\frac{1/3}{-1/3}, \frac{1/3}{-1/3}\} = -Max\{-1, -1\}$$

There is a tie, so we can select anyone of them incoming vector. So, we choose $s_1$be incoming vector. And, applying usual simplex method.

Table-12.3

B	C_B	C_j	1	1	0	0	0
		X_B	x_1	x_2	s_1	s_2	G_1
x_1	1	0	1	0	0	-1	1
x_2	1	2	0	1	0	1	0
s_1	0	1	0	0	1	1	-3

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Z = 2	Δ_j	0	0	0	0	0

Since all $\Delta_j \geq 0$ and all $X_B \geq 0$ and all restricted variables x_1, x_2 are integers. Hence, an optimum integer solution is $x_1 = 0, x_2 = 2$ and Max. Z=2

Example-2: The owner of a ready-made garments stores two types of shirts known as Zee-Shirts and Button-down shirts. He makes a profit of Rs. 1 and Rs. 4 per shirt on Zee-shirts and Button-shirts respectively. He has two Tailors A and B at his disposal to stitch the shirts. Tailor A and Tailor B can devote at the most 7 hours and 15 hours per-day respectively. Both these shirts are to be stitched by both tailors. Tailor A and Tailor B spend two hours and five hours respectively in stitching Zee-shirt, and four hours and three hours respectively in stitching a Button-down shirt. How many shirts of both the types should be stitched in order to maximize daily profit?

(a) Set-up and solve the linear programming problem.
(b) If the optimal solution is not integer-valued, use Gomory's technique to derive the optimal integer solution.

Solution: (a) Let x_1=Zee-shirts and x_2 =Button-down shirts

Then the linear programming problem becomes

$Max. \quad z = x_1 + 4x_2$

Subject to the constraints

$2x_1 + 4x_2 \leq 7$

$5x_1 + 3x_2 \leq 15$

where $x_1, x_2 \geq 0$ *and* x_1, x_2 *are integers*

(b)Convert all constraints into equations by using slack variables $s_1 \geq 0, s_2 \geq 0$ and then solving the linear programming problem by usual simplex method, the optimum solution is given by in the following table.

Table-12.4

B	C_B	C_j	1	4	0	0
		X_B	x_1	x_2	s_1	s_2
x_2	4	7/4	1/2	1	1/4	0
s_2	0	39/4	7/2	0	-3/4	1
Z = 7		Δ_j	1	0	1	0

Since all $\Delta_j \geq 0$. So optimal solution is $x_2 = 4, s_2 = 0$ and Max. $Z = 7$

To obtain an optimum integer solution, we have to add Gomorian Constraints:

$x_1 = 0, \quad x_2 = \frac{7}{4}\ (1 + \frac{3}{4})$

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Max. Fractional $\left(0, \frac{3}{4}\right) = \frac{3}{4}$

Since, $\frac{3}{4}$corresponding to the first row i.e. x_2 is the source row.

Since, x_2 is the source row, we have

$\frac{3}{4} = \frac{x_1}{2} + x_2 + \frac{1}{4}s_1 + 0s_2$

$\frac{x_1}{2} + \frac{1}{4}s_1 \geq \frac{3}{4}$

The fractional cut constraint is given by

$\frac{x_1}{2} + \frac{1}{4}s_1 \geq \frac{3}{4} \Rightarrow -\frac{x_1}{2} - \frac{1}{4}s_1 + G_1 = -\frac{3}{4}$

Where, G_1 is the Gomory Slack. Adding Gomory Constraint at the bottom of optimum simplex table 12.4.

Table-12.5

B	C_B	C_j	1	4	0	0	0
		X_B	x_1	x_2	s_1	s_2	G_1
x_2	4	7/4	½	1	1/4	0	0
s_2	0	39/4	7/2	0	-3/4	1	0
G_1	0	-3/4	$\boxed{-1/2}$	0	-1/4	0	1
Z = 7		Δ_j	1↑	0	1	0	0

Apply Dual Simplex Method:

Outgoing Vector

$$x_{Bk} = \underset{i}{Min}\{x_{Bi};\ x_{Bi} < 0\} = Min\{-3/4\} = -3/4(x_{B3})$$

Incoming Vector

$$x_{Br} = \underset{j}{Max}\left\{\frac{\Delta_j}{x_{Bj}}; x_{Bj<0}\right\} = Max\{\frac{1}{-1/2}, \frac{1}{-1/4}\} = -2$$

Apply usual simplex method

Table-12.6

B	C_B	C_j	1	4	0	0	0
		X_B	x_1	x_2	s_1	s_2	G_1

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x_2	4	1	0	1	0	0	1
s_2	0	9/2	0	0	-5/2	1	7
x_1	1	3/2	1	0	1/2	0	-2
Z =	11/2	Δ_j	0	0	1/2	0	2

Since, x_1 is still not an integer i.e., $x_1$is source row.

To obtain an optimum integer solution, we have to add Gomorian Constraints:

$$x_1 = \frac{3}{2}\ (1 + \frac{1}{2})$$

Max. Fractional $= \frac{1}{2}$

Since, $\frac{1}{2}$corresponding to the third row i.e. x_1 is the source row.

Since, x_1 is the source row, we have

$$\frac{1}{2} = x_1 + 0x_2 + \frac{1}{2}s_1 + 0s_2 + 0G_1$$

$$\frac{1}{2}s_1 \geq \frac{1}{2}$$

The fractional cut constraint is given by

$$-\frac{1}{2}s_1 + G_2 = -\frac{1}{2}$$

Where, G_2 is the Gomory Slack. Adding Gomory Constraint at the bottom of optimum simplex table 12.6.

Table-12.7

B	C_B	C_j	1	4	0	0	0	0
		X_B	x_1	x_2	s_1	s_2	G_1	G_2
x_2	4	1	0	1	0	0	1	0
s_2	0	9/2	0	0	-5/2	1	7	0
x_1	1	3/2	1	0	1/2	0	-2	0
G_2	0	-1/2	0	0	$\boxed{-1/2}$	0	0	1
Z =	11/2	Δ_j	0	0	1/2↑	0	2	0

Apply Dual Simplex Method:

Outgoing Vector

$$x_{Bk} = \underset{i}{Min}\{x_{Bi};\ x_{Bi} < 0\} = Min\{-1/2\} = -1/2$$

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Incoming Vector

$$x_{Br} = \underset{j}{Max}\left\{\frac{\Delta_j}{x_{Bj}}; x_{Bj<0}\right\} = Max\{\frac{1/2}{-1/2}\} = -1$$

Apply usual simplex method

Table-12.8

B	C_B	C_j	1	4	0	0	0	0
		X_B	x_1	x_2	s_1	s_2	G_1	G_2
x_2	4	1	0	1	0	0	1	0
s_2	0	7	0	0	0	1	7	-5
x_1	1	1	1	0	0	0	-2	1
s_1	0	1	0	0	1	0	0	-2
Z = 5		Δ_j	0	0	0	0	2	1

Since all $\Delta_j \geq 0$ and all $X_B \geq 0$ and all restricted variables x_1, x_2 are integers. Hence, an optimum integer solution is $x_1 = 1, x_2 = 1$ and Max. Z=5.

Thus, the owner of ready-made garments should produce one Zee-shirt and also one Button-down shirt in order to get the maximum profit of Rs. 5.

12.4.1.3 FRACTIONAL CUT METHOD-MIXED INTEGER LPP

This method is similar to the Fractional Cut Method—All Integer Linear Programming Problem. The only difference is in Step V when generating the Gomorian constraint. The Gomorian Constraint generation is as follows:

$$\sum_{j\in R_+} f_{kj}x_j + \left(\frac{f_{ko}}{f_{ko}-1}\right)\sum_{j\in R_-} f_{kj}x_j \geq f_{ko}$$

$0 < f_{k0} < 1$ and $R_+ = \{j: f_{kj} > 0\}$, $R_- = \{j: f_{kj} < 0\}$

$$i.e.\ G_1 = -f_{k0} + \sum_{j\in R_+} f_{kj}x_j + \left(\frac{f_{ko}}{f_{ko}-1}\right)\sum_{j\in R_-} f_{kj}x_j$$

where, G_1 is known as the Gomorian Slack variable and this constraint as the Gomory's cut.

Example-3: Find the optimum integer solution to the following linear programming problem:

$Max. \quad z = 4x_1 + 6x_2 + 2x_3$

Subject to the constraints

$4x_1 - 4x_2 \leq 5$

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$-x_1 + 6x_2 \leq 5$

$-x_1 + x_2 + x_3 \leq 5$

where $x_1, x_2, x_3 \geq 0$ *and* x_1 *and* x_3 *are integers*

Solution: Convert all constraints into equations by using slack variables $s_1 \geq 0, s_2 \geq 0$, $s_3 \geq 0$ we get

$Max. Z = 3x_1 + 5x_2 + 0s_1 + 0s_2 + 0s_3$

Subject to the constraints

$4x_1 - 4x_2 + s_1 = 5$

$-x_1 + 6x_2 + s_2 = 5$

$-x_1 + x_2 + x_3 + s_3 = 5$

$x_1, x_2, s_1, s_2, s_3 \geq 0$

Table-12.9: Initial Simplex Table

B	C_B	C_j	4	6	2	0	0	0	X_B/x_2 $x_2 > 0$
		X_B	x_1	x_2	x_3	s_1	s_2	s_3	
s_1	0	5	4	-4	0	1	0	0	------
s_2	0	5	-1	$\boxed{6}$	0	0	1	0	5/6→
s_3	0	5	-1	1	1	0	0	1	5/1
Z = 0		Δ_j	-4	-6↑	-2	0	0	0	X_B/x_1 $x_1 > 0$
s_1	0	25/3	$\boxed{10/3}$	0	0	1	2/3	0	5/2→
x_2	6	5/6	-1/6	1	0	0	1/6	0	------
s_3	0	25/6	-5/6	0	1	0	-1/6	1	------
Z = 5		Δ_j	-5↑	0	-2	0	1	0	X_B/x_3 $x_3 > 0$
x_1	4	5/2	1	0	0	3/10	1/5	0	------
x_2	6	5/4	0	1	0	1/20	1/5	0	------
s_3	0	25/4	0	0	$\boxed{1}$	¼	0	1	25/4→
Z = 15/2		Δ_j	0	0	-2↑	3/2	9/5	0	
x_1	4	5/2	1	0	0	3/10	1/5	0	

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x_2	6	5/4	0	1	0	1/20	1/5	0	
x_3	2	25/4	0	0	1	¼	0	1	
Z = 30		Δ_j	0	0	2	2	2	0	

Since all $\Delta_j \geq 0$, so the optimal solution is $x_1 = 5/2, x_2 = 5/4, x_3 = 25/4$ and Max. Z=30

To obtain an optimum integer solution, we have to add Gomorian Constraints:

$\boldsymbol{x_1 = \frac{5}{2}, \quad x_2 = \frac{5}{4}}$

Max. Fractional $\left(\frac{1}{2}, \frac{1}{4}\right) = \frac{1}{2}$

Since, $\frac{1}{2}$ corresponding to the first row i.e. x_1 is the source row.

$\frac{1}{2} = x_1 + 0x_2 + 0x_3 + \frac{3}{10}s_1 + \frac{1}{5}s_2 + 0s_3$

$\frac{3}{10}s_1 + \frac{1}{5}s_2 \geq \frac{1}{2}$

The fractional cut constraint is given by

$\frac{3}{10}s_1 + \frac{1}{5}s_2 \geq \frac{1}{2} \Rightarrow -\frac{3}{10}s_1 - \frac{1}{5}s_2 + G_1 = -\frac{1}{2}$

Where, G_1 is the Gomory Slack. Adding Gomory Constraint at the bottom of optimum simplex table 12.9.

Table-12.10

B	C_B	C_j	4	6	2	0	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3	G_1
x_1	4	5/2	1	0	0	3/10	1/5	0	0
x_2	6	5/4	0	1	0	1/20	1/5	0	0
x_3	2	25/4	0	0	1	¼	0	1	0
$\rightarrow G_1$	0	-1/2	0	0	0	**-3/10**	-1/5	0	1
Z = 30		Δ_j	0	0	2	2↑	2	0	0

Apply Dual Simplex Method:

Outgoing Vector

$$x_{Bk} = \underset{i}{Min}\{x_{Bi};\ x_{Bi} < 0\} = Min\{-1/3\} = -1/2$$

Incoming Vector

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$$x_{Br} = \underset{j}{Max}\left\{\frac{\Delta_j}{x_{Bj}}; x_{Bj<0}\right\} = Max\{\frac{2}{-3/10}, \frac{2}{-1/5}\} = Max\{-20/3, -10\} = -20/3$$

Table-12.11

B	C_B	C_j	4	6	2	0	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3	G_1
x_1	4	2	1	0	0	0	0	0	0
x_2	6	7/6	0	1	0	0	1/6	0	1/6
x_3	2	35/6	0	0	1	0	-1/6	1	5/6
s_1	0	5/3	0	0	0	$\boxed{1}$	2/3	0	-10/3
Z =	80/3	Δ_j	0	0	0	0	2/3	0	20/3

Since all $\Delta_j \geq 0$, so the optimal solution is $x_1 = 2, x_2 = 7/6, x_3 = 35/6$ and Max. Z=80/3

Since, x_3 is still not an integer i.e. .e. x_3 is the source row.

To obtain an optimum integer solution, we have to add Gomorian Constraints:

$$x_3 = \frac{35}{6} = 5 + \frac{5}{6}$$

$$\frac{5}{6} = 0x_1 + 0x_2 + x_3 + 0x_4 + 0s_1 + \frac{\left(\frac{5}{6}\right)}{\left(\frac{5}{6}-1\right)}\left(\frac{-1}{6}\right)s_2 + 0s_3 + \frac{5}{6}G_1$$

$$\frac{5}{6}s_2 + \frac{5}{6}G_1 \geq \frac{5}{6}$$

The fractional cut constraint is given by

$$\frac{5}{6}s_2 + \frac{5}{6}G_1 \geq \frac{5}{6} \Rightarrow -\frac{5}{6}s_2 - \frac{5}{6}G_1 + G_2 = -\frac{5}{6}$$

Where, G_2 is the Gomory Slack. Adding Gomory Constraint at the bottom of optimum simplex table 12.11.

Table-12.12

B	C_B	C_j	4	6	2	0	0	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3	G_1	G_2
x_1	4	2	1	0	0	0	0	0	0	0
x_2	6	7/6	0	1	0	0	1/6	0	1/6	0

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x_3	2	35/6	0	0	1	0	-1/6	1	5/6	0
s_1	0	5/3	0	0	0	1	2/3	0	-10/3	0
$\rightarrow G_2$	0	-5/6	0	0	0	0	$\boxed{-5/6}$	0	-5/6	1
Z = 80/3		Δ_j	0	0	0	0	2/3↑	2	20/3	0

Apply Dual Simplex Method:

Outgoing Vector

$$x_{Bk} = \underset{i}{Min}\{x_{Bi};\ x_{Bi} < 0\} = Min\{-5/6\} = -5/6$$

Incoming Vector

$$x_{Br} = \underset{j}{Max}\left\{\frac{\Delta_j}{x_{Bj}}; x_{Bj<0}\right\} = Max\{\frac{2/3}{-5/6}, \frac{20/3}{-5/6}\} = Max\{-4/5, -8\} = -4/5$$

Table-12.13

B	C_B	C_j	4	6	2	0	0	0	0	0
		X_B	x_1	x_2	x_3	s_1	s_2	s_3	G_1	G_2
x_1	4	2	1	0	0	0	0	0	1	0
x_2	6	1	0	1	0	0	0	0	1/6	1/5
x_3	2	6	0	0	1	0	0	1	5/6	-1/5
s_1	0	1	0	0	0	1	0	0	-10/3	4/5
s_2	0	1	0	0	0	0	1	0	1	-6/5
Z = 26		Δ_j	0	0	0	0	0	2	20/3	4/5

Since all $\Delta_j \geq 0$ and all $X_B \geq 0$ and all restricted variables x_1, x_3 are integers. Hence, an optimum integer solution is $x_1 = 0, x_2 = 1, x_3 = 6$ and Max. Z=26

12.4.2 BRANCH AND BOUND METHOD

The concept behind this method is to divide the entire feasible solution space of the L.P problem into smaller parts called sub-problems and then search each of them for an optimal solution. This approach is useful in those cases where there is large number of feasible solutions and enumeration of those becomes economically impractical and impossible.

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The branch and bound method start by imposing feasible and infeasible upper or lower bounds for the decision variables in each sub-problem. This helps in reducing the number of simplex method iterations to arrive at the optimal solution, because each sub problem worse than he current feasible bound is discarded and only the remaining sub problems are examined. At a point where no more sub problems can be created, we will find an optimal solution.

The iterative procedure is summarized below:

Step 1: Obtain an optimum solution of the given L.P.P. ignoring the integer restriction.

Step 2: Test the integrability of the optimum solution obtained in step 1. There are two cases:

i) If the solution is in integers, the current solution is optimum to the given integer programming problem

ii) If the solution is not in integers, go to next step.

Step 3: Considering the value of the objective function as upper bound, obtain the lower bound by rounding off to integer values of the decision variables.

Step 4: Let the optimum value x^*_j of the variable x_j be not an integer. Then subdivide(branch) the given L.P.P into two problems:

Sub Problem 1: Given L.P.P. with an additional constraint $x_j \leq [x^*_j]$

Sub Problem 2: Given L.P.P. with an additional constraint $x_j \geq [x^*_j] + 1$

Where $[x^*_j]$ is the largest integer contained in x^*_j.

Step 5: Solve the two sub problems obtained in step 4. There may arise three cases:

i) If the optimum solution of the two sub problems is integral, then the required solution is one that gives larger value of z.

ii) If the optimum solution of the one sub problems is integral and the other sub problem has no feasible optimal solution, then the required solution is same as ha of the sub problem having integer valued solution.

iii) If the optimum solution of one sub problem is integral while that of the other is not integer valued then record the integer valued solution and repeat steps 3 and 4 for the non- integer valued sub problem.

Step 6: Repeat steps 3 to 5, until all integers valued solution are recorded.

Step 7: Choose the solution amongst the recorded integer valued solutions that yields an optimum value of z.

Example-4: Use the branch and bound method to solve the following linear programming problem: $Min. z = 4x_1 + 3x_2$

subject to the constraints

$5x_1 + 3x_2 \geq 30$

$x_1 \leq 4$

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$x_2 \leq 6$

$x_1, x_2 \geq 0$ *and both are integers*

Solution: First solve the given linear programming problem using usual method ignoring the integer restriction. The optimal solution of the problem is $x_1 = 4, x_2 = 10/3$ *and* $Min.Z = 26$

Since the value of the variable $x_2$is not an integer, we branch on this variable. The two branches are $x_j \leq [x^*{}_j] = 3$ and $x_j \geq [x^*{}_j] + 1 = 3 + 1 = 4$. Thus, we have

Sub-Problem-I

$Min.z = 4x_1 + 3x_2$ *subject to the constraints*

$5x_1 + 3x_2 \geq 30$

$x_1 \leq 4$

$x_2 \leq 6$ and $x_2 \leq 3$

$x_1, x_2 \geq 0$

Sub-Problem-II

$Min.z = 4x_1 + 3x_2$ *subject to the constraints*

$5x_1 + 3x_2 \geq 30$

$x_1 \leq 4$

$x_2 \leq 6$ and $x_2 \geq 4$

$x_1, x_2 \geq 0$

On solving these problems separately, the optimum solutions are as follows:

Sub-Problem-I: No Feasible Solution

Sub-Problem-II: $x_1 = 18/5, x_2 = 4$ *and* $Min.Z = 132/5$

Since the value of the variable x_1 in Sub-Problem-II is not an integer, we branch on this variable. The two branches are $x_j \leq [x^*{}_j] = 3$ and $x_j \geq [x^*{}_j] + 1 = 3 + 1 = 4$. Thus, we have

Sub-Problem-III

$Min.z = 4x_1 + 3x_2$ *subject to the constraints*

$5x_1 + 3x_2 \geq 30$

$x_1 \leq 4$ and $x_1 \leq 3$

$x_2 \leq 6$ and $x_2 \geq 4$

$x_1, x_2 \geq 0$

Sub-Problem-IV

$Min.z = 4x_1 + 3x_2$ *subject to the constraints*

$5x_1 + 3x_2 \geq 30$

$x_1 \leq 4$ and $x_1 \geq 4$

$x_2 \leq 6$ and $x_2 \geq 4$

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$x_1, x_2 \geq 0$

On solving these problems separately, the optimum solutions are as follows:

Sub-Problem-III: $x_1 = 3, x_2 = 5 \; and \; Min. Z = 27$

Sub-Problem-IV: $x_1 = 3, x_2 = 5 \; and \; Min. Z = 28$

Hence, the required optimum solution is $x_1 = 3, x_2 = 5 \; and \; Min. Z = 27$

The complete branch and bound procedure for the given linear programming problem is shown below:

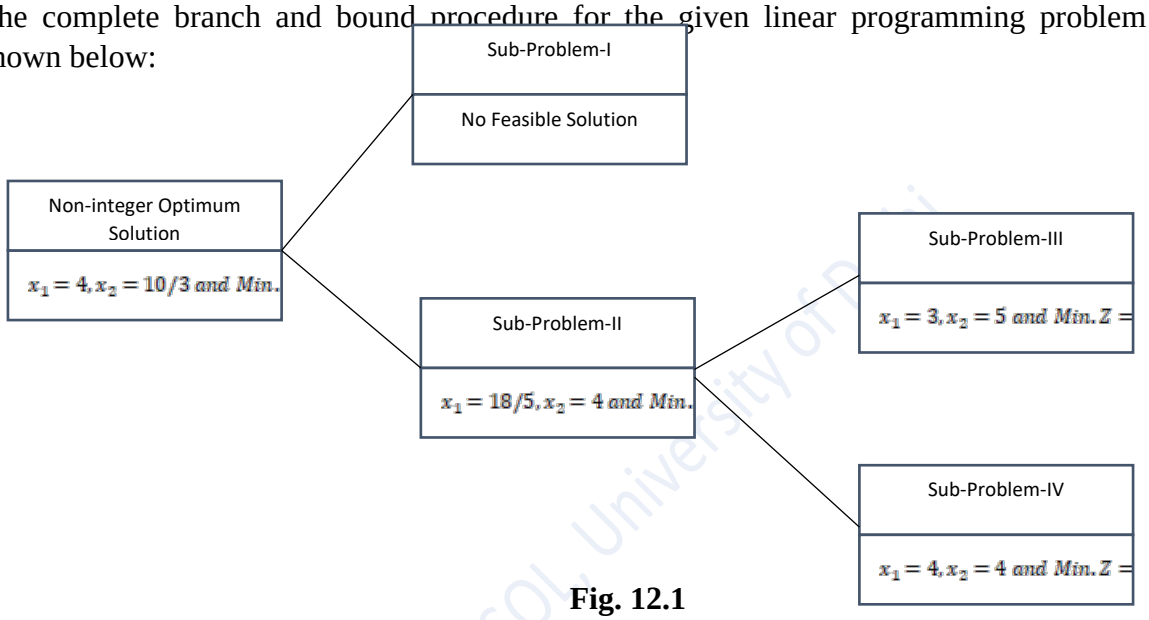

Fig. 12.1

12.5 SUMMARY

- In this chapter, an extension of the linear programming problem, referred to as an integer programming problem, was introduced where few or all variables must be integers.
- If all the variables in a problem are integers, then such problems are referred to as all-integer linear programming problem.
- If some, but not necessarily all, variables are integers, then such problems are referred to as mixed-integer linear problems.
- If all the variables of a problem are 0 or 1, then such problems are referred to as 0–1 integer linear programming problem.
- The study of integer linear programming is helpful when fractional values for the variables are not permitted and rounding off their values may not provide an optimal integer solution.

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12.6 SELF-ASSESSMENT QUESTIONS

1. Find the optimum integer solution of the following L.P.P.

a) $Mazimize\ z = x_1 + 2x_2$
$subject\ to\ the\ constraints$
$2x_2 \leq 7$
$x_1 + x_2 \leq 7$
$2x_1 \leq 11$
$and\ x_1, x_2 \geq 0\ and\ both\ are\ integers$

b) $Mazimize\ z = 4x_1 + 3x_2$
$subject\ to\ the\ constraints$
$x_1 + 2x_2 \leq 4$
$2x_1 + x_2 \leq 6$
$and\ x_1, x_2 \geq 0\ and\ both\ are\ integers$

c) $Mazimize\ z = x_1 + x_2$
$subject\ to\ the\ constraints$
$3x_1 + 2x_2 \leq 5$
$x_2 \leq 2$
$and\ x_1, x_2 \geq 0\ and\ x_1 is\ an\ integers$

2. Use Branch and Bound method for solving the following L.P.P.

a) $Mazimize\ z = 4x_1 + 3x_2\ subject\ to\ the\ constraints$
$5x_1 + 3x_2 \leq 13, x_1 \leq 4, x_1, x_2 \geq 0\ and\ both\ are\ integers$

b) $Mazimize\ z = 3x_1 + 5x_2\ subject\ to\ the\ constraints$

$2x_1 + 3x_2 \leq 25, x_2 \leq 10, x_1 \leq 8, x_1, x_2 \geq 0\ and\ are\ integers$

3. A manufacturer of baby-dolls makes two types of dolls: Doll P and Doll Q. Processing of these two dolls is done on two machine A and B. Doll P requires two hours on machine A and six hours on machine B. Doll Q requires five hours on machine A and also five hours on machine B. There are sixteen hours of time per day available on machine P and thirty hours on machine Q. The profit gained on both the dolls is same, i.e., one rupee per doll. What should be daily production of each of the two dolls?
   (a) Set up and solve the linear programming problem.
   (b) If the optimal solution is not integer values, use Gomory's technique to derive the optimal solution.

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4. A company manufacturers two products P_1 and P_2 which requires time on three different machines M_1, M_2 and M_3. Product P_1 requires 2 hours on machine M_1 and 1 hour on machine M_2. Product P_2 requires 4 hours on machine M_2 and 2 hour on machine M_3. There are 50 hours available on machine M_1, 16 hours on machine M_2 and 20 hours on machine M_3 per week. The per unit profit on products P_1 and P_2 are Rs. 30 and Rs. 50 respectively. Determine the output mix that will maximize the total profit per week, when only integer solution is acceptable.

12.7 ANSWERS

1. (a) $x_1 = 4, x_2 = 3 \text{ and } Max. Z = 10$
   (b) $x_1 = 3, x_2 = 0 \text{ and } Max. Z = 12$
   (c) $x_1 = 0, x_2 = 2 \text{ and } Max. Z = 2$
2. (a) $x_1 = 0, x_2 = 4 \text{and } Max. Z = 12$
   (b) $x_1 = 2, x_2 = 7 \text{ and } Max. Z = 41$

3. (a) Formulation of linear programming problem:

   $Mazimize\ z = x_1 + x_2$

   $subject\ to\ the\ constraints$

   $2x_1 + 5x_2 \leq 16$

   $6x_1 + 5x_2 \leq 30$

   $and\ x_1, x_2 \geq 0\ and\ both\ are\ integers$

   Where x_1 be the P type doll and x_2 be the Q type doll

   (b) $x_1 = 3, x_2 = 2 \text{ and } Max\ Z = 5$

4. 16 units of P_1 and no unit of P_2, maximum profit = Rs.480

12.8 MULTIPLE CHOICE QUESTIONS

1. In a mixed-integer programming problem
   (a) All of the decision variables require integer solutions
   (b) Few of the decision variables require integer solutions
   (c) Different objective functions are mixed together
   (d) None of the above
2. The use of cutting plane method
   (a) Reduces the number of constraints in the given problem
   (b) Yields better value of objective function

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(c) Requires the use of standard LP approach between each cutting plane application
(d) All of the above

3. The 0 – 1 integer programming problem
   (a) Requires the decision variables to have values between zero and one
   (b) Requires that all the constraints have coefficients between zero and one
   (c) Requires that the decision variables have coefficients between zero and one
   (d) All of the above
4. The part of the feasible solution space eliminated by plotting a cut contains
   (a) Only non-integer solutions
   (b) Only integer solutions
   (c) Both (a) and (b)
   (d) None of the above
5. While solving an IP problem any non-integer variable in the solution is picked up in order to
   (a) Obtain the cut constraint
   (b) Enter the solution
   (c) Leave the solution
   (d) None of the above
6. Branch and Bound method divide the feasible solution space into smaller parts by
   (a) Branching
   (b) Bounding
   (c) Enumerating
   (d) All of the above
7. Rounding-off solution values of decision variables in an LP problem may not be acceptable because
   (a) It does not satisfy constraints
   (b) It violates non-negativity conditions
   (c) Objective function value is less than the objective function value of LP
   (d) None of the above
8. In the Branch and Bound approach to a maximization integer LP problem, a node is terminated if
   (a) A node has an infeasible solution
   (b) A node yields a solution that is feasible but not an integer
   (c) Upper bound is less than the current sub-problem's lower bound
   (d) All of the above
9. Which of the following is the consequence of adding a new cut constraint to an optimal simplex table
   (a) Addition of a new variable to the table
   (b) Makes the previous optimal solution infeasible
   (c) Eliminates non-integer solution from the solution space
   (d) All of the above

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10. In a Branch and Bound minimization tree, the lower bounds on objective function value
    (a) Do not decrease in value
    (b) Do not increase in value
    (c) Remain constant
    (d) None of the above
11. The situation of multiple solutions arises with
    (a) Cutting plane method
    (b) Branch and bound method
    (c) Both (a) and (b)
    (d) None of the above
12. The corners of the reduced feasible region of an integer LP problem contains
    (a) Only integer solution
    (b) Optimal integer solution
    (c) Only non-integer solution
    (d) All of the above
13. While applying the cutting-plane method, dual simplex is used to maintain
    (a) Optimality
    (b) Feasibility
    (c) Both (a) and (b)
    (d) None of the above
14. A non-integer variable is chosen in the optimal simplex table of the integer LP problem
    to
    (a) Leave the basis
    (b) Enter the basis
    (c) To construct a Gomory cut
    (d) None of the above
15. Modifications made for the mixed-integer cutting plane method are:
    (a) Value of the objective function is bounded
    (b) Row corresponding to an integer variable serve as a source row
    (c) Top most rows of the simplex table contain integer variables
    (d) All of the above

ANSWER

1 (b) 2(c) 3(a) 4(a) 5(a) 6(a) 7(d) 8(d) 9(d) 10(b) 11(d)
12(a) 13(b) 14(c) 15(b)

12.9 APPLICATION AREAS

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Application of Integer Programming Problem

The IPP has many applications in industry and management. Some of these are discussed below:

1. **Travelling Salesman Problem**

Suppose there are 'n' cities with known distances between any pair of cities. A salesman starts from his home city; visit each city once and return to his starting point. The objective is to min the total traveling time (or cost of distance). Such a problem can be formulated as zero-one INTEGER programming problem

Mathematical

$$Min\ z = \sum_i \sum_j \sum_k x_{ijk} \qquad i \neq j$$

here d_{ij} denotes the distance from city 'i' to the city 'j' and i,j,k are integers varying from 1 to n

$$x_{ij} = \begin{cases} 1 & if\ k^{th}\ directed\ arcs\ is\ from\ city\ i\ to\ city\ j \\ 0 & otherwise \end{cases}$$

such that

1. $\sum_i \sum_j x_{ijk} = 1; k = 1\ to\ n\ and\ i \neq j$ only one directed are may be assigned to a specific value of k
2. $\sum_j \sum_k x_{ijk} = 1; i = 1\ to\ n$ only other city may be reached from a specific city i
3. $\sum_i \sum_k x_{ijk} = 1; j = 1\ to\ n$ only one other city can initiate directed are to a specified city j
4. $\sum_{i \neq j} x_{ijk} = \sum_{r, r \neq j} x_{jr(k+1)}\ \forall\ j\ and\ k$ .The round trip will consist of connected arcs D. It is given that the kth directed arc ends at some specific city j, the $(k+1)^{th}$ directed arcs must start at same city j.

2. **Fixed Charge Problem**

In this problem it is required to produce at least N units of a certain product on n different machines. Let x_j is a number of units produced on machines j(=1 to n). The product cost function for the j th function is given by

$$C_j(x_j) = \begin{cases} k_j + C_j + x_j & if\ x_j > 0 \\ 0 & if\ x_j = 0 \end{cases}$$

Where C_j is the setup cost or foundation cost for machine j. Thus, the problem is

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$Min\ z = \sum_{j=1}^{n} C_j(x_j)$

Subject to the constraints

$\sum_{i=1}^{n} x_j \geq N;\ x_j \geq 0\ and\ all\ are\ integers$

The objective function in this case is non-linear because of the presence of fixed charge k_j. This difficulty mat be removed by using the mixed integer problem as follows

Let $y_i = 0\ or\ 1\ \forall j$

The problem reduces to

$Min\ z = \sum_{j=1}^{n} C_j(x_j) + \sum_{j=1}^{n} k_j(y_j)$

Subject to the constraints

$\sum_{i=1}^{n} x_j \geq N;\ x_j \leq My_j \forall j;\ x_j \geq 0\ and\ all\ are\ integers$

12.10 CASE STUDY

Zodiac is well known brand in the fashion industry. It manufactures different types of shirts in different sizes, neck ties and other fashion accessories for professionals. Recently, it decided to make use of some latest techniques in order to help itself in the cloth cutting operation. The cutting operation for shirts is extremely time-consuming and gives rise to high set-up costs. A large amount of cloth was also being wasted in the cutting operation. The process of cutting involved putting several layers of cloth of standard width on a table and putting stencils, i.e., the templates in order to cut the cloth. However, the choice of the templates was based on judgement, which was leading to a lot of wastage. To overcome this problem, the services of R&D department were seeked, so as to minimize the setup cost and excess, subject to certain constraints:

1. Number of layers that can be cut is limited by the length of the knives and the thickness of the fabric

2. Length of the cutting table, which limits the number of stencils that can be cut in one operation. As the length of the stencils for the different sizes is almost equal, the maximum number of stencils on the cutting table is actually independent of the combination of the stencils used. Assumed that all stencils have equal length. The following data on cutting operation of a shirt, and demand pattern for different sizes is as follows:

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Size	39	41	43	45	47
Demand	55	85	92	61	30

The spreading of the fabric on the cutting table, the fixing of the layers and stencils, and the cutting itself are extremely delicate and time-consuming operations. Therefore, the number of these operations should be minimized. The problem then reduces to find the optimal combination of the number of layers of cloth on the cutting table and the associated set of stencils to reduce minimum number of setups, while satisfying the demand with no variation. There was an upper bound on the number of layers at 35 and the cutting table length could hold at most four stencils. Three cutting patterns were to be used. Develop an appropriate mathematical model to suggest an optimal solution to this problem.

12.11 GLOSSARY

Integer Linear Programming

Integer LP problems are those in which some or all of the variables are restricted to integer (or discrete) values.

Pure Integer Programming Problem

Pure (all) integer programming problems in which all decision variables are restricted to integer values.

Mixed Integer Programming Problem

Mixed integer programming problems in which some, but not all, of the decision variables are restricted to integer values

Zero-One Integer Programming Problem

Zero-one integer programming problems in which all decision variables are restricted to integer values of either 0 or 1

Branch and Bound Method

The Branch and Bound method are used to solve all-integer, mixed-integer and zero-one linear programming problems.

Dual Simplex Method

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Dual simplex method is applicable to those linear programming problems that start with infeasible but otherwise optimum solution.

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MANAGERIAL ECONOMICS

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LESSON 1
MANAGERIAL ECONOMICS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Introducing Management Students to Microeconomics.
  1.3.1 Meaning and Definition of Managerial Economics.
  1.3.2 Characteristics of Managerial Economics
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1.8 Self-Assessment Questions
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1.1 LEARNING OBJECTIVES

- The objective of this lesson is to help the learner to understand the meaning of managerial economics and what role it has in the subject of economics.
- How is it different from the umbrella subject of economics?
- Students will get to know the importance of managerial economics in the operation of the business and its scope.

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- The views of eminent economists on the topic of managerial economics are also given in this lesson.
- They will learn about the characteristics and nature of managerial economics.
- How do business firms take decisions under different objectives and what are the major theories that guide their decisions?
- Students will learn about marginal analysis and its uses in business decision-making.

1.2 INTRODUCTION

Economics is the study of the optimal use of scarce resources to satisfy human needs and wants. In a world, where resources are limited and the population is increasing every day, there is a mismatch of resources and people using them. This mismatch leads to several socioeconomic problems in society such as hunger, poverty, etc. There is a race to hoard as many resources as possible and accumulate wealth disproportionately by the powerful people of the society. Poor people are at the receiving end of this race. This has resulted in income inequality, access accumulation of resources in one part of the society, and scarcity in the other. The study of economics is one way to solve this problem of imbalance and irregular and artificial distribution of resources and wealth. Therefore, it is imperative to learn to manage the resources in the best way to serve the needs of all. Economics is all about learning to manage resources in the best manner.

The same problem can be seen at a micro level also, say, in a firm. Here, the application of the principles of economics is commonly known as managerial economics. Managerial economics is the study of the allocation of the resources available to a firm or management to produce goods and services. It is concerned with choice. It is goal-oriented and aims at maximizing the achievement of objectives. Managerial economics is a small part of economics and does the same work as that of economics but at a micro level. In this chapter, we will be discussing managerial economics in a more detailed manner.

1.3 INTRODUCING MANAGEMENT STUDENTS TO MICROECONOMICS

Managerial economics is a branch of economics that deals with the functioning and management of a business entity. Managerial economics is essentially that part of economics that is applied to business decision-making. It is a body of knowledge consisting of economic concepts, logic and reasoning, economic laws and theories, and tools and techniques for analysing economic phenomena, evaluating economic options, and for optimizing the allocation of resources. Economists have defined managerial economics according to their perception of the Subject. Managerial economics is the study of economic theories, concepts, logic, and tools of analysis that are used in analysing business conditions with the objective

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of finding an appropriate solution to business problems. As regards its nature, managerial economics can be considered primarily as applied microeconomics.

1.3.1 Meaning and Definition of Managerial Economics:

After the publication of the book "Managerial Economics" by Joel Dean in 1951, managerial economics as a subject gained popularity. Managerial economics can best be understood as the application of concepts of economics in decision-making at the managerial level of the business entity. It conducts economic analysis for identifying problems, organizing information, and evaluating alternatives. Managerial economics can also be defined as the study of economic theory, logic, and methodology which are generally applied to seek solutions to the practical problems of business. Managerial economics ties the gap between traditional economic theory and the real business situation in two ways.

Firstly, it offers a number of tools and techniques to enable the manager to become more efficient decision making in real-world and practical situations.

Secondly, it serves as an integrating course to show the interaction between the various areas in which the firm operates.

For example, when a large business organization decides to start a new operation in a new area, they have to make several important decisions regarding the right amount of capital infusion, prospective market, availability of raw materials and proper infrastructure, security concerns, availability of human resources, etc. before they go ahead with the operation. They require expert managerial advice during this juncture, without which they are more likely to make bad decisions that will lead to the failure of their business operations. A novice can't be expected to make prudent business decisions. Knowledge of managerial economics becomes essential and only the people having expertise in managerial economics are equipped with the necessary skills and knowledge to make these important decisions for the business. Managerial economics also plays the same role when a business entity expands its area of operations. They do try to replicate their existing business practices which again are based on principles of managerial economics but even then, they require a manager who has a clear understanding of managerial economics to provide optimal solutions to managerial decisions making problems.

Managerial economics is often called 'Business economics' or 'Economics of the Firm' in management studies. Both the terms, however, include 'economics' as a basic discipline useful in certain functional areas of business management. The term managerial refers to the functions of management. The main functions of management are decision-making and forward planning.

Decision-making means the process of choosing from among available alternatives to achieve the firm's established goals. A managerial team is always expected to come up with all the possible alternatives and select the best alternative. Sometimes, this exercise of selecting the

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best alternative can become tedious exercise and has a tendency to delay the decision-making process but with the right knowledge and centralizing the interests of the business, the best alternative can be found and selected quickly. This is what decision-making is within a business.

Forward planning refers to making plans for the future. A business organization cannot be run on narrowmindedness. It needs to have profoundness. Managers are required to plan to keep in mind the future of the business. A narrow approach would only lead to the failure of the business. The long approach always works for the better. The plan cannot be made keeping in mind the lifetime of the owner of the business but keeping in mind the lifetime of the business which is supposed to be indefinite.

Managerial economics takes the help of decision-making sciences or quantitative methods. Decision-making sciences or quantitative methods refer to the tools and techniques of analysis, optimization analysis, statistical methods, game theory, and capital budgeting. Decision-making sciences make special use of mathematical economics and econometrics to derive optimal solutions to managerial decision-making problems and other optimization and forecasting. It is fundamentally concerned with the art of economics making rational choices to yield maximum return out of minimum resources and effort by making the best selection among alternative courses of action. The subject matter of the business must go through economic analysis, as that can be helpful in solving business problems, policy, and planning.

Managerial economics definition by different Economists.

"Managerial economics consists of using an economic model of thought to analyse business situations."

Malcolm E. McNair and Richard S.

"Managerial economics is the integration of economic theory with business practice to facilitate decision making and forward planning by management."

Milton H. Spencer & Siegelman

"The purpose of managerial economics is to show how economic analysis can be used in formulating business policy."

Joel Dean.

"Managerial economics is a study of the behaviour of Firms in theory and practice**."**

Bates and Parkinson.

"Managerial economics is concerned with the application of economic concepts and economic analysis to the problems of formulating rational managerial decisions."

Mansfield.

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Thus, managerial economics is an attempt to use economics and economic logic in formulating business policy. It is that body of economic knowledge used to examine business problems for making appropriate business decisions and formulating future plans.

1.3.2 Characteristics and Nature of Managerial Economics

(i) **Micro-economic in character** - Microeconomics is the branch of economics that deals with individual units of the economy. These individual units may be a person or firm or group. Managerial economics is concerned with the analysis of and finding optimal solutions to decision-making problems of businesses or firms, so it is microeconomic in character. Decision-making in a firm or business affects them but has minimal effect on the economy of a country thereby microeconomic in nature.

(ii) **Pragmatic** - It avoids difficult and abstract issues associated with the analytical tools and techniques of economic theory, which are helpful in decision-making in business. Managerial economics is all about the individual touch in the decision-making process, avoiding complexities of organizational dictation or theoretical economics principles. Dealing with every issue individually is the primary approach of managerial economics which is more pragmatic.

(iii) **Theory of the firm or economics of the firm** - It mostly uses that body of economic concepts and philosophies which is known as the theory of the firm or economics of the firm. As firms or business organizations work distinctly than other governmental or non-governmental organizations, think tanks, etc. Many economic principles are developed keeping in mind the macro nature of economic policy making therefore they are unfit to be applied to a firm. Governmental organizations follow a welfare approach in their operations, and many non-governmental organizations also follow different approaches based on their individual agendas and areas of operations but firms or any other business organization are in the business of money-making for their promoters. Profit is one of the main goals of firms or businesses and therefore cannot be run using the same theory of economics that applies to other organizations mentioned above. This distinct style of functioning is one of the major reasons for the development of managerial economics.

(iv) **Normative economics rather than positive economics** - The main body of economic theory confines itself to descriptive hypotheses, trying to generalize about the relation among different variables without judgment about what is desirable. Normative economies on the other hand prescribe what ought to be, i.e., it distinguishes the ideal from the actual. Managerial economics is prescriptive not merely descriptive therefore follows a real-world approach.

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(v) **Goal-oriented end prescriptive** - Analysing the managerial problems and goal of the organization of business units, managerial economics aims at finding-out optimal solutions to the business problems of firms. In other words, it is problem-solving and goal oriented.

(vi) **Conceptual and metrical** - Managerial economics is based on a sound framework of economic concepts. Its subject matter is not an arbitrary collection of prescriptions. It aims to analyse business problems based on established concepts. Thus, it is conceptual and metrical in nature.

(vii) **Managerial Economics Deals with the Application of Economics** - Managerial economics is the branch of study that deals with economic theory and its application to business management. Managers need to understand pertinent aspects of economic theory like demand, supply, production, pricing, markets, etc. It helps them in managing businesses in a structured manner with the application of the principle of economics to managerial decision-making. Some of the important aspects of economic theory which can be applied to business management are as follows –

Demand Analysis: Laws of demand. the elasticity of demand, and factors affecting demand.

Production Analysis: Laws of variable proportions, Law of returns to scale, economies and diseconomies of scale.

Market Analysis: Nature of product market like perfect competition, monopoly, oligopoly, monopolistic competition. Product pricing and output decisions in different forms of market.

Difference between economics and managerial economics

Sr.No.	Economics	Managerial Economics
1.	Deals with the body of principles itself.	It deals with the application of certain principles to solve the problems of the Firm.
2	Economics includes both macroeconomics and microeconomics.	Microeconomic in character.
3	It studies both the economics of the individual as well as the economics of	It studies only individual firms.

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	the aggregate.	
4	It deals with the study and distribution theories of rent, wages, interest, and profits.	It deals with a study of only profit theories.
5	Both positive and normative in nature.	Normative in nature.
6	It studies only economic aspects.	It studies both economic and non-economic aspects.
7	It hypothesizes economic relationships and builds simplified economic models.	It adopts, modifies, and reformulates economic models to suit specific conditions and serves the specific problem-solving process.
8	Based on certain assumptions. As it is not possible to know beforehand all the possibilities therefore the theories are developed based on assumptions.	These assumptions disappear due to practical situations. Real-world situations require solutions that are specifically customized to that situation and hence applying economic theories based on assumptions would only result in failure.

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1.3.3 Scope of Managerial Economics.

1. Demand analysis and forecasting
2. Cost analysis
3. Production and supply analysis
4. Pricing decisions, policies, and practices.
5. Profit management and Capital Management.
6. Analysis of business environment.

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1. Demand Analysis and Forecasting: A business firm is an economic organization that is engaged in transforming productive resources into goods that are to be sold in the market. A major part of managerial decision-making depends on accurate estimates of demand. Demand analysis is done by estimating the demand function.

The demand function describes the relationship between the quantity of the demand and the factors associated with it. The demand for quantity reflects the function of the price of the goods or services, income, taste, price of related goods, and preferences. For example, while buying paper for the firm, the factors that will affect the decision of a customer would be –

i. Price of the paper of X paper company
ii. Price of the paper of other providers
iii. Price of the ink or toner
iv. Paying capacity of the customer or his personal disposable income
v. Quality of the paper
vi. Other factors such as the operating cost of the paper, etc.

All these factors are considered under demand analysis. To analyse the demand, the demand function needs to be estimated.

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In another example, say, a firm 'A' sells paper. For the sake of explanation, we will use this example of firm A throughout this section. The management will have to do a demand analysis to find the demand for paper in the market where it operates. Consider the market is in rural areas where the main economic activity is agriculture. The demand for paper in that region would be very less and therefore selling paper in that area won't be making any profit for the firm if it operates in only that region. But in urban areas, where the economic activity is highly diverse, there are offices of many companies, and they would certainly require papers for their office work. In that region, the firm would make a profit because of the large market. Demand analysis would determine the right market for the product where the product is in high demand.

Demand forecasting is the process of predicting the demand for a product in a future time period. It is done to plan future production inventories, new product development, etc. The current demand and values of the product are needed to calculate the future values and demand for the product. Correct estimates of the demand help the firm in decision-making, strengthening market position and enlarging profits.

2. Cost Analysis: Cost estimates are most useful for management decisions. The different factors that cause variations in cost estimates should be given due consideration for planning purposes. The chief topics covered under cost analysis are- cost concepts and classifications, cost-output relationships, economies and diseconomies of scale, Cost control, and Cost Production. Cost analysis becomes more important when the goal is profit-making. The cost of production should always be less than the sale price of the product in the market. The margin between the two is the profit after all.

For example, firm 'A' would have to do a proper cost analysis to find the cost of the production of paper. They would have to ensure the cost of production should not go up to a limit where the profit margin would be affected. In case it does, they would have to do the cost-cutting to maintain the profit margin. The management has to consider the competition in the market during cost analysis. Any increase in the cost of production would either decrease their profit margin or increase the price of the product in the market and both cases would be detrimental to the firm.

3. Production and Supply Analysis: Production analysis proceeds in physical terms and deals with different production functions and their managerial uses. Supply analysis deals with various aspects of the supply of commodities. The chief topics come under - supply schedule, curves and function, the Law of supply and its limitation, the elasticity of supply, and factors influencing supply.

For instance, to capture the market, firm A will have to ensure a proper supply of paper to all of its customers. Any irregularities will only cause distrust among customers, and they will look for alternatives in that case. Time is a precious component in the business field. Customers have deadlines and they need their products on time so that their business runs smoothly. Therefore, any delay in production or supply would cause distrust among

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customers. So, management has to do production and supply analysis periodically to find any deficiencies and resolve them on time so that production and supply work can be completed efficiently.

4. Pricing Decision, Policies, and Practices: The price of a product is directly related to the firm's total revenue, hence it constitutes the most important field of managerial economics. The various aspects that are dealt with under it cover price determination in various market forms, pricing policies, pricing methods, differential pricing, productive, and price forecasting. Pricing decisions should also consider the cost of production before determining the final price of the product. Therefore, pricing decisions and cost analysis go hand in hand.

For example, firm A would have to price its paper competitively in the market to make it an attractive option to prospective customers. Customers always look for cheaper options, therefore, an unnecessary increase in the sale price would be counterproductive. At the same time, the firm also has to analyse whether the other firms are pricing their products unreasonably low to weed out the competition in the market. In that case, the firm should price its products reasonably. There would be some monetary loss for a short time but in the long term, it would be beneficial as no one can afford to lose money for that long. Therefore, cost analysis should always be done in line with pricing decisions.

5. Profit Management and Capital Management: The main purpose of a business firm is to earn maximum profit. There is always an element of uncertainty about profits because of variations in costs and revenues. The important aspects covered in this area are the nature and measurement of profit, profit policies, and techniques of profit planning like break-even analysis. Capital management implies planning and control of capital expenditure because it involves a large sum and the problems in disposing of the capital assets are so complex that they require considerable time and labour. The management of these capital assets such as time and labour to control the cost of production is one of the main duties of managers. The main topics dealt with under capital management are the cost of capital, rate of return, and selection of projects.

For example, firm A selling paper would fail if the capital infusion were unnecessarily higher than the profit. Capital expenditure should always be controlled unless it's going to play a role in increasing sales. Sometimes, when the demand is high, supply is increased to balance the demand and the present labour force becomes too less for the job, in that situation, firms hire more workers who are there just to fill the gap. But when the demand goes down, the same workers become a liability for the firm. If the surplus workers are not let go on time, it would create a mismatch between profit and capital. Therefore, proper management of both profit and capital is necessary for the proper functioning of the business.

6. Analysis of Business Environment: The environmental factors influence the working and performance of a business undertaking. Therefore, the managers will have to consider environmental factors in the process of decision-making. Decisions taken in isolation of

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environmental factors would prove harmful to the firm. Therefore, the management must be fully aware of the economic environment, particularly those economic factors which constitute the business climate. Certain macroeconomic theories such as Income and Employment Theory, Monetary Theory, etc., help in analysing business climate. Analysis of monetary policy, fiscal policy, industrial policy, foreign trade policy, and other direct controls also help in forecasting business climate. Therefore, macro-economic theory and government policies are also included in the scope of managerial economics.

For instance, firm A would have to take into consideration the economic environment of the region where they are operating. Say, in times of recession, the firm would have to decrease the supply and should have buffer money or an emergency fund to survive during this difficult time. It should plan for any unforeseen calamity. Other factors such as law and order in the area, inflation, etc. can also affect the business of the firm and therefore the same must be properly planned and managed.

1.4 DECISION OF BUSINESS FIRMS UNDER DIFFERENT OBJECTIVES

Meaning Of Firm

A firm is an organization that combines and organizes resources for the purpose of producing goods and services for sale. In other words, a firm is a unit engaged in the production of goods and services. A firm can be –

- Small, medium, and large
- Sole Proprietorships, partnerships, and corporations
- Public sector, Private sector, and Joint sector.

A Firm has many objectives which include: -

- Desired outcomes
- Strategy or policy to achieve their goals
- Consumer satisfaction.

The economists differ in opinion regarding the objective of the business firms. According to classical economists, the main aim of the firm is to earn maximum profit. The reason for this is that earlier, owners of the firms were mostly called organizers. For example, Managers or organizers were the owners of the organization themselves. The interest was in profit maximization. But in the modern period, the importance of joint stock companies and partnerships has been increasing. In place of sole entrepreneur or partnership, the owners of joint stock companies and partnerships are a large number of shareholders who reside in different places. The actual management of these companies is in the hands of their appointed

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managers. These managers get salaries for the work rendered and certain other facilities like free accommodation, car, etc. The main interest of the shareholder of the joint stock company and partnerships is in the profit of the company, but the interest of the manager is not only earning profits for the firm like increasing the sales and development of the company but also increasing their own salaries and other facilities. The manager tries to ensure that the company may go on earning adequate profit.

1.4.1 Major Theories of Business Firms under Different Objectives

1**. Profit Maximisation: - Nicholson and Williamson**

Profit maximization is the only objective of business firms and is the main assumption of traditional economic theory. It also forms the basis of conventional price theory. Profit maximization is regarded as the most reasonable and analytically the most productive business objective. Under the assumptions of given tastes and technology, the price and output of a given product under perfect competition are determined with the sole objective of maximizing profits.

Profit Maximization Theory conditions: - If the difference between Total Revenue (TR) and Total Cost (TC) is maximum.

Profit= TR- TC

(i) MC (Marginal Cost) = MR (Marginal Revenue)

(ii) MC – must be rising at the point of equality between MC and MR

(a) MC < MR – Total profits are not maximized

(b) MC > MR – The level of total profit is being reduced.

(c) MC = MR – Profits are Maximized.

2. **Baumol's Model (Revenue Maximization Model)**

The basic principle of this theory is that the objective of the firms is sales maximization rather than Profit Maximisation. Sales here mean total revenue earned by the sale of goods. According to this theory, once profits reach an acceptable level, the goal of the firms becomes the maximization of sales revenue rather than the maximization of profit.

Managers pursue those goals which further their interests. Sales revenue trend is a more readily available indicator of firm performance.

3. Marris Model Growth Maximisation

Marris' approach is based on the fact that ownership and control of the firm are in the hands of two different sets of people. According to this theory, the rate of growth and potential of growth are the Standards used to measure the success of the Firm. The managers of the firm

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aim at the maximization of the growth rate and shareholders, or owners aim at the maximization of their dividend and share price of the firm.

Marris developed a balanced growth model in which the manager chooses the growth rate at which the firm's sales, profits, assets, etc., grow. He suggests the utility functions of managers and owners to highlight the different goals set by both. The utility function of managers is denoted by the symbol 'U_m' and includes variables such as salaries, power, status, job security, etc. upon which managers set their goals in the firm which is different from the owners'. Utility functions of owners are shown by Marris as 'U_o' which include variables such as profits, market share, output capital, etc. These are the goals of owners in the firm which do not coincide with that of managers.

U_m= f (Salaries, Power, Status, Job security, etc.)

U_o= f (Profits, Market share, Output capital, public esteem, etc.)

4. **Williamson's Model of Managerial Utility or Discretion.**

According to this theory**,** managers are free to pursue their own self-interest once they have achieved a level of profit that will pay a satisfactory dividend to shareholders and still ensure growth. They are free to increase their own emoluments and also the size of their staff and expenditure on them provided owner-shareholders are paid their expected profits or dividends as the case may be. Managers seek to maximize their own utility function subject to a minimum level of profit.

Utility Function U= f (S, M, I_D)

Where: - S= staff expenditure (More stuff is valued because they lead to the manager getting more salary, more prestige, and more security)**.**

M= Managerial Emoluments (Secretaries, company car, phones, perks for employees).

I_D= Discretionary Investment (Discretionary investment or investment are what remain with the manager after paying taxes and dividend to shareholders in order to retain effective control of the firm).

5. **Behavioural Theory of Organisation Goals: -**

Simon Model or Satisficing Theory

Herbert Simon propounded the behavioural theory of the firm. According to him the firm's principal objective is not maximizing profit but satisfying or satisfactory profits.

He claimed that due to the imperfection of data and uncertainty prevailing in the real world. The profit policy of the firm is not maximizing profit but Satisficing. The term 'Satisficing' means Satisfactory overall performance. The firm's aim is not to maximize profits but to

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attain a certain level or rate of profit holding a certain share of the market or a certain level of sales.

Cyert-March Model or Satisfying Theory.

The Cyert-March model says that in a modern large multiproduct firm, ownership is separate from management. Here, the firm is not considered as a single entity with a single goal of profit maximization by the entrepreneur. Instead, Cyert and March regard the modern business firm as a group of individuals who are engaged in the decision-making process relating to its internal structure having multiple goals. They emphasize that the modern business firm is so complex that individuals within it have limited information and imperfect foresight with respect to both internal and external developments. The modern business firm is a complex organisation in which the decision-making process should be analysed in variables that affect organisational goals, expectations, and choices.

6. Rothschild's Hypothesis or Security Profit

Economist Rothschild is of the view that 'there is another motive which is probably of a similar order of magnitude as the desire for maximum profit, the desire of security profits.' The firm is motivated not by profit maximization but by the objective of security profit. It implies that a firm is deciding its price and output policy does not aim at maximising its profits at a particular time or particular period. The primary goal of the firm is long-run survival.

7. **Satisfaction Maximisation**

As per the view of **ScitoVsky,** maximisation of satisfaction is the main objective of the firm and not preferring profit-maximisation. He is concerned with managerial effort and the disfavour that managers have for work. According to him, an entrepreneur would maximize profits only if his choice between more income and more leisure is independent of his income. It is due to the fact that after a certain level of profits, the psychology of the entrepreneur will be to give more preference to leisure in comparison to profits. In other words, the supply of entrepreneurship should have zero income elasticity. But an entrepreneur does not aim at profit maximisation. He wants to maximise satisfaction and keep his efforts and output below the level of maximum profits.

1.4.2 Managerial economics and decision making

The term managerial refers to the function of management. The main functions of management are decision-making and forward planning. Decision-making means the process of choosing from among available alternatives to achieve the firm's established goals.

Managerial economics is concerned with the decision-making process, decision model, and decision variables at the firm level. The managers within the firm think, take and execute decisions, either individually or collectively. These decisions may be scientific or intuitive,

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strategic or tactical, certain or uncertain, major or minor, hard or soft. All the decisions involve some degree of choice. Hence, these are economic in nature and attempt towards a solution to the problem. Business economists assist managers in using specialized skills and sophisticated techniques to solve the difficult problem of successful decision-making and forward planning. Business decisions can be classified into various categories depending upon the functional areas of the managers.

Steps in decision-making

Business economics is concerned with decision-making at the level of the firm. This decision has a far-reaching effect on the firm. Systematic efforts are required to be made to arrive at the right decision at the right time and right place. Delays in taking decisions or implementing decisions might turn things for the worse for the firm. Taking the right decisions at the right time is also important in the sense that it will keep the firm ahead of the competition in the market. The steps of decision-making are as follows –

1. Identify Business Problem
2. Defining Objective
3. Discovering Available Alternative
4. Evaluating Consequences of Various Alternatives
5. Selecting Best Alternative
6. Execution Sensitivity Analysis

1. **Identify business problems**

   In any business decision, the first step is to identify the business problem. It is a key part of the organization to understand the real problem. Businesses don't look for problems or deficiencies in their functioning unless they incur losses or when their sales go down. They often mistake their sales decline as a result of the decline in demand or an increase in inflation. But in many cases, the problem lies inwards. They fail to do proper business analysis or in managerial functions, meaning they fail to identify the real problem. For example, if the problem lies in the quality of the product and the sales go down, instead of looking into it, they think it is because of the low demand. Sometimes, there are external factors too. A change in the governmental tax policies or a real demand problem, etc can also cause problems. For example, if there is a private mobile manufacturer in the country, he has to recognize not only the demand-supply scenario in the country but also the role of government tax policy, state government taxes, goods and services taxes, etc. In short, the businesses will have to first identify the problem to deal with them.

2. **Defining objective**

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In any economic or business decision, the determination of the objective or goal of the organization is the second step in any decision-making. The most probable answer will be profit maximization. But, in the modern corporate sector, profit maximization may not be the only goal, or sometimes, may not even be the most important goal, as goals like sales maximization or growth maximization takes the centre stage. Sometimes, organizations have multiple goals like sales maximization along with customer satisfaction by going for price minimization. Some goals are mutually beneficial for most of the people within the organization. Say, if the goal is 'market share maximization'. This will make not only the sales and marketing departments happy, but the public esteem of that organization also goes up. Achieving such a goal will make the shareholders and managers very happy. A crucial factor in determining the objective is the time horizon set to achieve the goal. Further, the presence of risk and uncertainty, which makes the process of determining the objective a challenging job, should be seriously considered.

3. **Discovering Available Alternatives**

The third step involves searching for an answer to the question 'what are the various options available?' In other words, one has to explore all available alternatives. Ideally speaking, the decision maker should explore all possible alternatives and choose the best one. But that is practically not possible due to time, cost, and resource constraints. For example, in the era of globalization, there is a firm wanting to modernize its technology. It has various alternatives to choose from. Either it indigenously develops with its own Research and Development (R & D), or it gets into a joint venture with a known internationally famed company or gets into a technical collaboration. This way, one will get the latest technology and they won't have to spend a fortune or time, which are very crucial for any business to get them.

4. Evaluating Consequences of Various Alternative

Each of these alternatives has its benefits (opportunities) and limitations (constraints) that bring us to the fourth step, i.e., predicting the consequences of these alternative options available. If the firm goes for developing its own R & D, it will definitely be cost-effective, but the time horizon might be lengthened, which is crucial in the modern competitive world. On the other hand, the use of a known name in the business may get the firm started within no time. But one has to see what price the firm has to pay before going in for a joint venture. Alternatively, the firm can simply borrow the technical expertise.

5. Selecting the Best Alternative

The most important step, i.e., the fifth step of decision making (after exploring the alternatives), is the decision maker has to choose one of the alternatives, which is the most optimal and coincides with the stated objective. A variety of tools are used to reach the "optimal" decision, like marginal analysis, linear programming, game theory, etc.

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6. Execution Sensitivity Analysis

Keeping the uncertainty about the future in mind, one must always be prepared for the situation, "how should one change his optimal decision or how will the optimal decision change if one or some of the factors affecting the decision undergo change?" This is precisely the sensitivity analysis and is the sixth step in decision-making. For example, an automobile company has entered into a joint venture with a known name in the international field with the objective of sales maximization. A vital sensitivity analysis will be, what happens, if there is a recession in the economy and per capita real income of middle-class Indians falls, leading to a fall in the demand for passenger cars. Further, it is important to note that even after implementing the project, its performance must be monitored vis-à-vis expectations, so that projection errors are minimized in the future.

1.5 MARGINAL ANALYSIS AND ITS USES IN THE BUSINESS DECISION MAKING

Marginal analysis is a process by which businesses examine the variable change in adding or buying one unit of a good or service in a present set-up. In simple words, businesses calculate the net benefits of adding or buying one more unit of a good, service, or business activity in comparison to its cost.

Generally, there would be a marginal change in value, either positive or negative, when adding one more unit of a product, therefore the name marginal analysis. For example, in a factory, ten machines are used to manufacture plastic toys. The owner wants to expand his business, but he doesn't know if the expansion would be good for the business or not. He can do the marginal analysis to check the feasibility of expansion by calculating the net benefits of adding one more machine in the factory over the cost of installing the machine. If the calculation suggests a benefit, he can go for the expansion otherwise not.

When resources are scarce, managers have to be careful about utilizing each and every additional unit of resources or inputs. For example, if one has to decide whether an additional man-hour or machine-hour is to be used, it is necessary to ascertain what is the additional output expected from it. Likewise, a decision about additional investment has to be taken in view of the additional return from investment. For all such additional magnitudes of output or return, economists use the term "marginal", the examples being marginal output of labour, marginal output of machines, marginal return on investment, marginal revenue of output sold, marginal costs of production. Before using the concept of marginalism, the following points are worth noting:

(i) **Nature of Relationship among Variables be clearly stated: -** This means that the dependent variable is to be distinguished from the independent one. For instance, if sales depend on advertisement, advertisement is an independent variable and sales is

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the dependent variable, and one would talk of marginal sales of advertisement. On the other hand, if the advertisement budget depends on sales revenue, one would speak of marginal advertisement of sales.

(ii) **Independent Variable is to be changed by just One Unit: -** To work out the impact of independent variable on dependent variable, independent variable is changed by one unit for example, one additional hour of labour to find out 'marginal' output of labour or an additional one crore of investment to get 'marginal return on investment'.

(iii) **Marginal is different from Average: -** Concept of margin is not to be confused with the concept of average. For example, the average output of labour is the ratio of total output to total labour (Total output ÷ Total labour). But marginal output of labour is the ratio of change in output to one unit change in labour.

Marginal analysis is the study of variables in terms of the effect that would occur if they were changed by a small amount.

Marginal is defined as changes in dependent variable (whose value dependent on independent variable) associated with one unit change in the dependent variable

Y= f(X)

Y= dependent variable

X= independent variable

Using the symbol Δ is denoting change.

Change in the value of the independent variable X by Notation ΔX and change in dependent variable Y is ΔY.

Marginal Y= ΔY/ΔX which means change in dependent variable associated with one unit change in the value of X.

In economics the term Marginal Analysis

Table 1.1: Explains the relationship between average and marginal concepts.

No. of labours (L)	Total output (Q)	Average output (Q/L)	Marginal output (ΔQ/ΔL)
1	22	22	-
2	40	20	18
3	54	18	14
4	72	18	18

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5	95	19	23
6	120	20	25

Note: Δ is a symbol denoting change.

Facts

1. If the average output decreases, the marginal output decreases faster than the average output such that the marginal is lesser than the average (18<20,14<18).
2. If the average output remains the same, marginal output equals the average (18=18).
3. If the average output increases, the marginal output is faster than the average output (23>18,25>20).

Rules

1. Every factor labour may be paid according to the marginal product ($W=MP_L$)
2. Every good (X) maybe priced according to the marginal utility ($P_X=MU_X$)
3. Profit is maximized where marginal revenue equals to marginal cost (MR=MC)

In the instance, if these rules are not followed, the equilibrium will not be reached.

The model of marginal analysis is a very useful concept of Managerial economics to use marginalism, regarding continuous function. But if we have got decreased data, the concept of marginalism is substituted by incrementalism.

Following Types of Concepts related to Marginal analysis

1. **Marginal Revenue: -** It is the change in total revenue associated with one unit change in output sold.
2. **Marginal cost: -** It is the change in total cost following one unit change in output produced.
3. **Marginal cost pricing: -** It is the fixation of price of an item equal to the cost of producing and assignment of the item.
4. **Marginal product of labour: -** It is the change in total output due to one unit change in labour employed with other factors of production remaining constant.
5. **Marginal productivity of capital: -** It is the change in total output due to one unit change of capital.
6. **Marginal rate of substitution: -** The marginal rate of substitution of X for Y (MRS_{XY}) is defined as the amount of Y the consumer is just willing to give up getting one more unit of X and maintain the same level of satisfaction.

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7. **Marginal Rate of Technical Substitution: -** Rate at which one factor, e.g., labour is substituted for another factor input, e.g., capital, with output held constant.

Incremental Approach Vs. Marginal Analysis

Incremental analysis is especially useful in looking at trade-offs which are linear. In such cases, only the endpoints of a range need to be compared. For instance, if both the cost function and revenue function are linear for output over the range from zero to technical capacity of a plant, it is adequate to determine the incremental result of producing at capacity compared to no output at all. Also, if a choice is to be made between two technical processes which may be used to produce the same level of output, incremental approach alone can be used. Here, we cannot compare the processes in terms of marginal cost of moving from one to the other. But there is an incremental cost, associated with the change in technology and this can be studied.

On the other hand, marginal analysis is especially useful in looking at trade-offs which are determined by curvilinear functions. For example, if the cost function is curvilinear, marginal cost changes as output is increased. The concept of marginal analysis calls for unit-by-unit comparisons of marginal cost with marginal revenue as output is increased, until the best level of output is found at the point where marginal cost is equal to marginal revenue (MC=MR) Marginal (unit-by-unit) analysis can be better than incremental reasoning in several other cases:

(a) Choice of best-level of input when the input-output relationship shows diminishing returns.

(b) Choosing best product-mix as limited by commonly required scarce resources where the products substitute at decreasing rates.

(c) Choosing least cost combinations of inputs where inputs are substitutable at decreasing rates.

(d) Choosing optimum maturity of assets which gain value at decreasing rates over time.

1.6 SUMMARY

In this lesson, we discussed the nature and scope of managerial economics and how it is associated with Economics. We discussed the decision process, decision model and decision variables at the firm level. We also learnt how managers within the framework think about decisions and their execution. The main points and themes covered in the lesson are how decisions may be scientific or intuitive, strategic, or tactical, certain or uncertain, major or minor, hard or soft. Business economists assist managers in using specialised skills and

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sophisticated techniques to solve the difficult problem of successful decision-making forward planning. This is what we study in Managerial economics which is a must for all management students to learn.

1.7 GLOSSARY

Managerial economics: focuses on the application of economic theory and methodology to the solution of practical business problems.

Managerial economics: applies economic theory and methods to business and administrative decision making.

Theory of the firm: The basic model of the business enterprise is called the theory of the firm.

Profit margin or net income divided by sales, and the return on stockholders' equity, or accounting net income divided by the book value of total assets minus total liabilities, are practical indicators of firm performance.

1.8 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of Managerial Economics. Discuss the difference between Economics and Managerial economics.
2. Discuss decisions of business firms under Different objectives. Illustrate your answer with relevant examples.
3. Discussion about managerial economics is the result of the close interrelationship between management and economics.
4. Explain the concept of Marginal analysis. Discuss the difference between Marginal analysis and Incremental Analysis.
5. "Managerial economics is an integration of economic theory, decision science and business management." Comment.

Multiple Choice Questions: -

1. Which is not the subject of Managerial Economics?

   (a) Accounting Theory
   (b) Profit Management
   (c) Cost and Production Analysis
   (d) Capital Management

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2. The theory of firm also called -

(a) Macro Economics
(b) Microeconomics
(c) Welfare Economics
(d) None

3. Which among the following areas are covered by the subject managerial economics?

(a) Environmental issues
(b) Operational issue
(c) Operational and environmental issue
(d) all of them

4. When did the subject Managerial Economics gain popularity?

(a) 1949
(b) 1950
(c) 1951
(d) 1952

5. Which among the following subject studies the behaviour of the firm in theory and practice?

(a) Managerial Economics
(b) Welfare Economics
(c) Microeconomics
(d) Macro Economics

6. Managerial economics is close to……. Economics.

(a) Industrial
(b) National
(c) Business
(d) Micro

7. Which concept is not related to Marginal Analysis?

(a) Marginal Cost
(b) MRTS
(c) Marginal Revenue
(d) MPS

8. Which among the following options is correct for major theories of Business Firms?

(a) Profit Maximization
(b) Baumol's Model

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(c) Marris Model
(d) All of these

9. Who said, "Managerial economics is a study of the behaviour of Firms in theory and practice."?

(a) Malcoln E. Mc-Nair and Richard S.
(b) Milton H. Spencer & Siegelman.
(c) Bates and Parkinson
(d) Mansfield

10. Managerial economics as a subject gained popularity first in which country?

(a) USA
(b) India
(c) Germany
(d) Russia

Answers: - 1- (a), 2- (b), 3- (c), 4- (c), 5- (a), 6- (d), 7- (d), 8- (d), 9- (c), 10-(a),

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LESSON 2

THEORIES OF DEMAND

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STRUCTURE

2.1 Learning Objective
2.2 Introduction
2.3 Theories of Demand
2.4 Law of Demand
2.5 Utility Function
  2.5.1 Utility
  2.5.2 Concepts of Utility
  2.5.3 Approaches to Consumer Behaviour
2.6 Revealed Preferences Theory
2.7 Indifference Curve
2.8 Income Effect and Substitution Effect
2.9 Demand Function
  2.9.1 Determinants of Demand
  2.9.2 Elasticity of Demand
2.10 Demand Forecasting
2.11 Case Studies
2.12 Summary
2.13 Glossary
2.14 Self-assessment questions
2.15 References

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2.1 LEARNING OBJECTIVE

- To introduce the demand concepts and function
- To define the Utility and Revealed Preference Hypothesis
- To understand the use of demand forecasting and the demand schedule curve in managerial economic

2.2 INTRODUCTION

This unit will contain an analysis of demand, an indifference curve, and demand forecasting. The reader will understand that demand evaluation is an essential phase of economic and financial analysis. The producers produce and provide items to meet demand. When demand and supply are equal, the monetary conditions of the nation are in equilibrium. This demand and supply are a market force that offers dynamism to the financial stipulations of the country. The demand is now not continually static. The adjustments in demand, or elasticity of demand, offer room for managerial choice making like what to produce, how much to produce, when to produce, and where to distribute the products.

2.3 THEORY OF DEMAND

The demand for anything, at a given price, is the amount of it that will be bought per unit of time at that price. Demand means always demanding something at a price. Demand means always demanding something at a price; the term has no significance unless a price is stated or implied.

According to Chapman, 'Demand is the quantitative expression of preferences.'

According to Hansen, "quantity of a commodity that will be purchased at a particular price and not merely the desire of a thing"

Clearly, demand may be defined as the quantity of goods or services desired by an individual, backed by their ability and willingness to pay. It may be noted that demand is not the same as desire or need. Doubtless, many people who cannot afford a motor car would like one, and doubtless many children need more milk than they get, but unless desire or need is backed up by ability and willingness to pay, it does not affect the volume of sales. The demand for a thing at a given price is the amount of it that would in fact be bought at that price.

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Types of Demand:

1 **Direct and indirect demand**: The demand for consumer goods that satisfy human wants is called "direct demand." For instance, let us take the case of food, for which demand is direct, another example is demand for T-shirts On the contrary, when the same good satisfies human wants indirectly, it is known as indirect demand, or hand demand for goods that are used by producers for producing goods and services. (Example: demand for cotton by a textile mill)

2 **Joint demand and composite demand**: The demand for one commodity leading to the demand for another is known as joint demand. For example, demand for ink and paper is joint demand. On the other hand, demand is said to be composite when a thing is demanded for more than one purpose. The demand for coal and rubber is composite, as they are used for several purposes.

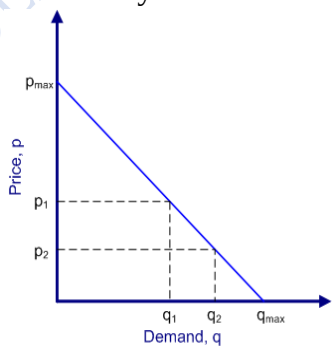
3 **Price demand**: Price demand refers to the various quantities of the commodity that the consumer will buy per unit of time and at a certain price (other things remaining the same). The quantity demanded changes with the change in price. The quantity demand increases with a fall in price and falls with an increase in price. In other words, we can say that quantity demanded, and price have a negative correlation as

$D_1 = f(P_1)$,

where D_1 = Demand for Commodity 1

f = function

P_1= Price of commodity 1



4 **Income demand (Normal Goods):** Income demand indicates the relationship between income and demand for a consumer good or service. The income demand curve shows how much quantity a consumer will buy at different levels of income. Generally, there is a positive relationship between income and consumer demand.

$D_1 = f(I_1)$,

where D_1 = Demand for Commodity 1

f = function

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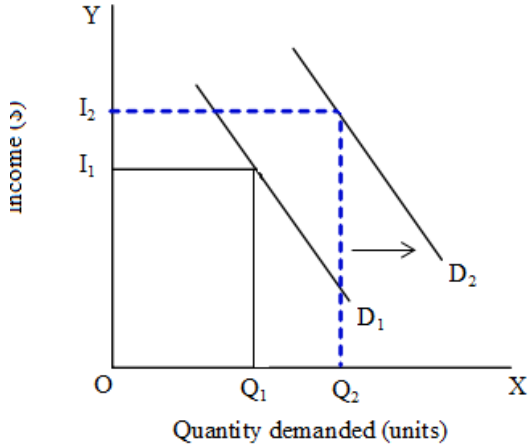
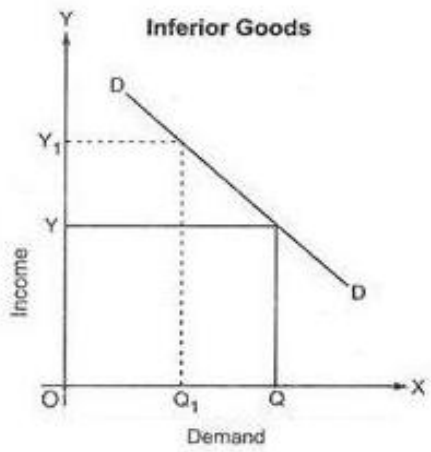
I_1= Income of commodity 1



As per the above figure indicates that as the income of the consumer increases demand also increases when income falls demand also decreases

Inferior Goods: In the case of inferior goods, the relationship between income and demand becomes negative. It is only due to the fact that, so long as the income of the consumer remains below a particular level of minimum subsistence, he will continue to buy more inferior goods even when his income increases by small increments. But when his income starts rising above the subsistence level, he reduces his demand for inferior goods. The phenomenon has been described by Sir Robert Giffen and is called the "Giffen Paradox."



5 **Cross Demand**: Cross demand refers to the relationship between quantity demand for good "A" and the price of related good "B," other things being equal. In simple words, by cross demand," we mean the change in the quantity demand of a commodity without any change in its price but due to a change in the price of related goods (i.e., B commodity).

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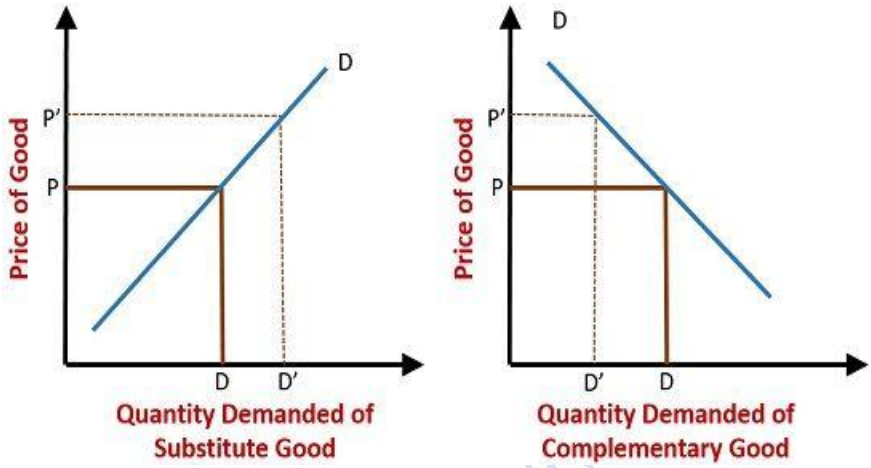
The related goods can either be substitute goods or complementary goods. The demand curve in the case of substitute goods will be upward sloping, while the demand curve for complementary goods will be downward sloping.



6 **Alternative demand**: Demand is known as "alternative" when it is satisfied by alternative ways. Let us consider the demand for light. It has an alternative demand: one can get light either from electricity, kerosene, or gas.

2.4 LAW OF DEMAND

The law of demand is one of the best known and most important laws of economic theory. This law is based on the law of diminishing marginal utility. This law states the relationship between the quantity demanded and the price.

Marshall explains the law as follows: "The amount demanded increases with a fall in price and diminishes with a rise in price''

It means that the quantity demanded increases with a fall in price and vice versa. In other words, when the price of a commodity falls, the demand for the commodity increases, and when the price rises, the demand for the commodity decreases. However, it can be explained as follows: $D_X = f(P_x, P_n, Y, T)$

Where, DX = Demand for commodity X

Px = Price of the commodity x

Pn= Price of the related commodities

Y = Income of the Consumer

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T = Taste

Assumption

According to Stigler and Boulding, the law of demand is based on the following assumptions:

- There should be no change in the income of the consumers
- There should be no change the taste of preferences of the consumers
- Price of the related commodities should remain unchanged
- There should be no change in the size of population
- The commodity in question should be a normal one
- There should be perfect competition in the market

Explanation of the law

The law of demand states that there is an inverse relation between the price and demand for a commodity. The demand for a commodity is higher at a lower price and lower at a higher price. Although, this relationship is not proportional yet, it does not mean that when prices fall by one-half, the demand for goods will double. It simply shows the direction of change in demand as a result of a change in price.

Tabular representation

Price/kg. (In Rupees)	Quantity Demanded (in Kgs.)
10	10
8	20
6	30
4	40
2	50

It is obvious from the above table that with the fall in the price per kg. quantity demand rises, and as the price goes on rising, quantity demand goes on falling. e.g., when the price of apples is Rs. 8 per kg., the quantity demanded of apples is 10 kg., and as the price falls from Rs. 8 to Rs. 2, the quantity demand of apples increases from 10 to 50 kg, thereby establishing a negative relationship between price and quantity demanded.

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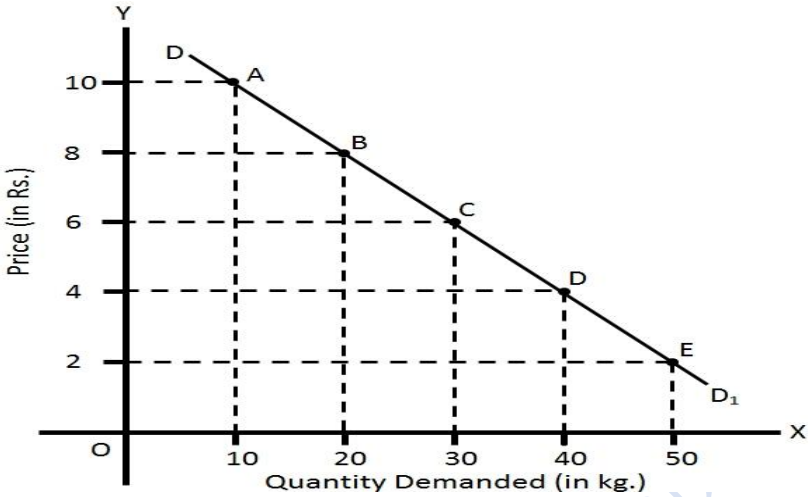

In this figure along X-axis, we measured demand for apples and along Y axis, prices of apples. if price decreases then quantity increases.

Why the Demand Curve slopes Downward?

There are several reasons responsible for the inverse price demand relationships, which have been explained as follows:

1. **Law of Diminishing Marginal Utility**: The law of demand is based on the law of diminishing marginal utility, which states that as the consumer purchases more and more units of a commodity, the utility derived from each successive unit goes on decreasing. It means that as the price of the commodity falls, the consumer purchases more of the commodity so that his marginal utility from the commodity falls to be equal to the reduced price, and vice versa.
2. **Substitution Effect:** substitution effect also leads the demand curve to slope from left to right. As the price of a commodity falls, price of substitute goods remains the same, the consumer will buy more of that commodity. For instance, tea and coffee are substitute goods. If the price of tea goes down, the consumer may substitute tea or coffee, although the price of coffee remains the same. Therefore, with a fall in price, the demand will increase due to the favourable substitution effect.
3. **Income Effect**: Another reason for the downward slope of the demand curve is the income effect. As the price of the commodity falls, the real income of the consumer goes up.

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4. **New Consumers**: When the price of a commodity falls, many other consumers who were not consuming that commodity previously will start consuming it. As a result, total market demand goes up.
5. **Psychological Effects:** When the price of a commodity falls, people tend to buy more, this is both natural and psychological. Therefore, the demand increases with the fall in prices. For example, when the price of silk falls, it is purchased for all family members.

Importance of the Law

The law of demand has great theoretical and practical importance in economics as:

1. **Price Determination**: The law of demand is useful to the monopolist in fixing the price of their products. The monopolist comes to know how much the quantity of the commodity will increase or decrease with the change in price.
2. **Importance of the Consumer**: The law of demand tells us that with the fall in price, the consumer will buy more of the commodity. On the other hand, with the increase in price, he will buy less of that commodity. Thus, the consumer maximises his satisfaction.
3. **Importance to finance minister**: The finance minister, while imposing the tax, keeps in mind the law of demand. It is the law through which he comes to know the effect of tax on the amount demanded of various commodities.
4. **Importance for Planning**: The law of demand has great importance for the planning commission. The planning commission, while framing the plan, keeps in mind not only the demand schedule but also the effect of price on a commodity.
5. **Importance for producers**: The law of demand provides guidelines to the producers regarding the production of goods whose prices have reduced. Generally, the law of demand states that, other things being equal, with the rise in price, quantity demand falls and with the fall in price, quantity demand increases. Therefore, it is for the welfare of the producers to concentrate on the production of those goods for which prices have been reduced.
6. **Importance for Farmers**: Through the law of demand, the farmers also come to know how a good or bad crop affects the economic condition of the country. If there is a good crop, the price will certainly go down, and the farmers will not be benefited more, but the rest of society will be benefited.

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2.5 UTILITY FUNCTION

2.5.1 Utility

The term 'utility' refers to that quality of a commodity by virtue of which our wants are satisfied. In other words, wants is called the utility of a good. Utility can also be defined as value in use of commodity as the satisfaction one gets from the consumption of a good, is its value-in-use. When commodities are used, they also give pleasure or pain to the consumer. Whatever the effects of goods may be, they satisfy human wants. As long as goods satisfy human wants, they are said to possess utility. It has been observed that non-material goods like the services of doctors, teachers, and artists satisfy human wants as much as material goods. Thus, where there is utility, there are non-material goods.

According to Prof. Hibdon, 'Utility is the ability of a good to satisfy a want'

According to J.S. Nicholson, "Utility" may be the quality that makes a thing desirable.

2.5.2 Concepts of Utility

The concepts of utility can be explained on the basis of the consumption of a commodity as-

1. **Initial Utility**:

   Initial utility means the utility derived from the consumption of its first unit. In other words, when the consumption of a commodity is made and the consumer gets the utility at the first stage, it is known as initial utility. It is always positive. For instance, when a man starts taking chapati or roti, the utility from the first unit obtained is the initial utility.

2. **Marginal Utility**:

   It refers to the additional utility on account of the consumption of an additional unit of a commodity. According to Prof. Boulding, "the marginal utility that results from a unit increase in consumption" Prof. Chapman says, 'Marginal utility is an addition made to total utility by consuming one more unit of a commodity'. Marginal utility can be expressed as

$$MU_{nth} = TU_n - TU_{n-1}$$

Where, MU_{nth}= Marginal utility of nth unit

TU_n= Total Utility of n units

TU_{n-1}= Total utility of n-1 units

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For example- When a consumer consumes one roti, he gets total utility equal to 10 units. By consuming second roti total utility becomes 18 units i.e., 10+8. Therefore, marginal utility of the second roti is 8 units i.e.,8= 18-10

There are three types of marginal utility:

- **Positive Marginal Utility**: When total utility increases with the consumption of a commodity, it is called positive marginal utility. Let us suppose. When one eats roti, one gets total utility at every additional unit, as 10,18,24,28,30-------- etc. We see that total utility increasing constantly. This is a case of positive marginal utility.
- **Zero Marginal utility:** Zero marginal utility is defined as no addition to the total utility by the consumption of an additional unit. In the above example, total utility reaches 30 by using the fifth unit of an article (roti). One gets the same total utility, i.e., 30 at the next unit (sixth unit). Thus, the consumer gets zero marginal utility.

3. **Negative Marginal Utility**: In the above examples, when the consumer uses the 7th unit, the total utility diminishes by using one more unit, i.e., from the 6th unit to the 7th unit, the total utility is 28 units. Therefore, at this stage, the consumer gets negative marginal utility after obtaining maximum satisfaction from the commodity, i.e., roti (28-20 = -2).

4. **Total Utility:**

Total utility means the total satisfaction received by the consumer from the consumption of all units taken together at one time. According to Leftwitch, "total utility" refers to the entire amount of satisfaction from consuming various quantities of a commodity. In mathematical terms, total utility is a direct function of the number of units of a commodity. It can be written as

$TU_X = f(Q_X)$

Where TU_x = Total utility of a commodity X

f= function of Qx

Q_X = Quantity of a commodity X

Relations between Total Utility and Marginal Utility

Quantity	Total Utility	Marginal Utility	
1	10	10	Initial Utility
2	18	18-10=8	

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3	24	24-18 = 6	Positive
4	28	28-24 = 4	
5	30	30-28 = 2	
6	30	30-30 = 0	Zero
7	28	28-30 = -2	Negative

It is clear from the table that total utility increases as a very large number of units are consumed by the consumer. At the first unit, total utility is equal to 10, which is the initial utility, and further, it is increased to 18,24,28,30. Here we must remember that this increase is at a diminishing rate, but still has positive utility. At the 6th unit, total utility is constant, i.e., 30 units, and later on starts declining at an increasing rate. At the 7th unit, total utility is recorded as 28 units. Therefore, we can say that total utility goes on increasing as long as the marginal utility of a commodity remains positive.

On the other side, at the first unit of consumption, marginal utility is equal to 10, and on successive units, it goes on falling until 5th unit of commodity is consumed. At the 6th unit, marginal utility becomes zero, the point of full satisfaction or saturation. Here, the consumer gets maximum satisfaction. At the 7th unit, marginal utility is -2 i.e., negative. This is the point of over satisfaction.

2.5.3. Approaches of the consumer Behaviour

There are two approaches of consumer behaviour i.e.

a) Cardinal Approach – Marshallian View
b) Ordinal Approach – Hickian View

Cardinal approach

Under cardinal approach there are two main laws i.e., i) law of Diminishing Marginal Utility ii) Law of Equi-Marginal Utility

i) Law of Diminishing Marginal Utility

This law was first given by the French engineer, Gossen. According to this law, as an individual continues to consume a commodity, the marginal utility obtained from its additional units goes on diminishing. For example, when one man is hungry and finds to get roti, the utility is maximum for the first unit of roti. At the second time (by eating a second Roti), one gets less utility. This process goes on, and utility at every step continues to diminish. Therefore, it is called Gossen's First Law. Dr. Marshall explained the law in a better way. He says that "the additional benefit that a person derives from a given increase in his stock of things diminishes with every increase in the stock that he already has."

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According to Chapman, "the more we have of something, the less we want additional increments of it, or the more we want not to have additional increments of it'

According to Anatol Murad, 'The law states that, other things being equal, the marginal utility of a stock decreases as the quantity of the stock increases."

According to Samuelson, "as the amount consumed of a good increase, the marginal utility of the good leads to decrease'

Assumptions:

The main assumptions of the law are as stated as:

- Utility can be measured in cardinal number like 1,2,3……. n units.
- The utility of a commodity depends on its own quantity rather than the quantities of other commodities.
- The law applies only when the commodity is continuously consumed
- All units consumed by the consumer are same in all respect i.e., same colour, shape, and taste etc.
- Marginal utility of money remains constant
- There is no change in the price of the commodity and its substitute.
- There is no change in the taste, habits, fashion of the consumer.

Explanation of the law

Units	Total Unity	Marginal utility
1	12	12 Initial utility
2	20	8
3	26	6
4	30	4 Positive utility
5	32	0
6	32	-2
7	30	-4 Negative

Above table shows that total utility is 12 from the first unit, and as more and more units are consumed and bought, total utility increases and further by 20, 26, 30, 32……. up to 4 units at a diminishing rate. At the fifth unit, total utility is constant, and after that, total utility goes on diminishing. On the other hand, marginal utility refers to the subsequent increment in total utility. It is clear from the table that the first units yield 12 marginal utilities. This will satisfy the consumer's desire to some extent, and the intensity of that desire will decrease. At

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the second unit, one gets less marginal utility than at the first unit. Similarly, at the third unit, one gets less marginal utility as compared to the second unit. This process will go up to the fourth unit. Therefore, the fifth unit may yield zero marginal utility. Now, if the consumer is forced to take six units, it will upset the entire system, and the consumer gets zero utility. In other words, the consumer will get the negative marginal utility at six units, one gets negative, i.e., -2, followed by a -4 marginal utility. In short, we may conclude from the above analysis that as the consumer buys more and more units of a commodity, the marginal utility from each successive unit will continue to decrease.

Diagrammatical Representation of the law

In this figure, units of a commodity are measured on X-axis whereas utility on Y-axis.

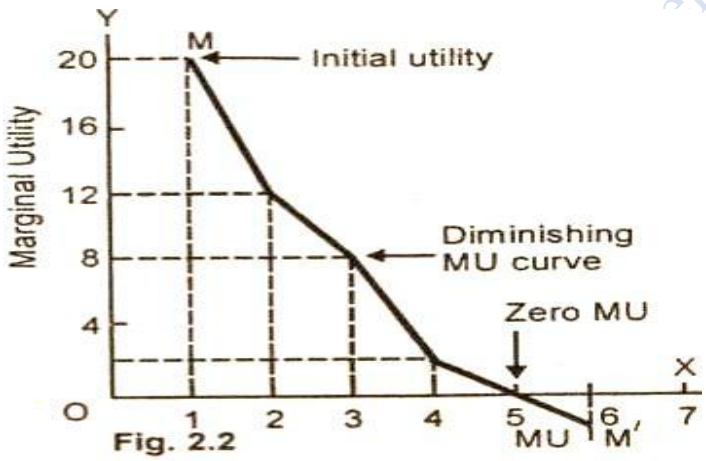

Fig. 2.2

MU is the marginal utility curve, which slopes downward from left to right. It shows that the first unit of the commodity yields 20 units, the second 12 units, and so on. At the 5th unit, one gets zero marginal utility. Here, the MU curve touches the X-axis at point MU. At the 6th unit, one gets negative marginal utility, and therefore, the MU curve goes below the X-axis. Therefore, marginal utility from an additional unit goes on decreasing, and so on.

Exceptions of the law

The law is universally applicable if all assumptions are fully met. But in practical life, it is not so. Therefore, there are exceptions, which are briefly discussed below:

- **Rare Things**: The foremost exception to the law is that it does not apply in the case of certain rare things like stamps, coins, etc. But this exception cannot be regarded as genuine because the assumption of homogeneity is violated.
- **Initial Stages**: When the initial units of a commodity are used in less than an appropriate quantity, the marginal utility of additional units increases.

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- **Public Goods:** In the case of public utility goods, marginal utility from additional increases. But this assumption is contrary to the law of diminishing marginal utility.
- **Misers:** It is stated that as the stock of money with a miser increases the greed for acquiring more and more money increases. It means the law of diminishing marginal utility does not apply in the case of misers.
- **Things of Display**: The present law is also not applicable in the case of display. For instance, in case of fashion and taste, the law is not properly applicable.
- **Discontinuous Consumption**: The law of diminishing marginal utility does not apply if there is time lag between the use of commodity. It requires the continuous consumption for its application.
- **Music or Poetry**: It is said that by hearing music or poetry for the second time, we get more satisfaction than the first hearing. Thus, the hearing of music and poetry is another exception of the law.

ii) Law of Equ-marginal Utility

The law of equi-marginal utility was propounded in the 19th century by a French engineer named Gossen. The law is nothing but an extension of the law of diminishing marginal utility. The law of diminishing marginal utility applies in the case of a single commodity. In reality, the consumer does not consume one commodity but a number of commodities at a given time. Therefore, for this purpose, we have to extend the law of diminishing marginal utility, which we call the Law of Equi-Marginal Utility. It is also called Gossen's second law. Moreover, different economists have called it differently. Dr. Marshall has called it 'Law of Maximum Satisfaction'

Statement of the Law

The law of equi-marginal utility may be defined as under:

According to **Dr. Marshall,** 'If a person has a thing which he can put to several uses, he will distribute it among these uses in such a way that it has the same marginal utility in all'

$MU_a/P_a = MU_b/P_b = MU_n/P_n$

According to **Samuelson**, 'A consumer gets maximum satisfaction when the ratio of marginal utilities of all commodities and their price is equal.

According to **Lipsey**, 'The household maximizing its utility will so allocate its expenditure between commodities that the utility of the last penny spent on each is equal'

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According to **Hicks,** 'Utility will be maximized when the marginal unit of expenditure in each direction brings the same increment of utility'. It means

$MU_1=MU_2=MU_3$

Assumption:

The law of equi-marginal utility is based on the following assumptions:

- Every consumer wants to maximize his satisfaction
- Price of the commodity remains constant. No change in the prices of substitutes or complimentary goods.
- Income of the consumer remains constant.
- Commodities can be divided and sub-divided into the required commodities.
- Marginal Utility of money remains constant.
- Consumer has a rational behaviour.
- No change in money, taste, fashion, habits, and customs of the consumer.

Explanation of the law

Let us suppose that the consumer must spend Rs. 5 on two different commodities viz. mangoes and oranges. Further, we assume that price of each of the commodities is Rs. 1. Marginal utilities of different units of mangoes and oranges are shown in the table:

Unit Rs.	M.U. of mango	M.U. of Orange
1	8(2)	10(1)
2	6(4)	8(3)
3	4	6(5)
4	2	4
5	1	2

Let us assume that at one time, the consumer spends his income on one commodity. The consumer spends first rupee on oranges which yields him 10 units of marginal utility. From the second rupee, he gets utility equal to 8 units. Now as one goes on spending more and more, the marginal utility goes on falling. On the other hand, if the consumer spends first rupee on mangoes, he gets 8 unit of utility. Bit as one goes on spending more and more on oranges; the marginal utility of oranges goes on diminishing. Moreover, if the consumer spends Rs. 5 on oranges then he will buy only oranges, which gives 30 units of utility (10+8+6+4+2=30). Thus, as the consumer wants to buy two commodities, he will spend first rupee on oranges and second on mangoes, again third on oranges. Similarly, the consumer

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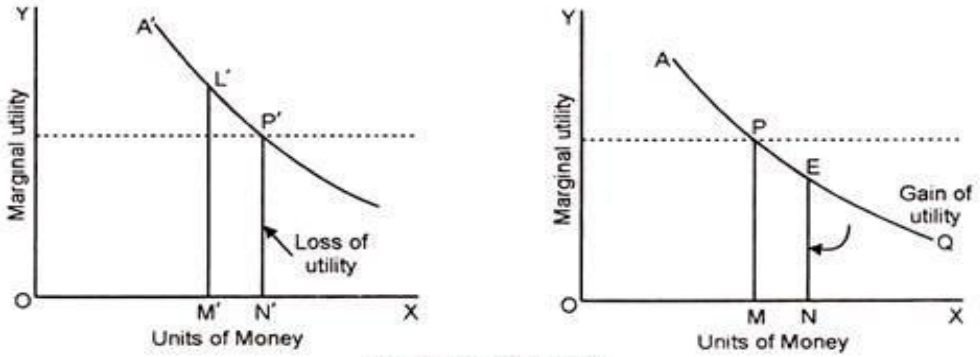
will spend fourth and fifth on mangoes and oranges respectively. In this way the consumer enjoys maximum satisfaction.

Diagrammatic representation



Equi. Marginal Utility

In this figure, units of money have been taken on the X-axis and the marginal utility of both commodities on the Y-axis. The figure depicts that at a given level of income, i.e., Rs. 5, the consumer would spend Rs. 3 on oranges and Rs. 2 on mangoes. In the case of mangoes, the consumer is in equilibrium at point P, while it is at point P1 in the case of oranges. The consumer finds that when Q = Q1, he gets maximum satisfaction. Moreover, if the consumer spends Rs. 3 on oranges, the utility gained is equal to the PMNE. On the other hand, if the consumer spends Rs. 2 on oranges, the loss in utility will be equal to L'M'N'P. So, it is clear that the loss of utility is greater than the gain. Thus, it is not worthwhile to buy any other proportion than 3 units of oranges and 2 units of mangoes.

Modern Statement of the Law

Modern economists have given a new name to this law as 'Law of Proportionality'. According to them, a consumer yields maximum satisfaction only when the ration of marginal utilities derived from different goods and their prices is equal. For example: the price of commodity-X is paise 50 and the consumer buys 10 units. The consumer gets 10 units of marginal utility from 10th unit. In the same way, if the price of the commodity-X is paise 25 and the consumer buys 12 units, he gets 3 units from the 12th unit. The formula to calculate the marginal utility according to modern economists is as under:

$$MU_a/P_a = MU_b/P_b = \ldots\ldots\ldots\ MUn/P_n$$

Importance of the law

Let us explain the significance of the law from the following points:

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1. **Consumption**: Every consumer wants to get the most satisfaction from their limited income. The income of the consumer is limited, while his wants are multiple. Therefore, if a consumer spends his limited income on different commodities in such a way that the last unit of the commodity yields equal marginal utility, he will get maximum satisfaction.

2. **Public Finance:** The law of substitution has also its importance in the sphere of public finance. By public finance, we mean the revenue and expenditure activities of the government. At the time of levying taxes, the finance minister takes help. He levies taxes in such a way that the marginal social sacrifice (MSS) of each taxpayer is equal.

3. **Exchange:** The law also applies to exchange. Exchange means replacing of goods which gives him less utility for another which yields more utility.

4. **Production:** Every producer in the market wants to get maximum Profit. Therefore, in order to achieve this objective, the producer has to use several factors for production.

5. **Distribution:** The law of equi-marginal utility gives us explanation about the distribution of national income. Distribution is done in such a way that in the long period every factor of production gets it share according to its marginal productivity. Therefore, in order to have such a distribution, factors have to be substituted.

Limitations or Exceptions of the Law

The following are the limitations of the law:

1. **Irrational Behaviour of the Consumer**: This law is based on the assumption that every consumer is rational but in real sense, consumer acts in irrational manner. His behaviour is greatly influenced by habits, advertisements, fashions etc. Under these cases, he fails to avail maximum satisfaction.

2. **Utility is subjective**: The law stands nowhere as consumer's behaviour is based on his psychology. It is difficult to measure one's psychology or utility as it is possible in case of heat or energy.

3. **Unrealistic Assumption**: This law is based on false unrealistic assumptions like homogeneous products, constant fashion, taste, habits etc. But this is wrong as they go on changing in a dynamic world.

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4. **Marginal Utility of money is not constant**: The law of equi-marginal utility is based on the assumption that marginal utility is constant. In real life, it is not so. The utility of money goes on decreasing with the passage of time, when there is a change in the price of a commodity.

5. **Ignorance of the consumer**: It is a fact that a common consumer does not possess complete knowledge of all commodities and their prices in the market. Moreover, prices are subject to change. Therefore, ignorance of the consumer is a biggest hindrance, so the law does not apply properly.

6. **Invisible Good**: Another limitation of the law is that it is not applicable in case of invisible goods. There are certain goods which cannot be divided or sub-divided i.e., T.V., car, freeze etc. If these commodities are divided, they will lose their utility. In such cases this law is not applicable.

7. **Durable Goods**: Still another limitation of the law persists as it is difficult to measure the utility in respect of durable goods such as car and machinery.

8. **Scarcity of the Good**: In the present world, there is acute shortage of some commodities, and the consumer is compelled to purchase an alternative or substitute goods in the market. In such cases, it is very difficult to measure the utility of such commodities.

2.6 REVEALED PREFERENCE THEORY

Prof. Samuelson's Revealed Preference Theory is a behaviourist ordinal utility analysis as distinct from the introspective ordinal utility theory of Hicks and Allen. It is the third root of the logical theory of demand and has been called by Hicks the "direct consistency test" under strong ordering. This theory analyses consumers' preferences for a combination of goods on the basis of observed consumer behaviour in the market.

Samuelson's theory is based on the premise that choice reveals preference. Keeping this fact in mind, a consumer buys a combination of two goods because he likes this combination in relation to others, because it is cheaper than others. Suppose the consumer buys combination A rather than combinations, or D. It means that he reveals his preference for combination A. He can do this for two reasons. First, combination A may be cheaper than the other combinations B, C, D. Second combination A may be dearer than others, and even then, he likes it more than other combinations. In such a situation, it can be said that A is revealed to be preferred to B, C, D or B, C, D are revealed inferior to A.

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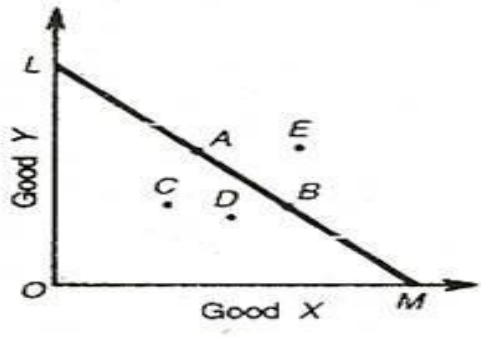

Given the income and prices of the two goods X and Y, LM is the price-income line of the consumer which shows the various combinations of X and Y on the given price-income situation LM. In other words, the consumer can choose any combination between A and B on the line LM or between C and D below this line. If he chooses A, it is revealed preferred to B. Combinations C and D are revealed inferior to A because they are below the price-income line LM. But combination E is beyond the reach of the consumer being dearer for him because it lies above his price-income line LM. Therefore, A is revealed preferred to other combinations.

Assumptions:

The revealed preference hypothesis is based on the following assumptions:

- The consumer's tastes do not change
- His choice for a combination reveals his preference for that.
- The Consumer chooses only one combination at a given price income line
- He prefers a combination of more goods to less in any situation
- It assumes consistency in consumer behaviour. If A is preferred to B in one situation, B cannot be preferred to A in the other situation. This is the two-term consistency, according to Hicks which must satisfy two conditions on a straight-line curve: a) If A is left of B, B must be right of A; b) if A is right of B, B must be left of A. This is the Hick's Direct Consistency Test under strong ordering.
- This theory is based on the assumption of transitivity. Transitivity, however, refers to the three- term consistency. If it is preferred to B, and B to C, then the consumer must prefer A over C. This assumption is necessary for the revealed preference theory if consumer is to make a consistent choice from given alternative situations.

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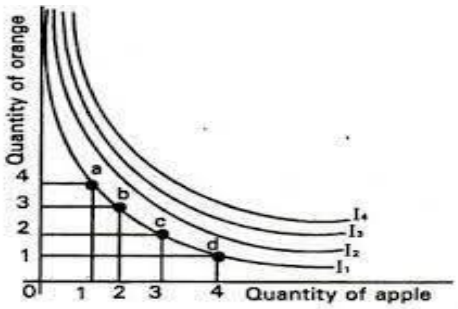
2.7 INDIFFERENCE CURVE

The indifference curve analysis measures ordinal utility. It explains consumer behaviour in terms of his preferences or rankings for different combinations of two goods, say X and Y. An indifference curve is drawn from the indifference schedule of the consumer. The latter shows the various combinations of the two commodities, such that the consumer is indifferent to those combinations. An indifference schedule is a list of combinations of two commodities, the list being so arranged that a consumer is indifferent to the combination, preferring none of the others.



A curve which is a diagrammatic presentation of indifference set. It shows different combination of two commodities (like apples and oranges) between which a consumer is indifferent. Each combination offers him the same level of satisfaction.

Assumption of the law

The indifference curve analysis remains some of the assumptions of the cardinal theory, rejects others and formulates its own. The assumptions of the ordinal theory are the following:

i) The consumer acts rationally so as to maximize satisfaction.

ii) These are two goods X and Y

iii) The consumers possess complete information about the prices of the good in the market.

iv) The prices of the two goods are given.

v) The consumer's taste, habits and income remain the same throughout the analysis.

vi) The consumer arranges the two goods in a scale of preferences which means that he has both 'preference' and 'indifference' for the goods.

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2.8 INCOME EFFECT AND SUBSTITUTION EFFECT

Income Effect

As the price of the commodity falls, the real income of the consumer goes up. Real income is that which is measured in terms of goods and services. For example, a consumer has Rs. 10, and wants to buy oranges whose price is Rs. 20 per dozen. It means the consumer can buy one dozen oranges with his fixed income. Now suppose the price of oranges falls to Rs. 7 per dozen, which leads to an increase in his real income of Rs. 3. In this case, either the consumer will buy more quantity of oranges than before, or he will buy some other commodity with his increased income.

For most goods, the income effect asserts that as a product's price declines (increases), an individual's real income (purchasing power) increases (decreases). The increase in real purchasing power resulting from a fall in prices enables the individual to consume greater quantities of a commodity, while the opposite is true for an increase in prices. In other words, an increase in real purchasing power generally (although not always) leads to an increase in quantity demanded. The goods of the types for which this phenomenon holds are referred to as "normal goods." Unfortunately, the income effect does not always have the expected positive effect on the quantity demanded of a good. In some cases, as an individual's purchasing power increases, the quantity demanded for that good fall. Goods of this type are called inferior goods. Examples of such goods may be potatoes, bus tickets, soup bones, and bologna. We will return to this issue shortly when considering separately the effect of changes in money income on the demand for goods and services.

Substitution Effect

The substitution effect also leads the demand curve to slope from left to right. As the price of a commodity falls, prices of its substitute goods remain the same, the consumer will buy more of that commodity. For instance, tea and coffee are substitute goods. If the price of tea goes down, consumers may substitute tea for coffee, although the price of coffee remains the same. Therefore, with a fall in price, the demand will increase due to favourable substitution effect. The substitution effect reflects changes in consumers' opportunity costs. The substitution effect states that as a product's price declines, consumers will substitute the now less expensive product for similar goods that are more expensive.

In the majority of cases, the income effect and the substitution effect complement and reinforce each other. That is, declines in the price of a good will not only have a positive substitution effect, but will also have a positive income effect as well. As a result, the ordinary demand curve will be downward sloping. Even in the case of inferior goods, where

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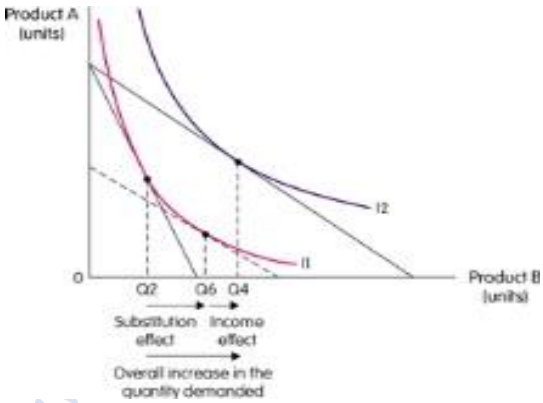
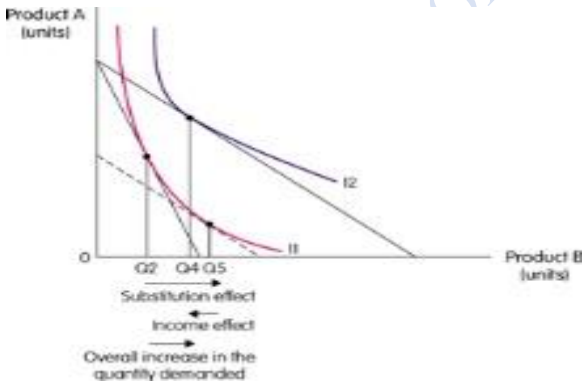
the income effect is negative, the ordinary demand curve will exhibit a downward slope because the substitution effect, which is always positive with a drop in price, outweighs the negative income effect.

Therefore, the substitution and income effects will generally work in the same direction, causing consumers to purchase more as the price falls and less as the price rises. The indifference curve can be used to separate these two effects.

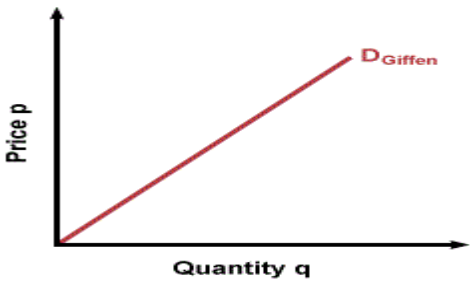
- In the case of **a normal good**, higher real income leads to an increase in quantity demanded, this complements the increase due to the substitution effect. This change is shown in the diagram below:



- In the case of an **inferior product**, the income effect leads to a fall in the quantity demanded, which will work against the substitution effect. In the following diagram, the substitution effect is Q2 Q5; the income effect is Q5 Q4. However, the substitution effect outweighs the income effect and overall, the quantity demanded rises. The overall change in quantity demanded results in an increase of Q2 Q4. This means the demand curve is downward sloping because a price fall increases the quantity demanded.



- When a good is inferior and the income effect outweighs the substitution effect, it is called a **Giffen good**. This is, however, unlikely, because the substitution effect is almost always stronger than the income effect.



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2.9 DEMAND FUNCTIONS

The demand function is a function that describes how much of a commodity will be purchased at the prevailing prices of that commodity and related commodities, alternative income levels, and alternative values of other variables affecting demand. Price is not the only factor that determines the level of demand for a good. Another important factor is income. The rise in income will lead to an increase in demand for normal commodities. A few goods are named as inferior goods for which demand will fall when income rises. Another important factor that influences the demand for a good is the price of other goods. Other factors that affect the demand for a good apart from the above-mentioned factors are:

Changes in Population

Changes in Fashion

Changes in Taste

Changes in Advertising

A change in demand occurs when one or more of the determinants of demand change and it is expressed in the following equation.

$Q_d X = f (P_x, P_r, Y, T, E_y, E_p, Adv.)$

Where,

$Q_d X$ = quantity demanded of good 'X'

P_x = the price of good X

P_r = the price of a related good

Y = income level of the consumer

T = taste and preference of the consumers

Ey = expected income

E_p = expected price

Adv = advertisement cost

The above-mentioned demand function expresses the relationship between the demand and other factors. The quantity demanded of commodity X varies according to the price of income (Y), commodity (Px), the price of a related commodity (Pr), expected income (Ey), taste and preference of the consumers (T), and advertisement cost (Adv) spent by the organization.

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2.9.1 Determinants of Demand:

There are many economic, social and political factors or determinants which greatly influence the demand for a commodity. Some of these factors are as follows:

1. **Price of a commodity**: The foremost significant factor which influences the demand is the price of the commodity. As the price of a commodity changes, it causes an inverse change in the demand for commodity.

2. **Price of Related Goods**: Demand for commodity is also influenced by the change in the price of related goods. These goods are of two types viz. substitute goods or complementary goods. Substitute goods are those which can replace each other's in use like tea and coffee while the complimentary goods are those which are jointly demanded as petrol and car etc.

3. **Income of the consumer**: Income of the consumer is another factor which influences demand. Generally, there is direct relation between income of the consumer and his demand. The demand for normal goods rises with an increase in income and falls with a fall in income. In the case of inferior goods, the demand falls with an increase in income and rises with decrease in income.

4. **Distribution of wealth**: The amount demanded of a commodity is also influenced by the distribution of wealth in society. If there is an equal distribution of income in the society, the demand will be higher and in case of inequality demand will be less.

5. **Tastes and preferences**: Taste and preferences of the consumer also influence the demand to a great extent. They include fashion, habits, customs, advertisement, climate, new inventions etc.

6. **Government Policy**: Government policy is also responsible to influence the demand for the commodity. The government imposes taxes on various commodities which lead to increases in the price of commodities. As a result, demand goes down.

7. **Population Growth**: The growth of population is another determinant to influence the demand of a commodity. Increase in population leads to an increase in demand for all types of goods whereas decrease in population means less demand for such commodities.

8. **State of Business**: The demand for commodities also depends on business conditions prevailing in the country or region

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2.9.2 Elasticity of Demand

In economics, the term "elasticity" means a proportionate (percentage) change in one variable relative to a proportionate (percentage) change in another variable. The quantity demanded of a good is affected by changes in the price of the good, changes in the price of other goods, changes in income, and changes in other factors. Elasticity is a measure of just how much of the quantity demanded will be affected by a change in price or income. Elasticity of demand is a technical term used by economists to describe the degree of responsiveness of the demand for a commodity due to a fall in its price. A fall in price leads to an increase in quantity demanded, and vice versa. The elasticity of demand may be as follows:

- Price Elasticity
- Income Elasticity and
- Cross Elasticity

i) Price Elasticity

The response of consumers to a change in the price of a commodity is measured by the price elasticity of the commodity demand. The responsiveness of changes in quantity demanded due to changes in price is referred to as price elasticity of demand. The price elasticity of demand is measured by dividing the percentage change in quantity demanded by the percentage change in price.

Price Elasticity = Proportionate change in the Quantity Demanded /Proportionate change in price = Percentage change in quantity demanded/Percentage change in price

$$(\Delta Q/Q)/(\Delta P/P)$$

ΔQ = change in quantity demanded

ΔP = change in price

P = price

Q = quantity demanded

The following are the possible combination of changes in Price and Quantity demanded. The slope of each combination is depicted in the following graphs.

1. **Relatively Elastic Demand** (Ed >1) a small percentage change in price leading to a larger change in Quantity demanded.

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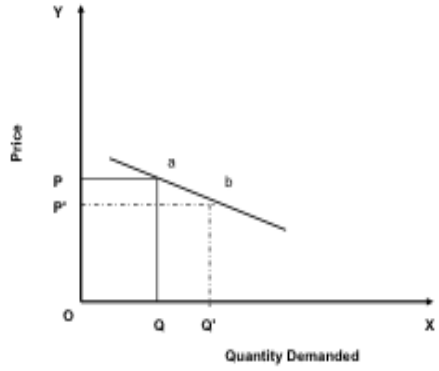
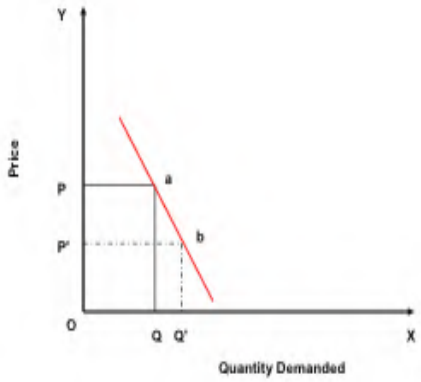
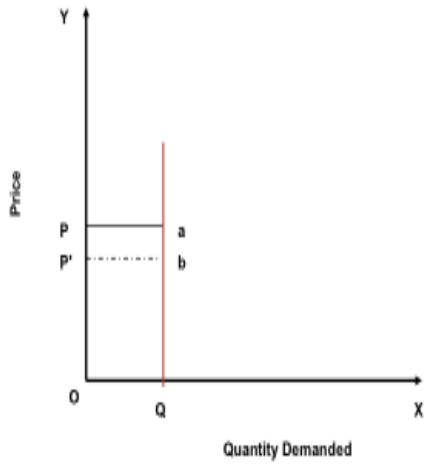


2. **Perfectly Elastic Demand** (Ed = ∞) a small change in price will change the quantity demanded by an infinite amount.



3. **Relatively Inelastic Demand** (Ed < 1) a change in price leads to a smaller percentage change in quantity demanded.



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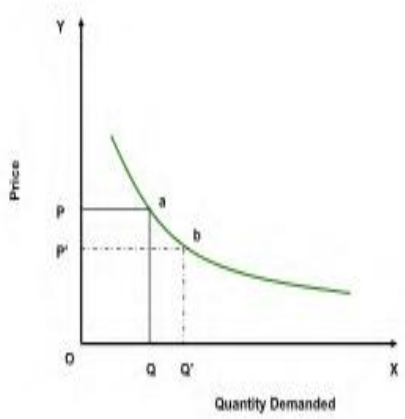
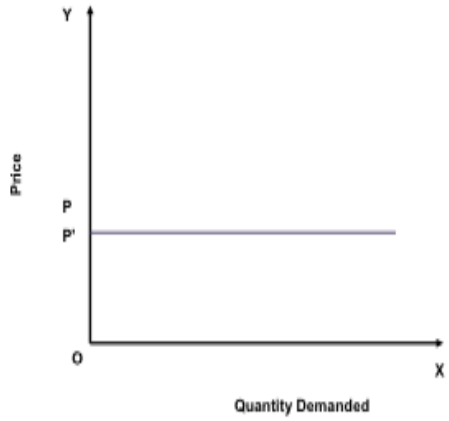
4. **Perfectly Inelastic Demand** (Ed = 0) the quantity demanded does not change regardless of the percentage change in price.



5. **Unit Elasticity of Demand** (Ed =1) the percentage change in quantity demanded is the same as the percentage change in price that caused it.



ii) Income Elasticity

According to Stonier and Hauge: 'Income elasticity of demand shows the way in which a consumer's purchase of any good changes as a result of change in his income'.

It shows the responsiveness of a consumers purchase of a particular commodity to a change in the quantity demanded to the percentage change in income.

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$$\text{Income Elasticity of Demand} = \frac{\text{Percentage Change in Quantity Demand } (\Delta D/D)}{\text{Percentage Change in Income } (\Delta I/I)}$$

$$\text{Income Elasticity of Demand} = \frac{(D_1 - D_0) / (D_1 + D_0)}{(I_1 - I_0) / (I_1 + I_0)}$$

The following are the various types of income elasticity:

Zero Income Elasticity: The increase in income of the individual does not make any difference in the demand for that commodity. (Ei = 0)

Negative Income Elasticity: The increase in the income of consumers leads to less purchase of those goods. (Ei < 0).

Unitary Income Elasticity: The change in income leads to the same percentage of change in the demand for the good. (Ei = 1).

Income Elasticity is Greater than 1: The change in income increases the demand for that commodity more than the change in the income. (Ei > 1).

Income Elasticity is Less than 1: The change in income increases the demand for the commodity but at a lesser percentage than the change in the Income. (Ei < 1).

iii) Cross Elasticity

It is the ration of proportionate change in the quantity demanded of Y to a given proportionate change in the price of the related commodity X. It is a measure of relative change in the quantity demanded of a commodity due to change in the price of its substitute complement. It can be expressed as-

$$\text{Cross Price Elasticity of Demand Formula} = \frac{\text{Percent Change in a Quantity of Good A}}{\text{Percent Change in the Price of Good B}}$$

If two commodities are unrelated goods, the increase in the price of one good does not result in any change in the demand for the other goods. For example, the price fall in salt does not make any change in the demand for car.

Use of Elasticity of Demand:

1. Useful for Business: It enables the business in general and the monopolists in particular to fix the price.
2. Fixation of Price: It is very useful to fix the price of jointly supplied goods

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3. Fixation of Wages: It guides the producers to fix wages for labourers.
4. In the sphere of international trade: It is of greater significance in the sphere of international trade.
5. Effect on employment: The effect of machines on employment opportunities depends on the elasticity of demand for the goods produced by such machines.

2.10 DEMAND FORECASTING

Demand forecasting refers to the prediction or estimation of a future situation under a given constraint. In a sense, knowledge of future demand is crucial for both new firms and those planning to expand their scale of production. Since the output is to be sold, since virtually nothing can be produced overnight, sales forecasts are required to determine the quantity of production. Therefore, a forecast is a prediction of a future event. It implies measurement of that event, which may not be per cent accurate since that much accuracy is not possible in view of the uncertainties of the future. A demand forecast will help the manager take effective decisions.

Objectives of Demand Forecasting:

The major short run decisions are:	The major long run decisions are:
• Purchase of inputs • Maintaining of economic • level of inventory • Setting up sales targets • Distribution network • Management of working capital • Price policy • Promotion policy	• Expansion of existing capacity • Diversification of the product mix • Growth of acquisition • Change of location of plant • Capital issues • Long run borrowings • Manpower planning

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Requirements for good demand forecasting

Demand forecasting for a commodity cannot be made merely through guess work. It requires a detailed understanding of the current and future conditions of the market in which the firms producing the commodity operate. Such understanding can be obtained through market research. For easy understanding, we may list the elements of basic requirements of demand forecasting as below:

(A) Elements Connected to Consumers

- Total number of consumers

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- Distribution of consumer Products
- Total purchasing power and per capita/household income
- Income elasticities
- Consumer tastes, social customs
- Consumer Marketing details: where they do buy and when etc.
- Effect of design, colour, etc. on consumers' preferences.

(B) Element Concerning the Suppliers

- Current level of sales
- Current Stock of goods
- Trends in sale and stocks
- Market share
- Pattern of seasonal fluctuations
- Research and Development trends
- Company strength and weakness
- New product possibilities

(C) Elements Concerning the Market

- The effect of price change i.e., price elasticity
- Product characteristic
- Identification of competitive and complementary products
- Number and nature of competitors
- Forms of market competition
- General price levels
- Prices of similar goods

Steps involved in Demand Forecasting

To have an efficient, accurate, and meaningful forecast, the management should proceed according to a systematic plan. The various steps involved in demand forecasting, are discussed as follows:

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1. **Clarity of objectives:** To have an efficient forecasting, one should have a clarity of objectives. It will remove the difficulties involved in the way of forecasting. A firm may use the concept to determine various things viz, allocation of funds for sale promotion, fixation of price, inventory control etc. The forecasting will differ for each and every approach.
2. **Selection of Goods:** Before, forecasting the entrepreneur might have to select the goods for which forecasting has to be made whether, it is for consumer and capital goods for existing goods.
3. **Selection of Method:** Another step involved in demand forecasting is the selection of method according to which forecasting must be made. In fact, the scope and success of a particular method depends upon the area of investigation, degree of accuracy required, availability of data etc.
4. **Interpreting the Results:** The last but not least is the interpreting of the results. It is based on certain assumption. If there happens to be a change in the assumptions involved in forecasting, the revision of forecast will become almost inevitable.

Methods or Techniques of Demand Forecasting

Demand forecasting is a difficult exercise as consumer's behaviour is most unpredictable. It is motivated and influenced by multiplicity of factors. Economists and statisticians have tried their best to develop several methods of demand forecasting. These methods are explained:

A) Consumer's Survey Method

This method uses the most direct approach to demand forecasting by directly asking the consumers about their future consumption plan. In this method, the burden of forecasting goes to the buyers. This method is very simple and free from statistical burden. It is of three types:

i) Complete Enumeration Survey
ii) Sample Survey
iii) End-Use Method

i) **Complete Enumeration Survey**: In the complete enumeration survey, the probable demands of all the consumers for the forecast period (as given by consumers themselves) are summed up to have the sales forecast for the forecast period. For example, if there are n consumers and their probable demands for commodity X in the forecast period is X_1, X_2, X_3……X_n , the sales forecast would be

$$X= X_1+X_2+X_3……. +X_n$$

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ii) **Sample Survey**: Under the sample survey method, the probable demand expressed by each selected unit summed up to get the total demand of sample units in the forecast period. It is then blown up to find the total demand in the market. That is, the total sample demand is multiplied by the ratio of number of consuming units in the sample.

This method when carefully applied gives good results especially for the new products and brands. Proper care should be taken in choosing a sample size which should not be too big.

The advantages of sample survey over complete enumeration method are:

- This method is simple
- This method is less costly
- Less possibility of data error

B) **End Use method**: The sale of a product under consideration is projected on the basis of a demand survey of the industries using this product as an intermediate product. The demand for the final product is the end-use demand for the intermediate product used in the production of this final product. However, an intermediate product may have many end-uses (like steel, which can be used in agricultural machinery, construction, etc.). It may have demand in both domestic and international markets. The demands for final consumption and exports net of imports are estimated through some other forecasting method, and the demand for intermediate use is estimated through a survey of its user industries regarding their production plans and input-output efficiencies. Then the sum of final consumption demand and export demand net of imports of any commodity can be obtained with the help of an input-output model.

C) **Opinion Poll Method**: The opinion poll methods aim at collecting opinions of those who are supposed to possess knowledge of the market, e.g., sales representatives, sales executives, professional marketing experts and consultants. The opinion poll method consists of:

- Expert- opinion method
- Delphi-method
- Market studies and experiments

D) **Statistical Methods**: In the theory of demand forecasting, the statistical techniques have proved to be useful. Statistical techniques are used to maintain objectivity as well as precision in demand forecasting. Here, statistical methods have been

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explained which utilize historical and cross-section data for estimating long-term demand. Statistical methods are considered to be superior techniques of demand estimation for the following reasons.

- The element of subjectivity in this method is minimum
- Method of estimation is scientific
- Estimation is based on the theoretical relationship between the dependent and independent variables.
- Estimates are relatively more reliable
- Estimation involves smaller cost

Merits of Consumer Survey Method:

The advantages of this method are as under:

- This method does not require mathematical calculations
- This method is based on the first-hand knowledge of the salesman.
- It is useful to forecast the sales of new products
- This method does not require any historical data

Demerits:

Although, this method has certain advantages, yet it suffers from the following disadvantages as:

- It is only a subjective approach
- It is suitable only for short-term forecasting
- Salesman lacks vision and may not foresee the influence of several unknown factors
- Individual industry will have to depend on some other method to estimate the future demand of its product for final consumption.

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Qualities of a good Demand Forecasting

The world is changing rapidly with the introduction of new techniques of production and highly development of infrastructure. As there are several methods of demand forecasting, it is essential to notice some qualities of a good forecasting. However, following criteria should be adopted for forecasting:

1. **Simplicity:** Any mathematical techniques of demand forecasting may be simple so that it may deliver better results.

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2. **Accuracy:** For forecasting, statistical data is pre-requisite. Therefore, data may be undertaken which is accurate, correct and dependable.
3. **Easy availability:** The results of a demand forecast must be easily available and well understand.
4. **Economy:** Another quality of a good demand forecast that it must be economical. Generally, a firm keeps a balance between the benefits and the extra cost of providing the improved forecasting.

Importance of Demand Forecasting

Demand forecasting is of great significance for decision making in modern business. The main points of importance are summarized below:

1. **Planning of Production**: It is a pre-requisite for planning of production in a firm. A firm has to expand its capacity according to the likely demand for its output. Otherwise, the capacity will be wasted

2. **Sales Forecasting**: Sales forecasting depends much on the demand forecast. Promotional efforts of the firm should be based on demand forecasting.

3. **Control on Business Activities**: For Satisfactory control of business inventories (raw materials, intermediate goods, semi-finished products and finished products) need regular estimates of future requirements which can be derived only from the demand forecasts.

4. **Decision/Policy making**: Demand forecasting is necessary for deciding about the growth rate of the firm, its long-term investment programmes and financial planning.

5. **Useful for Stability**: Demand forecasting is useful for stabilizing the production and employment within the firm. If dependable demand forecasts are available for the firm, then the firm can more easily design its business operation to counter the cyclical and seasonal changes in the demand for its good.

To select the appropriate forecasting technique, the manager/forecaster must be able to accomplish the following:

- Define the nature of the forecasting problem
- Explain the nature of the data under investigation
- Describe the capabilities and limitations of potentially useful forecasting techniques.

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- Develop some predetermined criteria on which the selection decision can be made.

2.11 CASE STUDIES

2.11.1 Case Study-1

Mr. Ashish Ranjan, an economist, at XYZ Limited, has estimated that if there is a one percent increase in the price of textiles the demand for Textiles would come down buy 1.2%. Similarly, if food prices go up by 1% the demand for textiles would decline by 0.96%. Finally, if there is 1% increase in the share of agriculture in the national income, then the demand for Textiles would go up by 0.4 %.

Price elasticity is an area where active intervention by the mills can contribute to the expansion of demand. The margins in the textile business as shown by CII and agrile and Vishakha study vary from 26% to 46% (this includes margins of manufacturers, wholesalers, semi-wholesalers and retailers). If the distribution system could be rationalized so as to bring down the final price of cloth, then by exploiting price elasticity alone, demand can go up.

Questions

1. Identify the various types of demand elasticity's relevant to textile demand in India.
2. What role has been visualized for price elasticity of demand for textiles in India?
3. If price of cloth is reduced by 14% how much will be the demand increases?

2.11.2 Case Study-2

A not-so-popular Nordic bridge [1]

It was not quite what the planners had in mind when Sweden and Denmark opened their expensive bridge across the Oresund strait in July. After an early boost from summer tourism, car crossings have fallen sharply, while trains now connecting Copenhagen, the Danish capital, and Malmo, Sweden's third city, are struggling to run on time. Many people think the costs of using the bridge are simply too high. And, from the point of view of Scandinavian solidarity, the traffic is embarrassingly one-sided: far more Swedes are going to Denmark than vice versa. So last week the authorities decided to knock almost 50% off the price of a one-way crossing for the last three months of this year. The two governments, which paid nearly $2 billion for the 16km (10-mile) state-owned bridge-communal, reckoned that, above all, it would strengthen economic ties across the strait and create, within a few years, one of

[1] 'A not-so-popular Nordic bridge', The Economist, 7 October 2000 assessed on 04.11.2022 https://www.economist.com/europe/2000/10/05/a-not-so-popular-nordic-bridge

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the fastest-growing and richest regions in Europe. But ministers on both sides of the water, especially in Sweden, have been getting edgy about the bridge's teething problems. Last month Leif Pagrotsky, Sweden's trade minister, called for a tariff review: the cost of driving over the bridge, at SKr255 ($26.40) each way, was too high to help integrate the region's two bits.

Businessmen have been complaining too. Novo Nordisk, a Danish drug firm which moved its Scandinavian marketing activities to Malmo to take advantage of 'the bridge effect', has been urging Danish staff to limit their trips to Malmo by working more from home. Ikea, a Swedish furniture chain with headquarters in Denmark, has banned its employees from using the bridge altogether when travelling on company business, and has told them to make their crossings –more cheaply if a lot more slowly – by ferry. The people managing the bridge consortium say they always expected a dip in car traffic from a summer peak of 20,000 vehicles a day. But they admit that the current daily flow of 6,000 vehicles or so must increase if the bridge is to pay its way in the long run. So, they are about to launch a new advertising campaign. And they are still upbeat about the overall trend: commercial traffic is indeed going up. The trains have carried more than 1m passengers since the service began in July. Certainly, the bridge is having some effect. Many more Swedes are visiting the art galleries and cafes of Copenhagen; more Danes are nipping northwards over the strait. Some 75% more people crossed the strait in the first two months after the bridge's opening than during the same period a year before. Other links are being forged too. Malmo's Sydsvenska Dagbladet and Copenhagen's Berlingske Tidende newspapers now produce a joint Oresund supplement every day, while cross-border ventures in health, education and information technology have begun to bear fruit. Joint cultural ventures are also underway. And how about linking eastern Denmark more directly with Germany's Baltic Sea coastline, enabling Danes to go by train from their capital to Berlin in, say, three hours? Despite the Danes' nej to the euro, it is still a fair bet that this last much-talked-about project will, within ten years or so, be undertaken.

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Questions

1. Explain why the demand for the bridge is likely to be price-elastic.
2. If the Swedish government estimates that the price elasticity is −1.4, calculate the effect on traffic using the bridge, stating any assumptions.
3. Why is the calculation above not likely to give an accurate forecast for the long term?

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2.11.3 Case Study-3

Jewellery is the name of the game[2]

Once upon a time, there was a saying, 'old is gold'. Today, the mantra is 'gold is old'. The latest fashion trend is off diamond jewellery. This shift in preference from gold to diamond jewellery was bound to happen. It doesn't take a degree in nuclear physics to figure out that in today's changing economic environment, consumption patterns are being dictated by the youth. And for them, gold is flashy and Gaudy. The biggest problem with gold jewellery is that you can't wear it all the time. The bulk of the gold jewellery owned by consumers is worn only on a special occasion and then put away in a locker. Diamond jewellery, on the other hand, is practical and ideal for daily or casual use.

Many gold jewellery dealers believe that one reason why people are shifting away from gold jewellery is because of the decline in gold prices. A few years ago, trading at Rs. 5600 per ten grams, whereas today, it is trading at rupees 4200 per 10 grams. This dealer believes if gold prices start to rise, the preference of people will shift once again to gold. Could there be any truth in this theory? No, perhaps not. These people need to go back to school and brush up on their economics. One way of looking at this issue is that because people are shifting their preference to diamonds, the demand for gold has gone down. Because there is less demand for gold, the price for gold is low. Because the craze for diamond jewellery is increasing, it is unlikely that the demand for gold will increase and therefore it is unlikely that the price of gold will increase.

Questions

1. Do you agree with the above inference? explain
2. Is it a case of changes in personal preferences, social perception, fashion trends or capital valuation of the two kinds of jewellery?
3. Do you visualize a significant shift over time given the income and spatial distribution of India's population?

2.12 SUMMARY

This unit has presented the basic elements of demand, consumer preference pattern and utility function, demand forecasting. The law of demand states that other factors are held constant nt, the quantity demanded is inversely related to price. Other factors that affect demand are: i) income of consumers; ii) price of related product; iii) tastes and preferences; and iv) number

[2] Mehta, P.L., 'Managerial Economics: Analysis, Problems AND Cases', p.70.

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of buyers. The law of demand is also verified with the help of marginal utility and indifference curve analysis. The main points highlighted in this unit are:

- A change in the quantity demanded refers to a movement along a particular demand curve caused by a change in the price of the good. It is also known as the Extension and contraction of demand.
- A change in demand refers to a shift of demand curve the resulting from a change in consumer preferences, income, or prices of related goods.
- When an increase in the price of one good results in increased demand for other goods, then the two goods are said to be substitutes
- When an increase in the price of one good results in a decreased demand for other goods, then the two goods are said to be complements.
- When the price of one good increases/decreases but the demand for other goods does not change, then the two goods are unrelated.
- When the consumer consumes additional units of a good, the marginal utility of that good declines. This is known as the law of diminishing marginal utility.
- As an additional unit of a good provides lesser and lesser utility to the consumer, the consumer will buy these additional units only at a lower price. Hence, the law of demand states that more is demanded at a lower price.
- A consumer maximizes his total utility by allocating his income among goods on the basis of the law of equi-marginal utility which states that for the best allocation of income the marginal utility per rupee in each good must be equal.
- An indifference curve is the locus of points representing all such combinations of the two goods which give equal satisfaction.
- Indifference curves have the properties of negative slope, convexity, and non-intersection. A higher indifference curve means higher utility.

2.13 GLOSSARY

- **Demand**: it refers to various amounts of a commodity that a consumer is ready to buy at different possible prices of the commodity.
- **Individual demand schedule:** this is a table showing various quantities of a commodity that a consumer is ready to buy at different possible prices of the commodity at a point of time.

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- **Market demand schedule**: it is a schedule showing various quantities of a commodity which all the buyers in the market are ready to buy at different possible prices of the commodity at a point of time.
- **Demand curve**: this is a graphic representation of the demand schedule.
- **Law of demand** expresses an inverse relationship between the price of a commodity and its quantity demanded. It means that other things being equal, the demand for a commodity falls with a rise in its price and rises with a fall in its price. Geometrically, it is represented by a downward-sloping demand curve.
- **Exception of the law of demand** occurs in case of i) articles of distinction ii) Giffen goods and iii) ignorance of the buyers.
- **Shift in the demand curve** occurs when demand for a commodity is related to factors other than the price of the commodity. When more is demanded at the same price there a is forward Shift in the demand curve when less is demanded at the same price, there is a backward shift in the demand curve. A forward Shift in the demand curve is a situation of increase in demand. A backward Shift in the demand curve is a situation of decrease in demand.
- **Normal good** is that good whose income effect is positive and price effect is negative.
- **Giffen good:** a special case of inferior good. In the case of such goods, a fall in price induces a reduction in quantity demanded (because of a very strong negative income effect)
- **Inferior good:** a product whose consumption decreases as income increases (i.e., its income elasticity is negative)
- **Income effect:** it refers to a change in quantity demanded of a commodity when the real income of the consumer changes owing to a change in the price of the commodity.
- **Indifference curve**: The locus of points representing the combination of the two goods all of which give equal satisfaction to the consumer.
- **Marginal rate of substitution:** the rate at which the consumer is prepared to give up one good for acquiring another good.

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- **Derived demand:** the demand for products or factors that are not directly consumed but go into the production of a final product. The demand for such a product or factor exists because there is demand for the final product.
- **Substitute good**: A product that is similar to another and can be consumed in place of it. Two goods are substitute if the quantity consumed of one increase when the price of the other increases.
- **Complementary good:** a product consumed in conjunction with another product two goods are complementary if the quantity demanded of one increases when the price of the other decreases.
- **Price effect:** change in the consumption of the good due to a change in the price of the good.
- **Utility**: the amount of satisfaction by consuming a good or service.
- **Substitution effect**: an increase in the quantity of the good whose price falls after income has been so 'adjusted' that the real purchasing power of the consumer remains the same as before.

2.14 SELF-ASSESSMENT QUESTIONS

MCQ Questions:

1. When there is a change in demand leading to a shift of the Demand Curve to the right, at the same price as before, the quantity demanded will-

   a) Decrease b) Increase c) Remain the same d) Contract

2. An exceptional demand curve is one that moves-

   a) Upward to the right b) Downward to the right c) Horizontally d) Vertically

3. Revealed Preference Theory was propounded by-

   a) Adam Smith b) Marshall c) P.A. Samuelson d) J.S. Mill

4. If two commodities are complements, then their cross-price elasticity is

   a) Zero b) Positive c) Negative d) Imaginary Number

5. 'Law of Demand' implies that when there is excess demand for a commodity then–

   a) Price of commodity falls

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b) Price of Commodity remains the same

c) Price of Commodity rises

d) Quantity demanded of the commodity falls

6. Which one of the following factors does not shift the demand curve for a product to the right?

   a) Successful advertising

   b) A fall in the price of its complements

   c) A rise in the price of its substitutes

   d) A fall in the price of the product itself

7. A movement along the demand curve of a non-economic good?

   a) Income of the consumer b) Its own Price c) Taste of the consumers

   d) Expectations of the Consumer

8. The term optimum allocation on consumer's expenditure on consumer's expenditure on various goods and services is used in-

   a) Giffen paradox b) Law of demand c) Law of equi-marginal utility

   d) Law of diminishing marginal utility

9. A high value of cross-elasticity indicates that the two commodities are-

   a) Very good substitutes b) Good complements c) Poor substitutes d) Poor complements

10. Marginal Utility has no place in an ordinal theory because it is-

    a) Not observable b) Subjective c) Introspective d) Additive

11. Total Utility of a commodity can be found by-

    a) Multiplying price by the number of units

    b) Adding up the marginal utility of all units

    c) Multiplying the number of units by marginal utility

    d) None of these

12. In the case of an inferior commodity, the income elasticity of demand is

    a) Infinity b) Unitary c) Negative d) Positive

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13. Income elasticity of demand will be zero when a given change in income brings about-
    a) The same proportionate change in demand
    b) A more than proportionate change in quantity demanded
    c) A less than proportionate change in quantity demanded
    d) No change in demand
14. Indifference curve is downward sloping from left to right since more X and less Y give

    a) Less satisfaction b) More Satisfaction c) Equal Satisfaction d) Maximum Satisfaction
15. The indifference curve which is 'L' shape represents

    a) Perfect Complementarity b) Perfect Substitutability c) No Substitutability

    d) Non-complementarity

Answers

1.b 2.b 3.c 4.c 5.c 6.b 7.b 8.c 9.a 10. d 11. b 12.c 13.d 14.c 15.a

Short Question

1. Retail out the types of demand.
2. Point out any two determinants of demand.
3. Write down the main assumption of law of demand
4. Explain the following: Marginal Utility, Initial utility, Total Utility
5. What do you mean by utility?
6. Briefly explain Revealed Preference hypothesis.
7. What do you mean by Income elasticity?
8. What do you know about cross elasticity of demand?
9. Describe the qualities of a good demand forecasting
10. Discuss the various methods of demand forecasting

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Long Question

1. State the law of demand. What are exceptions of it?
2. Define price elasticity of demand and distinguish its various types. Discuss the role of price elasticity of demand in managerial decisions.
3. Why is demand analysis essential for successful production planning and capital expansion?
4. What are the assumptions of the law of diminishing marginal utility?
5. Give the relationship between marginal utility and total utility.
6. Examine the law of diminishing Marginal Utility. What is its assumption, expectations, and importance?
7. Explain the law of equi-marginal utility. What are its assumptions, limitations, and usefulness?
8. What is the significance of demand forecasting? What are the steps involved in forecasting demand?
9. Define the concept of Demand forecasting. Explaining its objectives in economic theory.
10. Explain the Law of demand. Explain the exceptional situation when the demand for a commodity may increase even when its price increases.
11. Discuss the various methods of demand forecasting.
12. Define the indifference curve and its assumption with income and substitution effect.
13. What is the elasticity of demand? Draw the various degrees with diagrams.
14. The enrolment in 10 top business schools in India went up from 2200 in 1980 to 3800 in 2000, while the average tuition fee per year went up from Rs. 6000 to Rs. 72000 during the same period. Does this imply that the demand curve for quality education is upward-sloping? Comment.
15. Distinguish between:
    - i) Derived demand and autonomous demand
    - ii) Demand schedule and demand function
    - iii) Superior and inferior goods
    - iv) Complementary goods and substitutes

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LESSON 3

THEORY OF PRODUCTION

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STRUCTURE

3.1 Learning Objectives
3.2 Introduction
3.3 Production Function
 3.3.1 Production and cost
 3.3.2 Concepts of Production
 3.3.3 Relationship between Average Product and Marginal Product
3.4 Production in the Short run
 3.4.1 Law of variable Proportion
 3.4.2 Economies of Scale of Production
3.5 Production in the Long run
 3.5.1 Returns to Scale
 3.5.2 Isoquants
 3.5.3 Choice of Input Combination
3.6 Summary
3.7 Glossary
3.8 Answers to In-text Questions
3.9 Self-Assessment Questions
3.10 References
3.11 Suggested Readings

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3.1 LEARNING OBJECTIVES

The objective of this lesson is to introduce students to the concept and working of Production in both the short run and long run. This lesson will equip students with the necessary theory and techniques and the ability to apply them to inform and enhance

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managerial decision-making along with the use of Economic tools to explain the optimal allocation of resources within the firm and also use the tools of economic theory to obtain optimal production.

3.2 INTRODUCTION

In previous lessons, we have looked at demand, supply and how the interaction of demand and supply affects market price. According to the Law of Supply, firms are willing to produce and sell more when the price is higher and hence the supply curve is upward-sloping. This lesson will examine firm behaviour and supply-side decision-making.

We will understand firms and their profit-maximizing goals. we will identify the most profitable level of production for a firm and how its costs vary with output. Firstly, we will have a look at short-run production, when a firm can vary only one factor of production which is called the law of diminishing returns. The second part deals with the long run when all the factors of production are variable. We will also discuss how firms make decisions to achieve maximum profits.

Many forms are operating in an economy at different scales, some are large-scale firms operating within the country, some are multinational organizations, and some are small-scale firms. Every firm uses a different proportion of factor of production according to the scale of an operation like there might be several Pizza outlets like Domino, Pizza Hut etc. in your city but there might be only one dry cleaner shop. Many firms in a particular area determine their pricing and efficiency.

Managerial decision-making involves four types of production decisions:

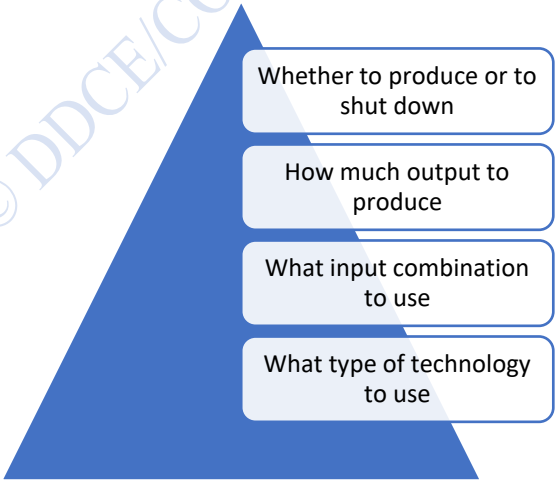

Fig. 3.1 Production Decision-Making (Solman, 2006)

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3.3 PRODUCTION FUNCTION

3.3.1 Definition:

Production and Cost

Production is the total amount of goods and services produced in a given year and the cost incurred to produce these goods and services is called costs of production.

Production Function

It is the relationship between inputs i.e. factors of production (Land, labour, capital and entrepreneur) to produce a certain level of output.

Q= f (Land, Labour, Capital, Entrepreneurship)

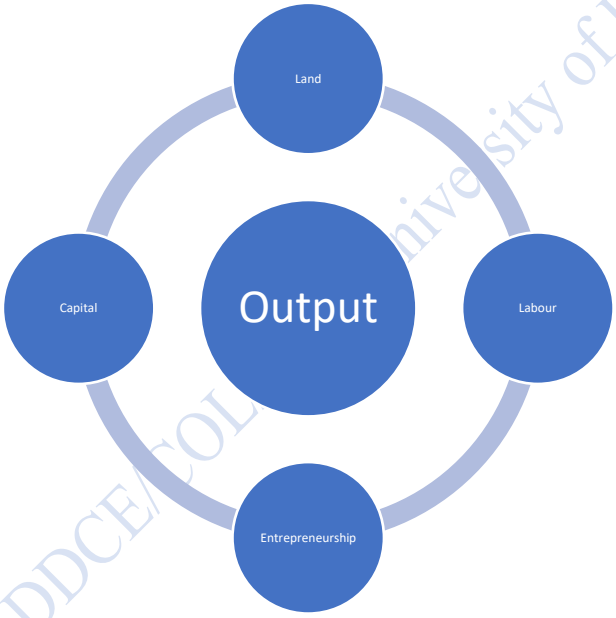

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Fig 3.2: Production Function

Figure 3.2 explains the four factors of production namely Land, Labour, Capital and Entrepreneurship and their relationship with output.

Production Function in Long Run and Short Run

The Long Run is a period long enough for all inputs or factors of production to be variable as far as an individual firm is concerned. The Output will be increased by changing both labour and capital.

The Short Run is a period so brief that the amount of at least one input is fixed and others

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are variable say if capital is a fixed input and labour, is a variable. Hence, an increase in production during this period is possible only by increasing the variable input.

The length of time necessary for all inputs to be variable may differ according to the nature of the industry and the structure of a firm

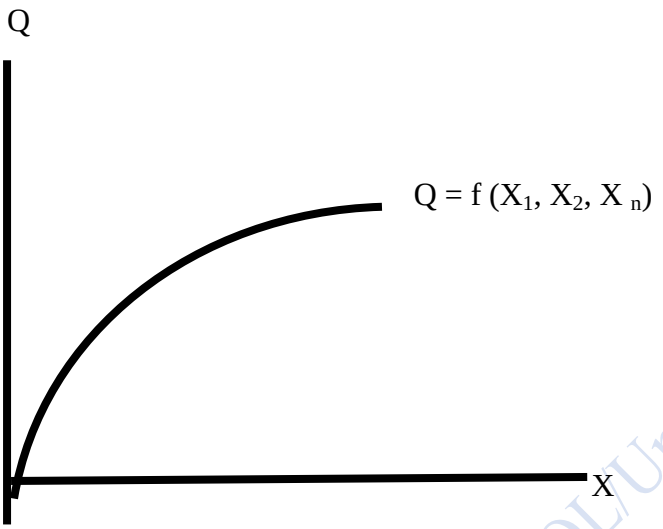

Figure 3.3 Production Function

Figure 3.3 depicts the production function. The X-axis represents the inputs and Y-axis represents the output. The curve shows the relationship between input and output, given the state of technology.

$Q = f (X_1, X_2, X_n)$

where Q stands for the output of a good per unit of time, X1 for labour, X2 for land (or natural resources), X3 for capital, X4 for a given technology, X5 for Entrepreneurship and F refers to the functional relationship function with many inputs cannot be depicted on a diagram.

Hence, economists use a two-input production function. If we take two inputs, labour and capital, the production function assumes the form.

Q = F (L, K)

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Relevance to Business

Homogeneous Production Function helps businesses in deciding the optimal use of inputs, given the input prices. For example, if he has to double the output, he knows by how much proportion he needs to increase the input as the production function is linear homogeneous.

ACTIVITY

A Fisherman notices the relationship between number of hours spent catching the fish and the number of fishes caught:

Hours	No of Fishes
0	0
1	10
2	18
3	24
4	28
5	30

1. What is the marginal product of each hour spent fishing?
2. Draw Fisherman's production function with the help of data and explain its shape.

3.3.2 Concepts of Production

Total Product: It refers to the maximum amount of output that can be produced by combining one variable factor with a fixed factor of production.

Average Product: It refers to the ratio of the total product to the total units of the variable factoremployed in producing a certain level of output.

AP = TP/L

Marginal Product: It refers to the change in total output while producing one additional unit of a variable factor.

MP = Change in TP / Change in variable factor = ΔTP/ΔL

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Labour	Total product	Average product= TP/L	Marginal product = **ΔTP/ΔL**
1	10	10	-
2	24	12	14
3	39	13	15
4	52	13	13
5	61	12.2	9
6	66	11	5
7	66	9.4	0
8	64	8	-2

Table 3.1 – Total Product, Average Product and Marginal Product

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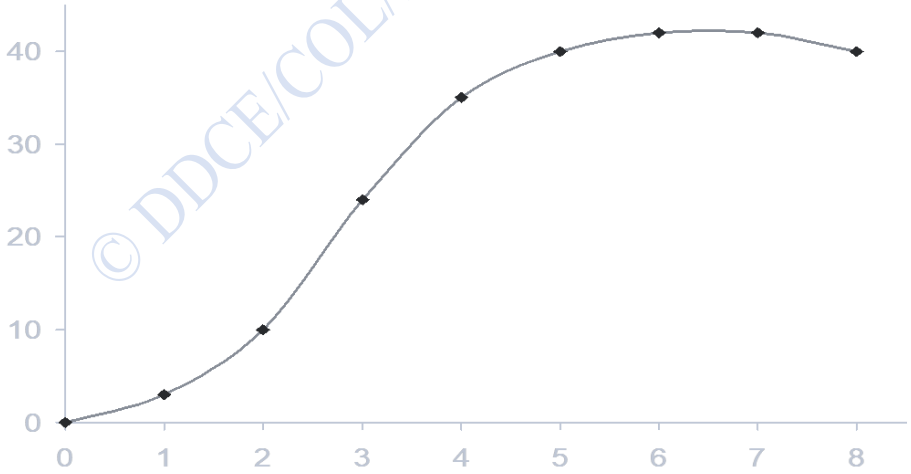

Quantity

No of workers

Fig. 3.4 Total Product

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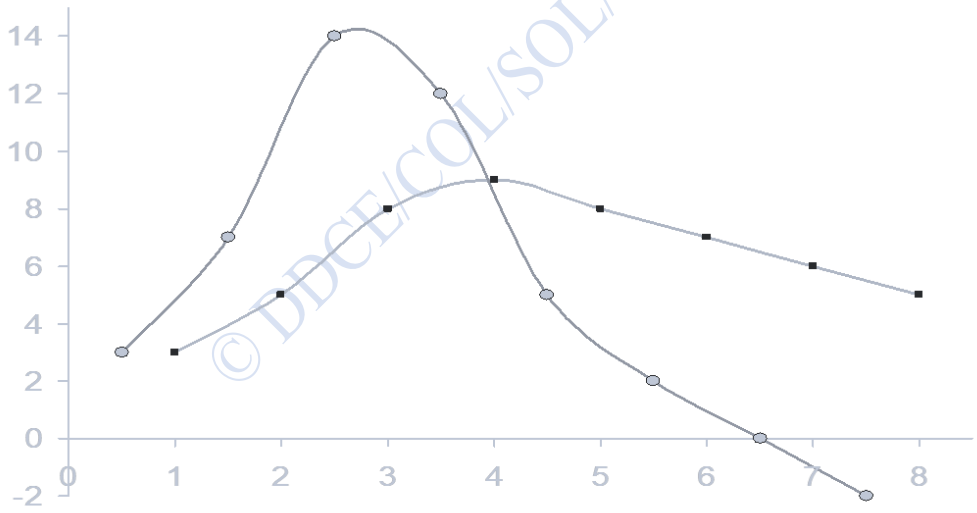
The total product (TP) curve represents the total amount of output that a firm can produce with a given amount of labour. As the number of labour changes, total output changes. The total product curve is a short-run curve, meaning that technology and all inputs except labour are held constant. This assumption is keeping the other factors constant. In figure 1.4, X-axis is the number of workers and the Y- axis is the quantity. The S-shaped total product curve has an economic meaning. At the lower end, where the number of workers and quantity is low, the curve is convex. Convexity means that when the number of workers is added, production increases at an increasing rate. This happens as more workers are added at low production levels, they can specialize in tasks and more can work more efficiently using the fixed inputs as specialisation is possible. In the middle production range, the slope of the total product curve gets flattered, and the shape of the curve becomes concave. Concavity means that production increases but at a decreasing rate. The economic interpretation of concavity is that as more workers are added, there is less and less specialization available and the workers are less and less efficient in using the fixed inputs. Finally, the total product curve hits a maximum point after which output decreases with each additional worker. After the maximum is reached, additional employees don't add anything valuable and are not productive and unable to use the fixed inputs efficiently. This pattern can be observed in figure 3.4 and Table 3.1.

Quantity



No of workers

Fig. 3.5 Average Product and Marginal Product

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Average Product

The average product (AP) is output per worker. It can be defined as the total product divided by the quantity of the variable input (i.e., the number of workers) employed. In Table 1.1 different values of labour are given and they can be determined at different levels of input. Thus, the average product of labour is maximum at 5 units of labour. Figure 1.5 graphically illustrates the average product of labour. The average product of the labour shows the efficiency of the input factor.

The first unit of labour produces 10 units of output and the second unit of labour (when combined with the first unit and the fixed resources used) produces 24 units and so on. Thus, the average product for one unit of labour is 10 and for two units of labour is 12. An important point to note in this context is that when two units of labour are employed, the average product of labour increases. This shows two units of labour are more efficient than one unit. This does not necessarily mean that the second unit of labour is more efficient than the first unit.

The increase in average labour productivity when the second unit of labour is employed in the production process is a result of more efficient use of both the fixed factor of production and the first unit of labour. The reason could be an increase in productivity and the production process becoming more specialized. This can also help managers in measuring the productivity of each labour and they can accordingly reward labour because of higher per capita productivity.

Marginal Product

The marginal product may be defined as the rate of change in total output associated with the employment of one additional unit of the variable factor. The marginal product of labour (MPL) can be computed as

MPL=dQ/dL

The marginal product of labour is measured by the slope of the total product curve at a particular point, dQ/dL. The slope of the total product curve is initially positive meaning positive MP_L, then zero MP_L where the total product is constant and finally negative MP_L.

Alternatively, marginal product per unit of labour input can be calculated over an input range by simply relating the absolute change in output (ΔQ) to the absolute change in the variable (factor) input (ΔL). Thus, when the second unit of labour is employed, MP_L per unit is:

Average $M/P_L = \Delta Q/\Delta L = (24-10)/ (2-1) = 14$

Thus, over the range from one to two units of labour, the average marginal product is 14 units.

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This distinction between the marginal value at a single point on a curve and the marginal value between the two points on a curve can play important role in making managerial decisions related to cost and output.

3.3.3 Relationship between Marginal Product and Average Product

1. When Marginal Product > Average Product, Average Product rises.

   Till the point the marginal product curve lies above the average product curve, the average product curve will rise. The implication is that the average efficiency of the variable factor is increasing.

2. When Marginal Product < Average Product, Average Product falls.
3. When marginal product must be equal to average product, they both are at their maximum.
4. The point at which average product reaches its maximum is the point of maximum production that can be achieved in the short run, but this may not necessarily be the point at which profits will be maximized for that cost need to be considered as well.

3.4 PRODUCTION IN THE SHORT RUN

IN-TEXT QUESTIONS

1. Production theory can be divided into which of the below?
   A. Short
   B. Long
   C. Intermediate
   D. Both A&B
2. "The length of time necessary for all inputs to be variable may differ according to the nature of the industry and the structure of a firm". Is the statement true or false?
   A. True
   B. False
3. Long-run production function is related to _____.
   A. Law of Demand
   B. Law of Increasing Returns
   C. Laws of Returns to Scale
   D. Elasticity of Demand

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4. Production function is expressed as _____.
   A. Qx = Px
   B. Qx = f (A, B, C, D)
   C. Qx = Dx
   D. None of these
5. Long-run production function is related to _____.
   A. Law of Demand
   B. Law of Increasing Returns
   C. Laws of Returns to Scale
   D. Elasticity of Demand

3.4.1 Law of Variable Proportion

Holding all factors constant **except one,** the law of diminishing returns says that:

As additional units of a variable input are combined with a fixed input, at some point the additional output (i.e., marginal product) starts to diminish.

Assumptions

- A Production function is associated with a specific period.
- The level of technology is constant.
- The factors of production are divisible.
- There are only two factors of production namely labour and capital.
- The Supply of factors is inelastic in the short run.

The three stages of the law of variable proportions are as follows:

1. Increasing marginal returns- is the range of production for which increases in variable input led to an increase in the average product.
2. Diminishing marginal returns - is the range of production for which increases in variable input led to a decrease in the average product while the marginal product remains non-negative.
3. Negative marginal returns – is the range for which the use of variable input corresponds to negative values for its marginal product

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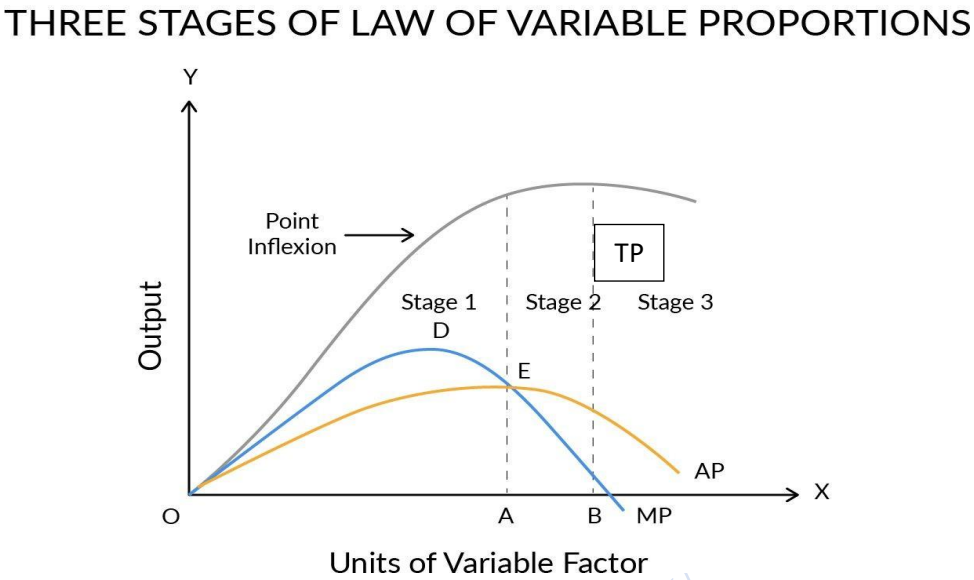

Fig. 3.6 Law of Variable Proportion

In figure 1.6, the X- axis represents labour (Units of variable factor) and Y-axis represents Output. TP is the total product curve. Up to point A, the total product is increasing at an increasing rate. Between points A and B, it is increasing at a decreasing rate. Here marginal product has started falling. At point B, the total product is maximum while, the marginal product is zero. Thereafter, it begins to diminish correspondingly to a negative marginal product. In the lower part of the figure, MP is the marginal product curve. Up to point D marginal product increases and after that, the marginal product begins to decrease and then the marginal product becomes zero and turns negative. AP curve represents the average product. Before point E, the average product is less than the marginal product. At point E average product is maximum and then the average product increases but after that, it starts to diminish.

First Stage

The First stage starts from point O and ends up pointing A. At point E average product is the maximum and is equal to the marginal product. In this stage, the total product increases initially at an increasing rate up to point A. Between A and B it increases at a diminishing rate. Similarly, the marginal product also increases initially and reaches its maximum at point D. In this stage, the marginal product exceeds the average product (MP > AP).

Second Stage

It begins from point A. In this stage, the total product increases at a diminishing rate and is at its maximum and the marginal product diminishes rapidly and becomes zero. The Average product is maximum at point E and thereafter it begins to decrease. In this stage, the marginal product is less than the average product (MP < AP).

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Third Stage

This stage begins beyond point B. Here total product starts diminishing. The average product keeps on declining and the marginal product becomes negative. In this stage ideally, firms will try to stop production. This happens because the marginal product of the labour becomes negative implying that additional labour will give negative returns.

Causes of Increasing and Diminishing return:

Initially, due to the underutilization of resources and high efficiency, an increase in variable factors adds more to output. As we keep on increasing variable factors and as factors of production are imperfect substitutes for each other so they cannot be replaced with other factors of production.

The Law of variable proportion can be applied universally in both primary and secondary sectors.

Relevance for Business:

Businesses can increase productivity by employing skilled labour or more capital. If a nation invests in modern technology and better infrastructure that can improve the productivity of all the businesses and the nation as a whole. For example, China has invested its capital, and this has resulted in growth in the average quantity of output per worker.

3.4.2 Economies of scale of Production:

When a firm increases the scale of production, they achieve economies of scale till a point and then economies start to convert into diseconomies of scale.

Economies of Scale are two types:

Internal Economies of Scale- These economies are internal to the growth of a firm such as technical, managerial, financial etc.

External Economies of Scale are external to the firm, and they happen as a result of changes in the external environment such as localization, vertical disintegration etc.

Diseconomies of Scale When the firm over utilises the used machinery, labour, increased plant size etc leading to an increase in cost of production and hence the efficiency declines. This happens due to lack of coordination, depreciation of machinery etc. When the factors are external to a firm such as an increase in prices of inputs, taxes, lack of funds etc then they are called external diseconomies of scale.

External Economies and Diseconomies – Relevance to Industry:

The concept of external economies and diseconomies have been used to classify industries into three types for determining the equilibrium. It can be shown by Decreasing cost industry where costs decrease as the industry expands, the Constant cost industry has no change in

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average costs and the increasing cost industry where the costs rise due to demand for highly skilled labour or better technology.

Case Study -1

Apple – Increasing or Diminishing Returns

In some industries, securing the adoption and new technology is favourable to one's own product. As the product market share grows, the companies start putting more effort and money into marketing. Apple is an excellent example. The more customers start using Apple products and more applications are developed for ios, the greater the demand for the product. As apple introduces new products and upgrades every year, the increasing returns persist and hence they are able to spend a proportionate amount of money on marketing efforts and that is the reason that they are dominating the market.

According to experts, Apple has introduced so many models of all its products like the iPhone, iPad, and Mac book. Each model represents a considerable advance over the previous one and the demand goes up as people are willing to pay for upgrades. However, there is limited scope for users to take advantage of these upgrades. Most of the products have similar features and customers are unlikely to fully utilize the features with each upgrade. In this respect, Apple is a victim of the law of diminishing returns. The majority of the users may not be too impressed with the further capabilities of Apple products. Given the enormous costs of developing upgrades of the products, the question is where does Apple go from here? At the moment such products require a considerable investment from the customers and also the company should be able to get increasing returns.

IN-TEXT QUESTIONS

6. Draw the TPP and MPP curves for the three sites in the table.
7. Rainfall and the amount of nitrogen occurring in the soil will cause differences in the position of the TPP curve between sites. One will cause vertical differences in the curves, and one will cause horizontal differences. explain which causes which effect and why.
8. What other things farmer needs to know before deciding whether to use 600 kg/ha of nitrogen fertilizer?
9. Does the law of diminishing returns apply here and why?
10. Can this phenomenon be observed in short run or long run?

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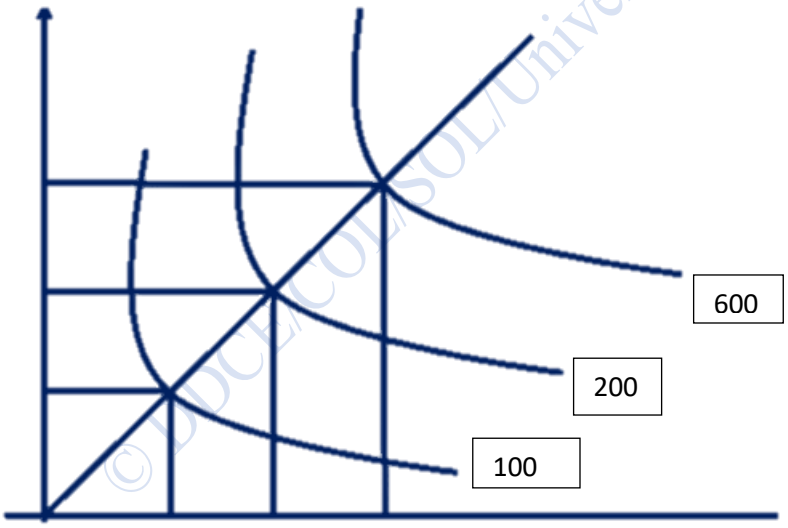
3.5 PRODUCTION IN THE LONG RUN

3.5.1 Returns to Scale

The return to scale is a long-run concept. It shows the possibilities of different input combinations. In the long run all factors of production are variable. No factor is fixed. Accordingly, the scale of production can be changed by changing the quantity of all factors of production.

Increasing Returns to Scale: a production function for which any given proportional change in all inputs leads to a more than proportional change in output. Increasing returns to scale refers to a situation when all factors of production increase but output increases at an increasing rate. It means if all inputs are doubled, the increase in output will be more than double. Hence, it is called increasing returns to scale. This increase is due to many reasons like the division of external economies of scale.

Capital



Labour

Figure 3.7 Increasing Returns to Scale

In figure 3.7, the X- axis represents an increase in labour and Y-axis represents capital. The combination of both the factors will produce more output as can be seen in the diagram from point 100 to 200 to 600 units.

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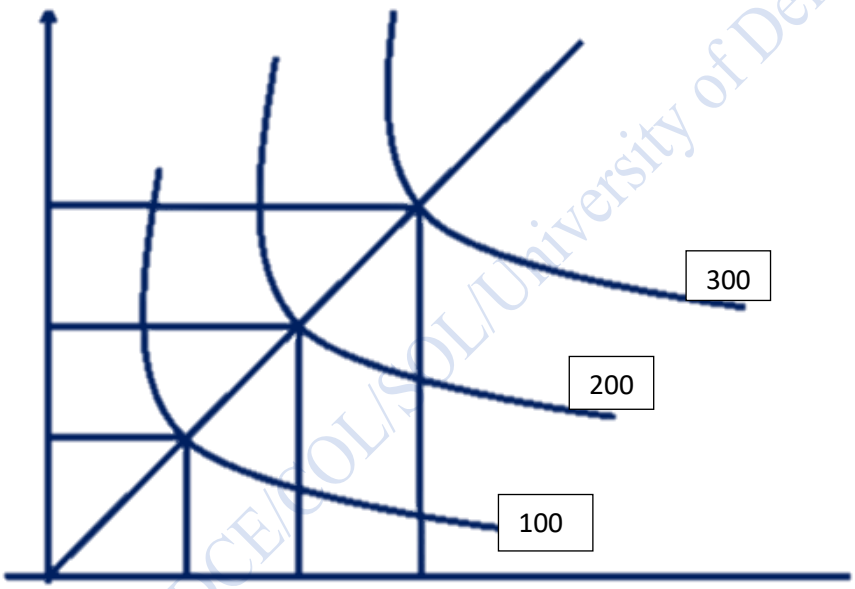
Constant Returns to Scale: a production function for which a proportional change in all inputs causes output to change by the same proportion. Constant returns to scale refer to the production situation in which output increases exactly in the same proportion as the ratio of inputs is increased meaning if inputs are doubled output will also be doubled.

In constant return to scale internal and external economies are exactly equal to internal and external diseconomies. This situation arises when after reaching a certain level of production, economies of scale are balanced by diseconomies of scale.

Capital



Labour

Fig. 3.8 Constant Return to Scale

In fig. 3.8, X-axis represents labour and Y-axis represents capital. Diagram suggests that an increase in factors of production i.e., labour and capital are equal to the ratio of increase in output. Hence, we get constant returns to scale.

Decreasing Returns to Scale: a production function for which a proportional change in all inputs causes a less than proportional change in output. It means, that if inputs are doubled, the output will be less than doubled. If inputs are increased by 20 per cent, the increase in output is 10 per cent.

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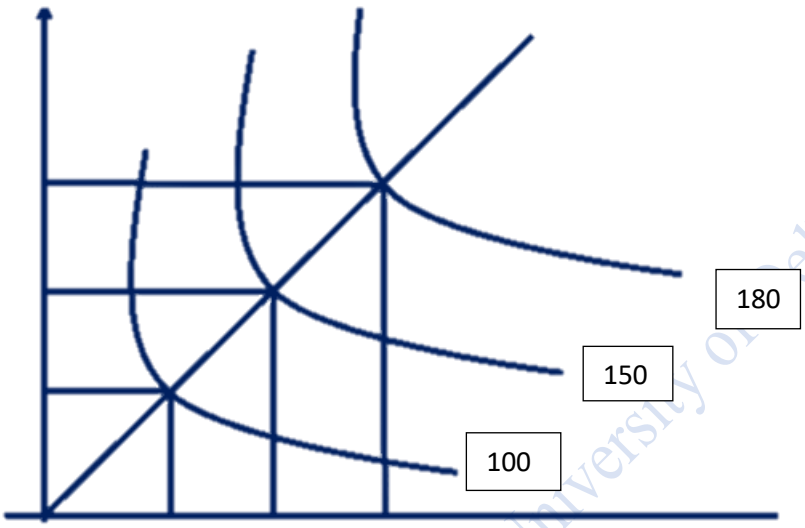
The main cause of the decreasing returns to scale is that internal and external economies are less than internal and external diseconomies.

Capital



Labour

Figure 3.9 Decreasing Returns to Scale

In this diagram 3.9, X-axis represents labour and Y-axis represents capital. When inputs increase from 1 to 3 units, the increase in output is proportionately lesser from 100 to 150 to 180.

3.5.2 Isoquants

All inputs are now considered to be variable (both L and K in our case)

How to determine the optimal combination of inputs?

An isoquant is a curve showing all possible combinations of inputs physically capable of producing a given fixed level of output.

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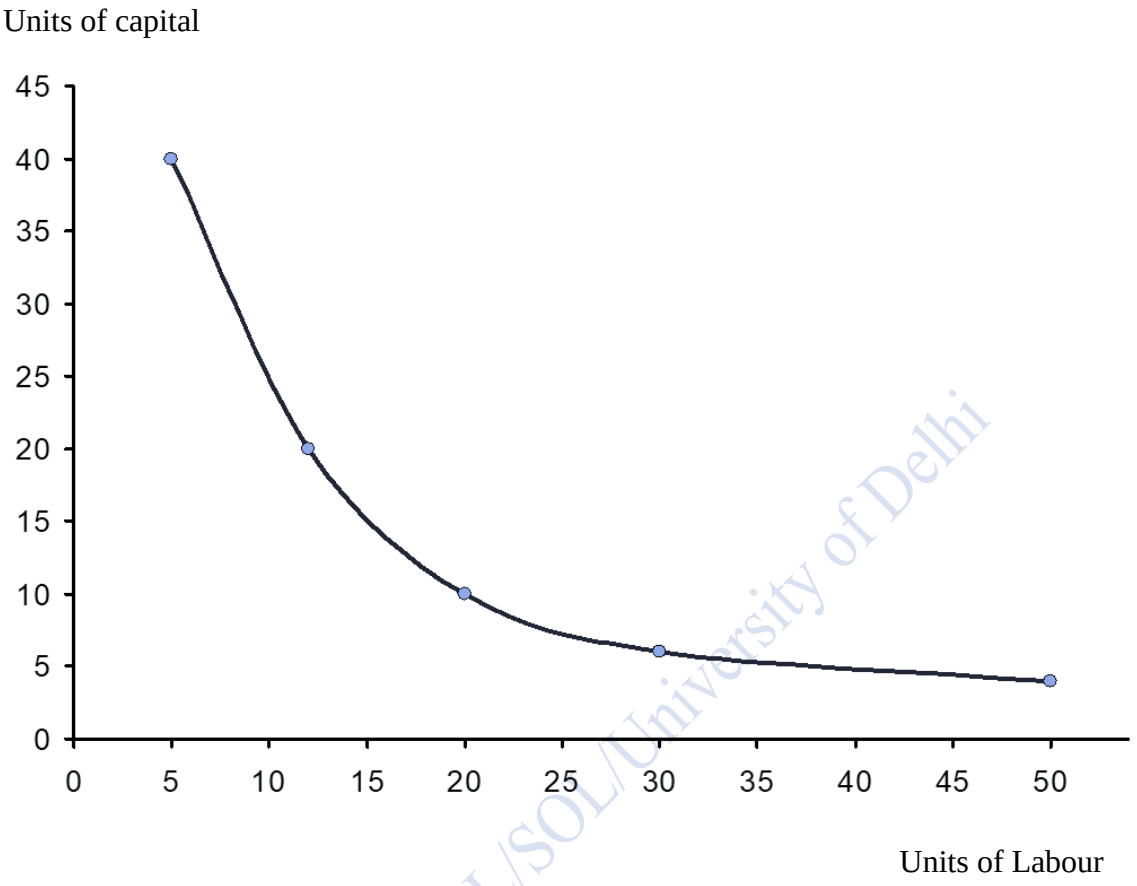

Fig. 3.10 Isoquant Curve

In Fig. 3.10, X-axis represents labour, and the Y-axis represents capital. Different points along the curve show combinations of labour and capital. As the usage of labour increases, the usage of capital decreases to produce a certain level of output.

An Isoquant is a curve that shows the various combinations of two inputs that will produce a given level of output

The slope of an isoquant indicates the rate at which factors K and L can be substituted for each other while a constant level of production is maintained.

The slope is called Marginal Rate of Technical Substitution (MRTS)

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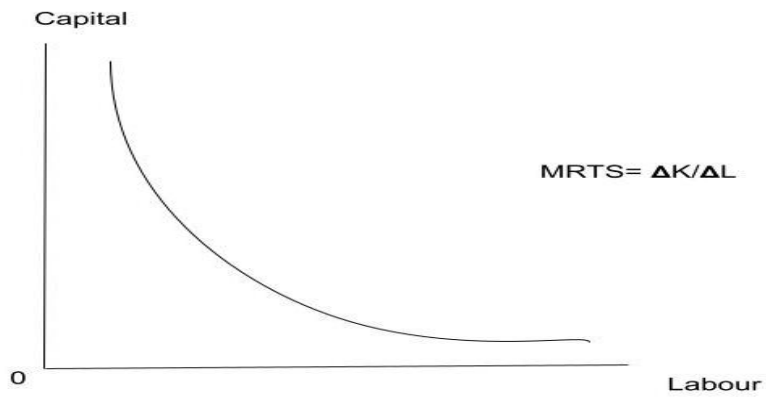

Fig. 3.11 Marginal Rate of Technical Substitution

Fig. 3.11 depicts the Marginal rate of technical substitution. The X-axis represents labour, and the Y-axis represents capital. The changes in the ratio of capital to labour used to produce a certain level of output are shown.

The absolute value of the slope of the isoquant is the marginal rate of technical substitution between two factors.

Thus, the MRTS is the rate at which labour substitutes for capital without affecting output, when more capital and less labour are used, the marginal productivity of labour is relatively large and the marginal productivity of capital relatively small. Hence, one unit of labour will substitute for a relatively large amount of capital.

Anywhere along the isoquant, the marginal rate of technical substitution of labour for capital equals the marginal product of labour divided by the marginal product of capital, which also equals the absolute value of the slope of the isoquant.

$MRTS = MP_L / MP_C$

Properties of Isoquant

- There is a different isoquant for every output level and farther from the origin indicates higher rates of output.
- Isoquants have negative slopes indicating the quantity of labour employed is inversely related to the quantity of capital employed.
- Isoquants do not intersect. Since each isoquant refers to a specific rate of output, an intersection would indicate that the same combination of resources could, with equal efficiency, produce two different amounts of output.
- Isoquants are usually convex to the origin. So, an isoquant gets flattered as we move down along the curve.

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Exceptions to Isoquant Curve:

There are exceptions to the isoquant curve, and it can have three general types of shapes.

Perfect Complements -The isoquants are right angles, indicating that inputs a and b must be used in fixed proportions and therefore are not substitutable.

For Example - The Left shoe and the Right Shoe.

Perfect Substitutes – Input a can be substituted for another input say b at a fixed rate as indicated by the straight-line isoquants (which have a constant slope and MRS)

For Example - Jaggery and brown sugar are often nearly perfect substitutes

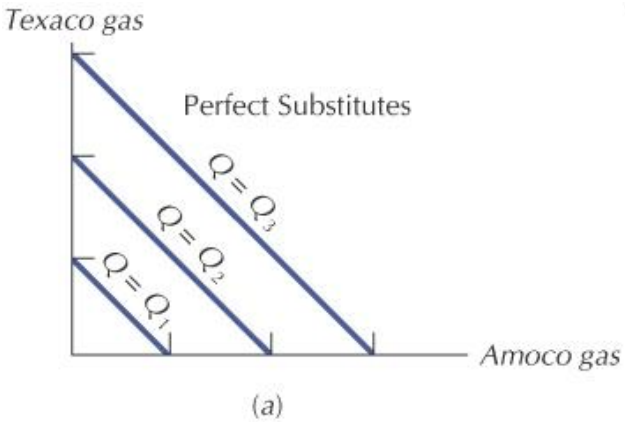

Figure 3.12 Perfect Substitutes

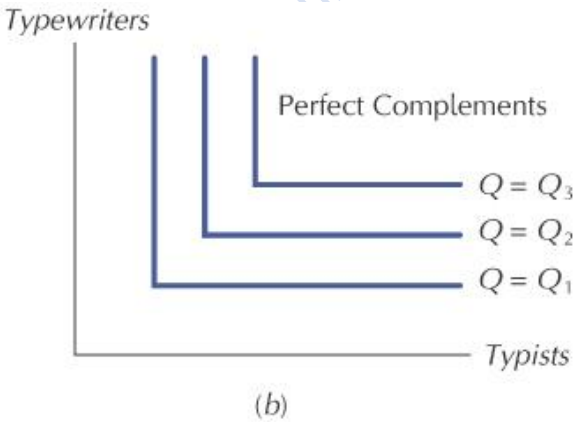

Figure 3.13 Perfect Complements

Figure 3.12 depicts Perfect Substitutes. The X-axis represents Amoco gas and Y-axis represents Texaco gas. As both as perfect substitutes for each other, so whether the consumer uses Amoco or Texaco does not make a difference. Hence, the curves are straight lines.

Figure 3.13 depicts Perfect complements. The X-axis represents typists and Y-axis represents Typewriters. Both inputs should be used in fixed proportions as they cannot be substituted. Hence, the curve will be right angles.

Imperfect Substitutes –It is the rate at which input b can be given up in return for one more unit of input a while maintaining the same level of output as the number of inputs increases.

For Example - In farming, harvesters and labour for harvesting grain provide an example of a diminishing MRS considering capital and labour are imperfect substitutes.

3.5.3 Choice of Input Combination

The Input combination used can be shown with the help of Isocost lines.

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Isocost lines show different combinations of inputs which give the same cost. It shows the various combinations of two inputs that can be bought for a given dollar cost.

The slope of the isocost line is given by

Slope of isocost line = -w/r

The equation for an isocost line is:

$$C = L.P_L + K.P_K$$

$$MRTS_{LK} = \frac{MP_L}{MP_K} = \frac{w}{r}$$

A producer aims at either maximizing output for a given cost or minimizing cost subject to a given output.

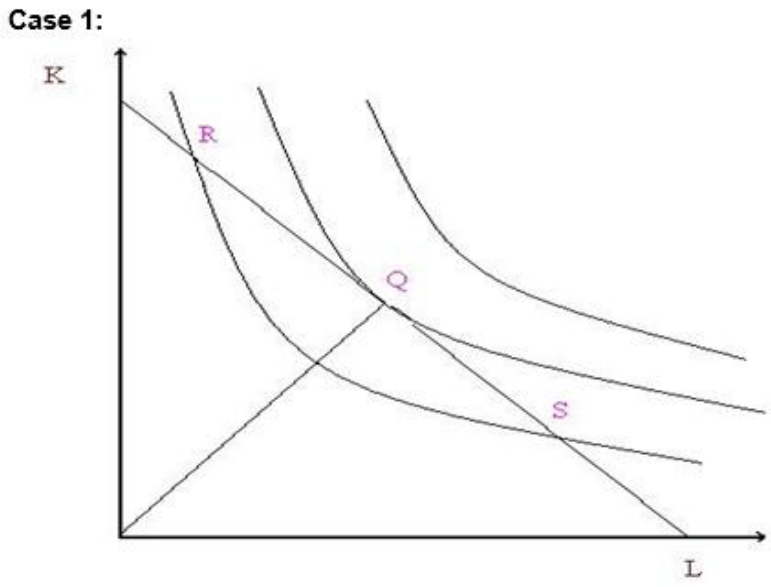

Fig. 3.14 Maximizing Output for a given cost

In fig. 3.14, the x-axis represents labour, and the y-axis represents capital. An isocost line which is the budget line for the producer is drawn along with different isoquants representing different levels of output. The Higher the isoquant, the higher the level of output but the maximum output will be at a point where the isoquant intersects with the isocost line i.e., Q. The producer will achieve maximum output at this point.

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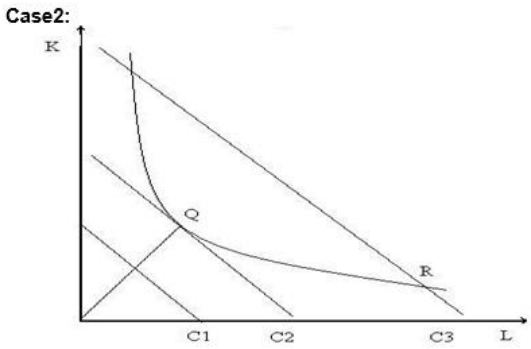

Fig. 3.15: Minimizing Cost subject to given Output

In fig. 3.15, The x-axis represents labour, and the y-axis represents capital. An isoquant which shows a different combination of factors by the producer is drawn along with different isocost lines representing a different amount of costs. The point at which the producer will minimise costs will be where isoquant is tangent to the isocost line i.e., Q.

The producer will choose the best input combination as per the costs and availability of factors

Choosing the Economically Efficient Point of Production

The least cost combination of inputs for a given output occurs where the isocost curve is tangent to the isoquant curve for that output and where the output is highest.

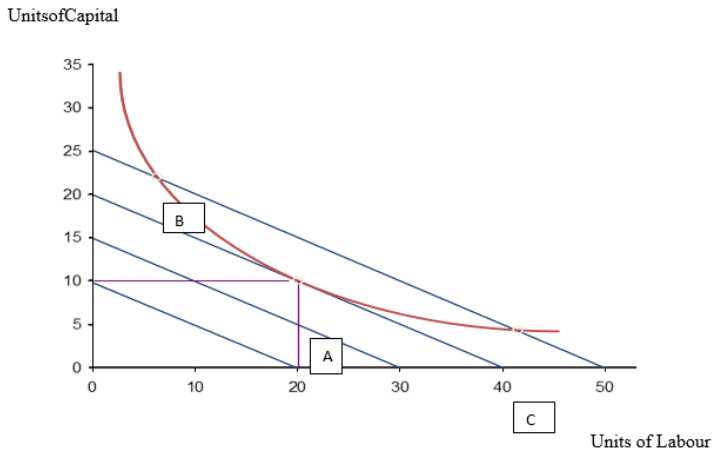

Fig. 3.16: Least Cost Combination of Production

In fig. 3.16, X-axis represents Labour and Y-axis represents capital. The Least Combination is at Point A where the isoquant curve is tangent to the isocost line. Point B and C are on higher isocost lines but are not tangent. Hence, the equilibrium can't be reached.

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Relevance to Business:

Applicability of Choice of combination for Production will be explained through an example.

Inputs used for Producing Cars

Technology	Units of Capital	Units of Labour
A	50	120
B	80	100
C	120	40
D	150	30
E	200	20

Consider the choices available for manufacturing cars is given in the table above. Five different techniques are available. Technology A is the most labour-intensive requiring 120 hours of labour and 50 units of capital to produce 100 cars. E is the most capital-intensive requiring maximum units of capital.

For choosing the best combination firms must look into input prices of labour and capital. If the price of Labour and capital is $1 then forms will look at the minimum cost which will be by using technology C. Now, suppose wages increase to $5 then Technology E will be cost-minimising for the firm. The flexibility of a firm's ability to change techniques of production plays an important role in determining its costs.

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CASE STUDY -2

Since the 2000's, manufacturing firms in India have been relocated to places with lower land rental rates and labour costs, mostly in the outskirts of the city and small towns. At the same time, firms in service sectors like finance, insurance, Information technology etc have been locating near the city centres and contributing towards urbanisation like millennium city Gurgaon. One of the major reasons seems to be that manufacturing firms find it difficult to substitute capital for land and service sector firms do not require lot of space.

IN-TEXT QUESTIONS

11. What is the prime reason of shifting for the manufacturing firms?
12. Is it easy to substitute capital for land as a factor of production?
13. Why is it relatively easier for an IT firm to substitute capital for land?
14. Why is the demand for land likely to be high near the city centre?
15. Can land be substituted for capital near city centre? Discuss

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3.6 SUMMARY

1. A Production function shows the relationship between the number of inputs used and the amount of output produced in a given period.
2. In the short run, one of the factors of production is fixed.
3. Production in the short run is subject to diminishing returns, as the quantity of variable input or factor increases, the marginal product diminishes.
4. In the long run, all the factors are variable
5. An Isoquant curve shows the combination of different factors at a particular level of output.
6. Isocost is the cost incurred or budget of the producer
7. For an efficient outcome, Isoquant should be tangent to the isocost line.

3.7 GLOSSARY

Diminishing marginal product is the property whereby the marginal product of an input declines as the quantity of the input increases

An Efficient scale is the quantity of output that minimizes the average total cost

Equilibrium is a situation in which the market price has reached the level

at which quantity supplied equals quantity demanded

The Equilibrium price is the price that balances the quantity supplied and the quantity demanded

Equilibrium quantity is the quantity supplied and the quantity demanded at the equilibrium price

Efficiency is the property of society getting the most it can from its scarce resources

Factors of production the inputs used to produce goods and services

Law of supply other things equal, the quantity supplied of good rises when the price of the good rises

Marginal changes are small incremental adjustments to a plan of action

The Marginal rate of substitution is the rate at which a consumer is willing to trade one good for another

Quantity demanded the amount of a good that buyers are willing and able to purchase

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A Supply curve is a graph showing relationship between the price of a good and the quantity supplied

3.8 ANSWERS TO IN-TEXT QUESTIONS

1.D 2. A 3. C 4. B 5. C 6. diagram as per data in a table 7. Effect of grass yields 8. A similar pattern emerges from all the sites. The total output of grass (total physical product: TPP) rises at a roughly constant rate (in other words, a marginal physical product (MPP) is roughly constant), with up to about 300 kg/ha of fertiliser. These rises are substantial. Just look at the Gleadthorpe figures! Above 300 kg/ha, however, diminishing returns set in. Additional applications of fertiliser yield less and less extra output: MPP falls. Maximum yield is obtained at around 600 kg/ha of nitrogen level. Above that MPP is negative. Why? If the soil has a high natural level of nitrogen, the effects of adding nitrogen fertiliser will be more limited. Diminishing returns will set in before the 300 kg/ha level.	9. Yes, diminishing returns 10. Short run 11. skyscrapers 12. legal formalities and investment 13. easy capital 14. business purpose 15. circle area

3.9 SELF-ASSESSMENT QUESTIONS

1. With the growth in the service sector, the number of people engaged in agriculture has declined sharply, even if the agricultural output is growing. Given the production technology and production functions, explain this inconsistency.

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2. Discuss the factors firms consider while choosing technique of production.

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LESSON 4

THEORY OF COST

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STRUCTURE

4.1 Learning Objectives
4.2 Introduction
4.3 Cost Concepts
4.3.1 Accounting Costs
4.3.2 Economic Costs
4.3.3 Opportunity Costs
4.3.4 Sunk Costs
4.3.5 Historical Costs
4.3.6 Replacement Costs
4.3.7 Incremental Costs
4.3.8 Book Costs
4.3.9 Out-of-Pocket Costs
4.3.10 Private Costs
4.3.11 Social Costs
4.3.12 Shut-down Costs
4.4 Traditional Theory of Costs
4.4.1 Cost-Output Relationship in the Short Run.
4.4.2 Cost-Output Relationship in the Long Run.
4.5 Modern Theory of Costs

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4.6 Summary

4.7 Glossary

4.8 Answers to In-text Questions

4.9 Suggested Readings

4.1 LEARNING OBJECTIVES

After studying this lesson, you shall be able to

- Understand the cost of production and related cost concepts.
- Learn about the traditional and modern theories of costs.
- Plot various cost curves.
- Comprehend the relationship between different cost curves

4.2 INTRODUCTION

Cost of production refers to the expenses incurred when producing or obtaining items and services that bring in money for a business. Costs incurred by a company during the production of its goods and services are a crucial factor in decision-making. It includes both direct and indirect costs. Direct costs are those that can be linked directly to the production of a product, such as labour and material costs, whereas indirect costs are those that cannot be linked directly to the product, such as overhead.

Profit is every business' ultimate goal, and a company's capacity to generate consistent profits determines how prosperous it will be in the long run. The profit margin of a business concern is determined by total cost and total revenue. A company works to raise revenue and cut expenditures in order to maximise profits. The profit margin of a business concern is determined by total cost and total revenue. A company works to raise revenue and cut expenditures in order to maximise profits. While a corporation often has no influence over the selling price, it does have control over a number of costs. Therefore, the business should strive to minimise and control costs. Since costs are taken into account in every business decision, it is essential to comprehend the meaning of various terms in order to think strategically.

Significant cost estimates that are helpful for managerial choices can be obtained from an analysis of economic costs when supplemented with information derived from the company's accounting records. If management intends to arrive at cost estimates that are relevant for

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planning purposes, the reasons causing cost changes must be acknowledged and taken into account. Cost concepts and classifications, and cost output relationships (traditional and modern theories) are the main topics covered in cost analysis in this chapter.

4.3 COST CONCEPTS

Costs are very important in managerial decisions that involve choosing between alternative courses of action. It aids in the quantitative specification of various alternatives. The type of cost to be used in a specific situation is determined by the business decisions to be made. Costs factor into almost every business decision, and it is critical to conduct a proper cost analysis. As a result, it is critical to comprehend what these various cost concepts are, as well as how they can be defined and operationalized.

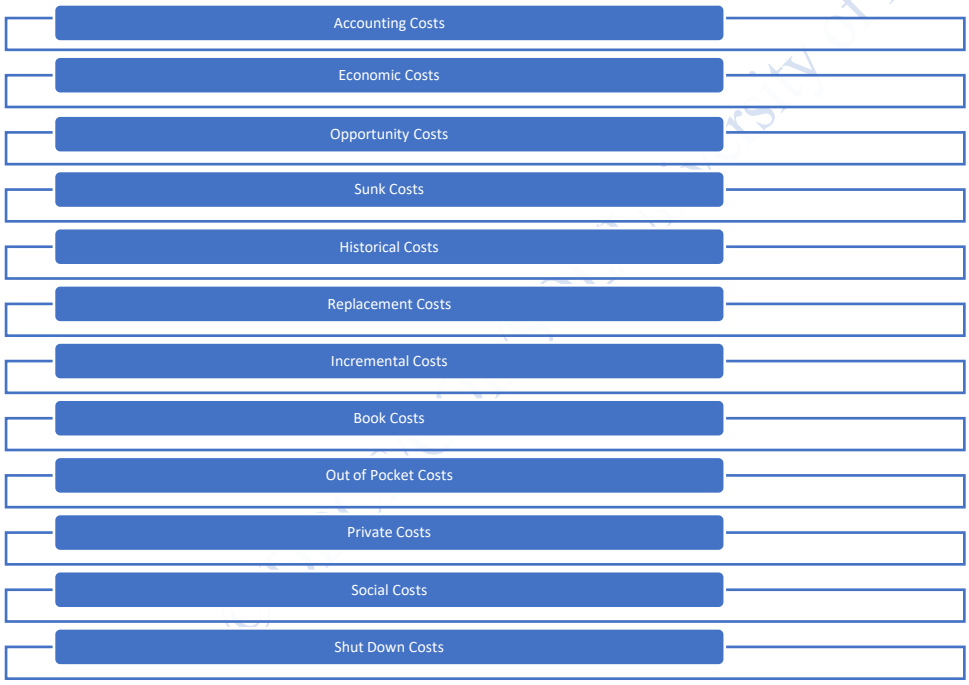

Fig. 2: *Types of Costs*

4.3.1: Accounting Costs

Accounting is a historical concept that records what happened in the post. Accounting costs are the expenses that are recorded in the books of account such as the balance sheet and profit and loss statements for the company's legal, financial, and taxation purposes. The accounting cost concept encompasses actual cost. Actual or explicit costs are those incurred by the firm

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in payment for labour, materials, plant, building, machinery, equipment, travelling and transportation, advertising, and so on. For all practical purposes, the total money expenses recorded in the books of accounts are the actual costs.

4.3.2 Economic Costs:

There are some costs do not take the form of cash outlays and are not recorded in the accounting system. These are referred to as implicit or imputed costs. An important example of implicit cost is opportunity cost. Assume an entrepreneur does not use his services in his own business and instead works as a manager in another firm on a salary. He foregoes his salary as manager if he starts his own business. This salary loss represents the opportunity cost of income from his own business. This is an unspoken cost of his own company. Thus, implicit wages, rent, and interest are the wages, rent, and interest that an owner's labour, building, and capital can earn from their second-best use, respectively. Implicit costs are not considered when calculating the business's loss or gain, but they are an important consideration when deciding whether or not to keep a factor in its current use. The economic cost is the sum of the explicit and implicit costs.

Economic Cost = Accounting Cost (Explicit Cost) + Implicit Cost

4.3.3 Opportunity Costs:

The concept of opportunity cost plays a critical role in modern economic analysis. The opportunity costs or alternative costs are the returns from the firm's second-best use of resources that it foregoes in order to reap the benefits of the best use of resources. For example, a farmer who grows sugarcane can also grow wheat using the same factors. As a result, the opportunity cost of a quintal of sugarcane is the amount of wheat output sacrificed. As a result, the opportunity cost of anything is the next best alternative that could be produced instead of the same or an equivalent group of factors at the same cost. This definition must include two points. First, the opportunity cost of anything is simply the loss of the next best alternative. The second important thing is the consideration of "an equivalent group of factors costing the same amount of money" in the above definition. The concept of opportunity cost is extremely important in economics –

a) **Assists in determining relative prices of goods:** The concept of opportunity cost is useful in explaining how relative prices of different goods are determined.

b) **Assists in determining a factor's normal remuneration:** The opportunity cost determines the value of a productive factor for its best alternative use. It implies that if

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a productive factor is to be retained in its next best alternative use, it must be compensated for or paid at least as much as it can earn from that use.

c) **Decision support and efficient resource allocation:** The concept of opportunity cost is critical in rational producer decision-making. Opportunity cost is a useful economic tool for analysing optimal resource allocation and rational decision-making.

ACTIVITY

- Identify three imputed costs for the business concern.
- Mr. John has invested Rs. 10,00, 000 in his shoes manufacturing business and has also bought a new land for setting up a factory apart from the cash investments. Identify if there is any opportunity cost.

4.3.4 Sunk Costs:

Sunk costs are those that are not affected by changes in the level of production or nature of the business activity. It will remain constant regardless of activity level. The most common example of sunk cost is depreciation, and amortisation of past expenses. It will remain constant regardless of the level of activity. Sunk Costs are also known as unavoidable costs. Even if business activity is reduced, there will be no reduction in this cost. The cost of the idle machine capacity, for example, is an unavoidable cost. Sunk costs are investments that have no opportunity cost.

4.3.5 Historical Costs:

The historical cost of an asset is its original cost. Historical cost refers to the cost of acquiring productive assets in the past, such as land, a building, machinery, and so on. The cost of an asset is shown as the original price paid for the asset acquired in the past in historical cost valuation. Financial accounts are based on historical valuation.

4.3.6 Replacement Costs:

A replacement cost is the amount of money that would have to be paid today to replace the same asset. During periods of significant price change, historical valuation provides a poor projection of future costs intended for managerial decisions. When financial statements have to be adjusted for inflation, a replacement cost is an important thing to consider.

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4.3.7 Incremental Costs:

Incremental costs are defined as the change in overall costs caused by specific decisions. Fixed and variable costs are both included in incremental costs. In the short term, incremental cost will consist of variable costs — costs of fuel, power, additional labour, additional raw materials, etc. — incurred as a result of the firm's new decision. Because these costs can be avoided by not changing the scale of operations, they are also known as avoidable costs or escapable costs.

Incremental costs are similar to the concept of marginal cost but have a broader connotation. While marginal cost refers to the cost of the marginal unit of output (typically one unit), incremental cost refers to the total additional cost associated with decisions to expand output or add a new variety of products, etc.

4.3.8 Book Costs:

Certain actual business costs do not involve cash payments, but a provision is made in the books of account, and they are taken into account when the profit and loss accounts are finalised. These are referred to as book costs. Book costs include unpaid interest on the owner's own funds and depreciation on assets.

4.3.9 Out-of-Pocket Costs:

Out-of-pocket costs, also known as explicit costs, are those that require immediate cash payment. Out-of-pocket costs are items of expenditure that involve cash payments or cash transfers, both recurring and non-recurring. This category includes all explicit costs (e.g., wages, rent, interest, material and maintenance costs, transportation expenses, electricity, and telephone expenses, and so on). On the other hand, Book costs, also known as implicit costs, do not require immediate cash payments. Book costs include the salary of the owner, depreciation, unpaid interest on the owner's capital.

4.3.10 Private Costs:

Private costs are those that are actually incurred or provided for by an individual or a business for its business activity. Private cost is the cost of production incurred and provided for by an individual firm engaged in the production of a commodity.

This cost has nothing to do with society. It includes both explicit and implicit costs. A company wishes to reduce its private.

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4.3.11 Social Costs:

The social cost, on the other hand, is the total cost to society of producing a good. As a result, the economic costs include both private and public costs. The social cost of producing a commodity is the cost to society as a whole. It takes into account all costs borne by society, whether directly or indirectly. The firm bears no social cost. It is rather passed on to people who are not directly involved in the activity. The concept of social cost is much broader than private cost.

Social Cost = Private Cost + External Cost

4.3.12 Shut Down Costs:

Shut-down costs must be incurred when production operations are suspended. When a plant is permanently shut down, some costs must be incurred to dispose of the fixed assets. These are known as abandonment costs.

IN-TEXT QUESTIONS

1. _____ costs do not take the form of cash outlays and are not recorded in the accounting system.
2. The historical cost of an asset is its original cost. True / False
3. The addition to total cost associated with decisions to expand output are called:
   a) Books Costs b) Incremental Costs
   c) Sunk Costs d) Out of Pocket Costs
4. The total cost to society of producing a good is called _____.
5. Out of Pocket Costs are also known as Implicit Costs. True/False

4.4 TRADITIONAL THEORY OF COST

The production function expresses a technological relationship between physical inputs and physical outputs. Further, the cost function shows the relationship between the firm's cost and firm output given the state of technology. The cost function combines the production function's information with the prices of the factors of production. Cost functions are thus

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derived functions from production functions. Depending on the time period under consideration, the firms have different production functions.

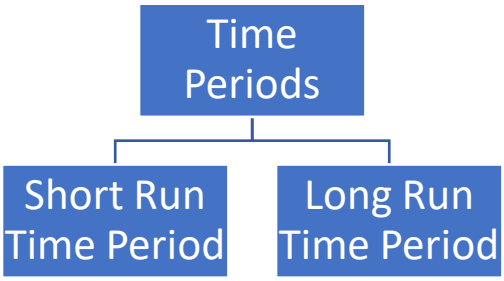

Fig. 3: *Different Time Periods*

4.4.1 Cost-Output Relationship in the Short Run

A short run is a time period in which some factors remain constant while others change. As a result, in the short run, the firm can only change its variable factors to change the output. The short-run costs of a firm are the costs of employing variable units of production plus the costs of fixed factors. Thus, the use of both fixed and variable factors incurs costs in the short run.

4.4.1.1 Total Fixed Costs

Fixed costs are those that are not affected by changes in output. Even if the output is zero, it must be incurred. Fixed costs are also known as overhead costs. These include charges such as depreciation on the asset, interest on debt, rent of premises, insurance, maintenance costs, property taxes, interest on capital invested, and some administrative costs such as salary of permanent employees, wages of permanent staff, etc. Thus, fixed costs are those incurred in hiring fixed factors of production whose amounts cannot be changed in the short run. These costs are also known as overhead costs, supplementary costs, and unavoidable costs.

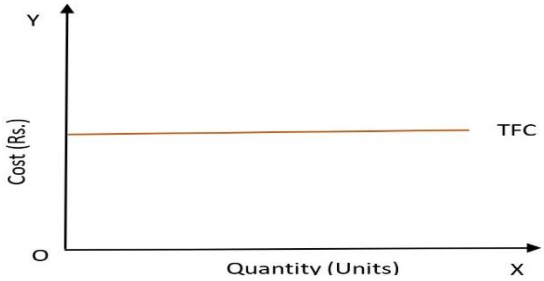

Fig. 4: *Total Fixed Costs*

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In the above fig. 3, TFC is a straight line parallel to the X-axis depicting that the fixed costs do not vary with the change in the level of output.

4.4.1.2 Total Variable Costs

Variable costs are the costs associated with the use of variable factors of production, the amount of which can be changed in the short run. As a result, in the short run, the total variable costs vary with changes in output. When the output is zero, the total variable costs are zero. These costs include payments such as labour wages, the cost of raw materials, fuel and power used, transportation expenses, and so on. Variable costs are also referred to as prime costs.

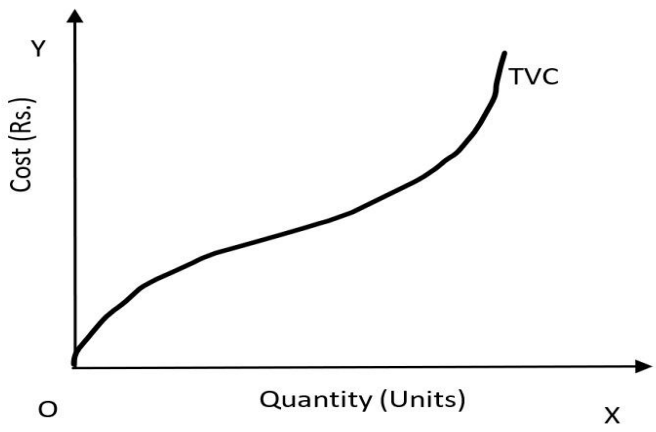

Fig. 5: *Total Variable Costs*

The TVC curve is an inverted S shape, it reflects the law of variable proportions, which corresponds to a short run period only.

4.4.1.3 Total Costs

It is the actual cost that must be incurred to produce a given quantity of output in the short run, using both fixed and variable inputs. It is the sum of total fixed costs and total variable costs.

Total Cost = Total Fixed Cost + Total Variable Cost

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It is the actual cost of producing a given quantity of output in the short run using both fixed and variable inputs. It is the total of fixed and variable costs.

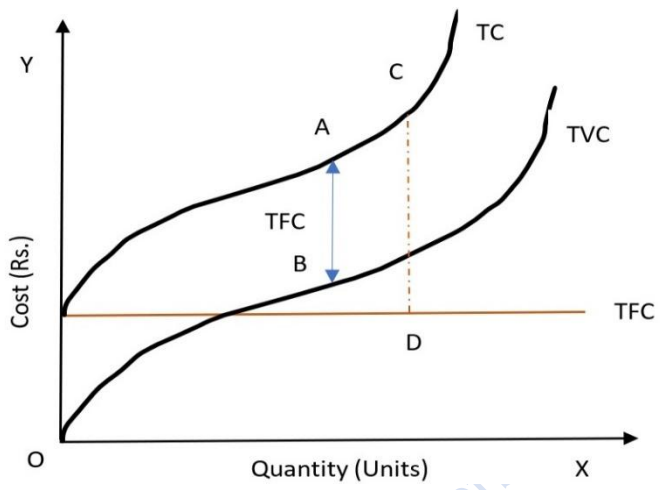

Fig. 6: *Total Costs*

The difference between total cost and total variable cost is the total fixed cost.

Apart from total cost analysis, it is critical in managerial decision-making to have information on per-unit costs in order to make objective decisions. As a result, average costs or per unit costs are explained below.

4.4.1.4 Average Fixed Costs

The average fixed cost is calculated by dividing the total fixed cost by the number of units of output produced. Therefore,

$$AFC = \frac{\text{TFC}}{\text{Q}}$$

Where, TFC = Total Fixed Cost and Q= Units of Output

The total fixed cost is constant. Therefore, the average fixed cost per unit of output decreases as output increases.

The AFC is represented graphically as a rectangular hyperbola. S since, the TFC is spread over a large number of units, therefore, AFC decreases steadily as output increases. Because

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the AFC is a rectangular hyperbola, it approaches both axes asymptomatically, that is, it gets closer and closer to the axes until it touches them at infinity.

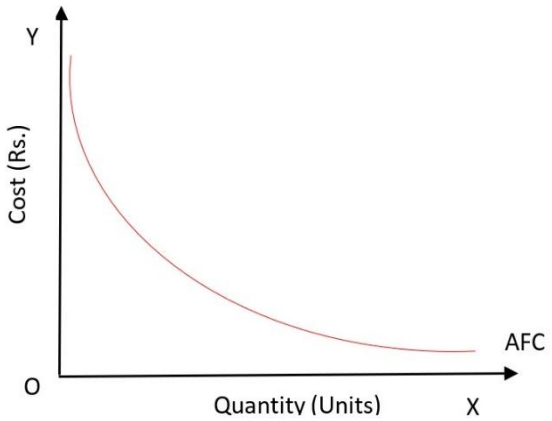

Fig. 7: *Average Fixed Costs*

4.4.1.5 Average Variable Costs

The average variable cost is calculated by dividing the total variable cost by the number of units of output produced. Therefore,

$$AVC = \frac{\text{TVC}}{\text{Q}}$$

where TVC = Total Variable Cost and Q= Units of Output

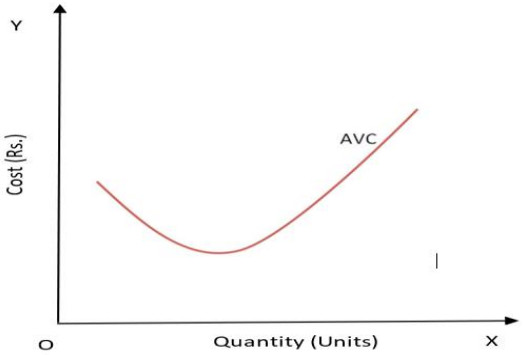

Fig 8: *Average Variable Costs*

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The AVC curve initially falls as the variable factor's productivity rises, resulting in higher returns. It then reaches a minimum at the point where the optimal combination of fixed and variable factors is in place. As the output is increased further, the AVC begins to rise as the variable factor's efficiency decreases from its maximum level, and the combination of fixed and variable factors becomes sub-optimal.

4.4.1.6 Average Costs

The average total cost, or simply average cost, is the total cost divided by the number of output units produced. Therefore,

$$AC = \frac{\text{TC}}{\text{Q}}$$

where TC = Total Cost and Q= Units of Output

Since the total cost is the sum of total variable cost and total fixed cost, the average cost is also the sum of average variable cost and average fixed cost.

$$\boldsymbol{TC = \text{TFC} + \text{TVC}}$$

Dividing both sides by Units of Output (Q)

$$\boldsymbol{TC = \frac{\text{TFC}}{\text{Q}} + \frac{\text{TVC}}{\text{Q}}}$$

$$AC = \text{AFC} + \text{AVC}$$

ACTIVITY

- Draw short-run average variable costs and average cost curves according to traditional theory of costs.

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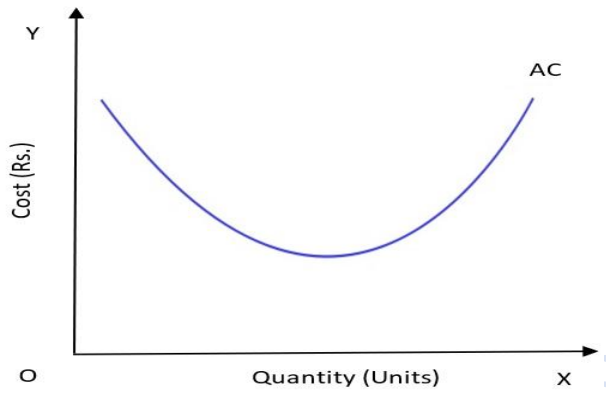

Fig. 9: *Average Costs*

Graphically, the shape of the AC curve is determined by the shape of the AFC and AVC curves. AC initially falls, reaches a minimum at the plant's optimal utilisation level, and then rises again.

4.4.1.7 Marginal Costs

The marginal cost is the cost added to the total cost of producing one more unit of output. In other words, marginal cost is the cost of producing n units rather than n-1 units added to the total cost.

$$MC_n = TC_n - TC_{n-1}$$

If change in output is greater than one unit, then the marginal cost can be found over a range of output as well.

$$MC = \frac{\Delta TC}{\Delta Q}$$

The MC curve is a U-shaped curve. It initially falls with increasing output due to more efficient use of the variable factor as output increases, and then it slopes upward as further increase in output negatively impacts the variable factor's efficiency.

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Fig. 10: Short Run Marginal Costs

Example -: The following is the schedule of the cost of production an ABC Ltd. for a better understanding of the cost concepts studied above.

Units	Fixed Cost (Rs.)	Variable Cost (Rs.)	Total Cost (Rs.)	Marginal Cost (Rs.)	Average Cost (Rs.)	Average Variable Cost (Rs.)
0	55	-	55			
10	55	28	83	2.8	8.30	2.80
20	55	48	103	2	5.15	2.40
30	55	64	119	1.6	3.97	2.13
40	55	82	137	1.8	3.43	2.05
50	55	104	159	2.2	3.18	2.08
60	55	130	185	2.6	3.08	2.17
70	55	162	217	3.2	3.10	2.31
80	55	202	257	4	3.21	2.53
90	55	262	317	6	3.52	2.91
100	55	342	397	8	3.97	3.42

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4.4.1.8 Relationship Between Average Cost and Average Variable Cost

- AC and AVC are both U-shaped, illustrating the law of variable proportions.
- The MC curve intersects the AVC and AC curves at their minimum points. The minimum point of AC comes after the minimum point of AVC. The minimum point of AC is to the right of the minimum point of AVC.
- The behaviour of the AC curve is determined by the behaviour of the AVC and AFC curves.
- Initially, both AVC and AFC are falling, resulting in a precipitous drop in AC. The AVC begins to rise after reaching its minimum point. The AFC is still in decline. The rate of fall of AFC is greater than the rate of rise of AVC until the minimum point of AC.
- Beyond that level of output, the rate of rising AVC offsets the rate of falling AFC, causing the AC to rise. It is also possible to observe the AVC approaching the AC asymptomatically. This is due to the AFC, which continues to decrease as output increases, which in turn shrinks the distance between AC and AVC.

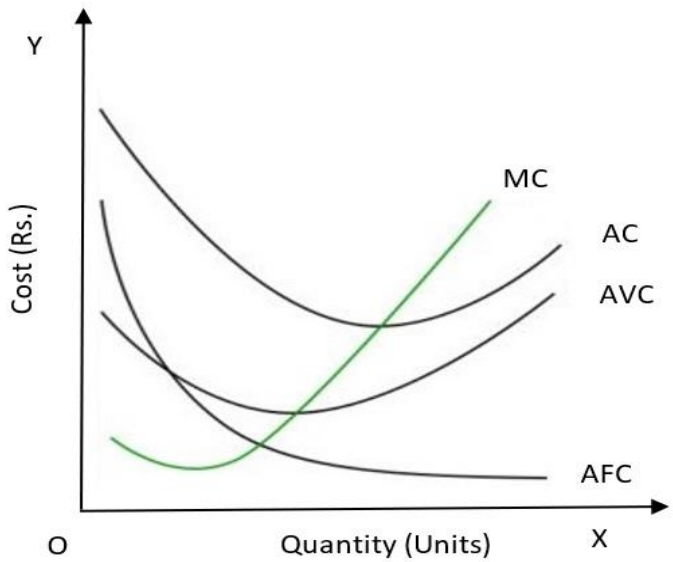

Fig. 11: *Short Run Cost Curves*

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4.4.1.9 Relationship Between Average Cost and Marginal Cost

- When AC falls, MC is less than AC and lies below AC.
- At the minimum point of the AC curve, the slope of AC is zero. At this minimum point of the AC curve, AC = MC.
- When the slope of AC exceeds zero (AC is rising), MC will be greater than AC and will lie above it.

CASE STUDY

Golden Tires Ltd. which produces rubber tubes for cycles has the following production details:

Number of Units Produced	1600 units
Selling Price Per Unit	Rs. 20 per unit
Fixed Costs	Rs. 20,000
Variable Costs Per Unit	Rs. 12 per unit
Total Revenue	1600 units * Rs. 20 per unit = Rs. 32000
Total Variable Costs	1600 units * Rs. 12 per unit = Rs. 19,200
Loss	**(7200)**

Comment on whether Golden Tires Ltd. should continue or shut down its operations in the short run.

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IN-TEXT QUESTIONS

11. A short run is a time period in which some factors remain constant while others change. True / False
12. _____ is the total cost divided by the number of output units produced.
13. The cost added to the total cost of producing one more unit of output is known as:
    a) Marginal Costs b) Average Costs
    c) Fixed Costs d) Average Variable Costs
14. The combination of fixed and variable factors becomes optimal at the minimum point of _____costs.
15. AC and AVC are both U-shaped, illustrating the law of variable proportions. True/False

4.4.2 Cost-Output Relationship in the Long Run

The long run is a time period in which the firm can vary all of its inputs. None of the variables are fixed and can be changed to increase output. Long run is a period of time long enough to allow changes in the plant, such as capital equipment, machinery, land, and so on, in order to expand or contract output. The long run cost of production is the lowest possible cost of producing any given level of output when all inputs, including plant size, are variable. There is no fixed factor of production and thus no fixed cost in the long run. Because the scale of production may change during this period, the long run cost curves will be subject to Returns to Scales.

4.4.2.1 Long Run Total Cost

The long run total cost curve shows us the cheapest way to produce any level of output. Each point on the long run total cost curve is obtained by a point on the short run total cost curve representing the most appropriate plant to produce that output (the plant that provides the lowest possible cost to produce the specific level of output). The long run total cost curve is the one that is tangent to the short run total cost curves. There can never be a portion of the STC curve that is lower than the LTC curve derived from the STC curves. Because there are no fixed costs in the long run, the LTC curve is S-shaped and begins at the origin.

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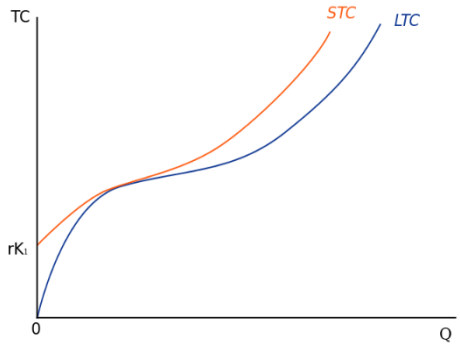

***Fig. 12**: Long Run Total Costs*

4.4.2.2 Long Run Average Cost Curve

In the long run, all of the production factors are variable, and the firm has a number of options for determining the size of the plants and the production factors to employ. Different short run average cost curves represent the various plant sizes available to a firm. We can obtain the long run average cost curve by combining all of the short run average cost curves. The long run average cost curve encompasses all of the short run average cost curves contained within it. It's also known as a 'Envelope Curve' or a 'Planning Curve'.

The long run average cost curve is also a flat U-shaped curve, as illustrated in the diagram below:

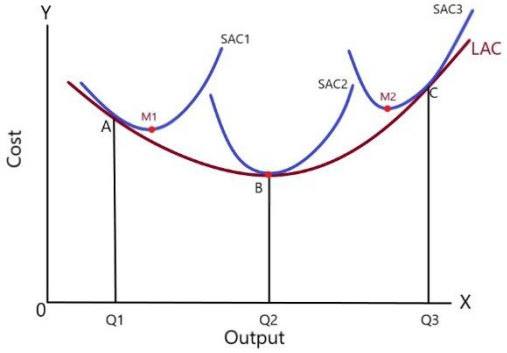

***Fig. 13:** Long Run Average Costs*

Characteristics of LAC curve

(i) LAC is called the "envelope curve" as it envelops the SAC curve since LAC is derived from the short run cost curves.

(ii) No portion of LAC can be above any portion of SAC's

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(iii) Each point on the LAC is the point of tangency with the corresponding SAC curve.

(iv) The firm chooses that short run plant which allows it to produce the expected output at the minimum cost in the long run. Therefore, the LAC helps the firm in decision making and is called the "planning curve".

(v) Each point on the LAC curves shows the least cost for producing the corresponding level of output. Any point above LAC curve is inefficient because it represents higher per unit cost of production. Any point below the LAC is desirable but unattainable.

(vi) The U shape of the LAC curve reflects the law of returns to scale.

(vii) The LAC touches the minimum of SAC only in the special case- where the optimal plant size is reached.

(viii) The LAC is U shaped, but the sides are flatter than the U-shaped SACs.

4.4.2.3 Long Run Marginal Cost Curve

The LMC curves are derived from the SMC curves. The LMC is derived from the points of intersection of SMC with vertical lines drawn from the points of tangency of the corresponding SAC and LAC curves to the X axis.

When output is increased by one unit, the LMC shows the lowest additional long-run total cost.

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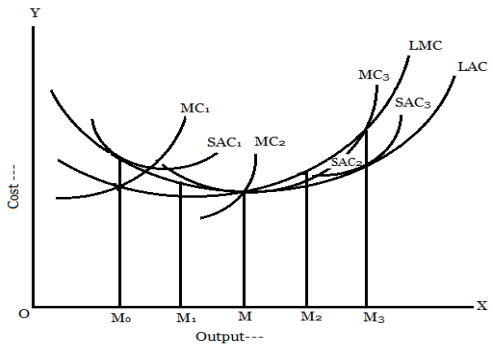

Fig. 14: *Long Run Marginal Costs*

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Relationship between LAC and LMC curves

(i) The U-shape of the LAC curve implies that LMC is also U-shaped.

(ii) The LMC curve cuts the LAC curve at the latter's minimum point.

(iii) When LAC is falling, LMC is below it.

(iv) When LAC is rising, LMC is above it.

(v) When LAC is at its minimum point, then LMC = LAC

SHUT DOWN IN THE LONG RUN (EXITING THE INDUSTRY)

As a general rule, a decision to permanently close down, that is, leave the market, should only be made if revenues are insufficient to pay for all costs. It implies that a company incurring losses should eventually close its doors and leave the market. The short run is defined as a period in which the business has at least one fixed input or cost. Fixed costs like rentals must be paid even if the business has undertaken production or not. However, in the long all inputs and costs fluctuate over time.

Shutdown is a short-term temporary decision made to reduce losses when the firm is not even able to recover its average variable cost. A business may temporarily cease operations, but it may later restart operations if market conditions allow. Even if the company decides to shut down in the short run, the investment in plant and equipment will have resulted in sunk expenses. Therefore, a business may decide to stop operating temporarily before starting up again later in the long run.

However, businesses will ultimately elect to leave the industry if conditions do not change; this is a long-term choice. The losses will continue to grow, though, until average revenue (AR) exceeds average total cost (AC), if the company is unable to raise the selling price per unit (to increase overall revenue) to cover total expenses (ATC). The decision to exit the industry is guided by the relationship between the price (P) and the long-run average cost (LRAC). If P < LRAC, businesses will leave the industry. If the company decides to continue operating, it will do so where long-run marginal cost (LRMC) equals marginal revenue (MR).

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4.4.3 Relationship Between Production and Cost Curves

This section describes the relationship between

(i) average variable cost (AVC) and average product (AP)

(ii) marginal cost and marginal product

(i) AVC is inversely related to AP, given the price of the variable factor

Suppose the variable factor is Labour (L) and price of the variable factor is the wage rate (W).

$$AVC = \frac{\text{TVC}}{\text{Q}}$$

Since we know that $TVC = W.L$

Therefore, we can write $AVC = W.L/Q$

We know that (Q/L) = AP_L

Therefore AVC = W/ AP_L

Therefore, given the price of the variable factor (say wage rate of the labour), the average variable cost (AVC) is inversely related to the Average product of labour ($AP_{L)}$.

(ii) MC is inversely related to MP, given the price of the variable factor

$$MC = \frac{\Delta TC}{\Delta Q}$$

Since the marginal cost is only dependent on the variable cost, we can say

$$MC = \frac{\Delta TVC}{\Delta Q}$$

In case the variable factor is labour (L), and the price of variable factor is wage rate (W), TVC can also be expressed as,

$$TVC = W.\Delta \text{L}$$

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Therefore,

$$MC = \frac{W.\Delta L}{\Delta Q} = W/(\Delta Q/\Delta L)$$

Thus, MC = W/MP_L

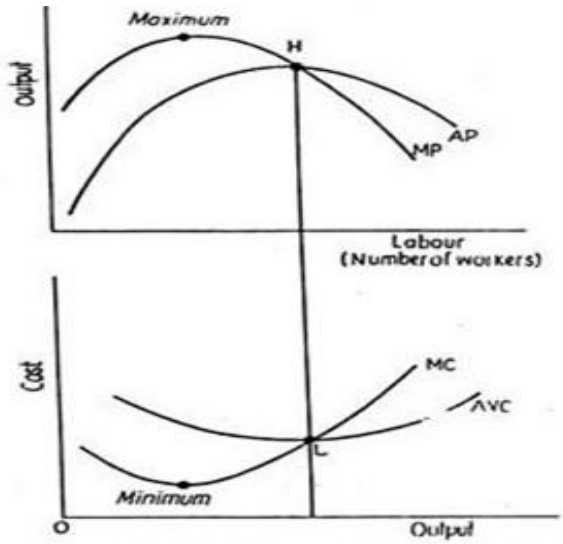

Figure 15: Relationship Between Production and Cost Curves

4.5 MODERN THEORY OF COST

We have learnt about the traditional theory of costs in the previous section. In this section, we will learn about the modern theory of costs. Unlike the traditional theory of cost, the modern theory does not agree on the U-shaped cost curves. According to modern theory, the short-run cost curve is saucer-shaped, while the long-run average cost curve is either L-shaped or inverse J-shaped. This is due to the presence of built-in reserve capacity, which provides flexibility and allows the plant to produce more output without increasing costs.

The Modern theory proposes the existence of "built-in reserve capacity," which provides flexibility and allows the plant to produce more output without increasing costs. The short-run cost curve is shaped like a saucer, whereas the long run cost curve is either L-shaped or inverse J-shaped. The firm, according to the Modern theory of costs, can produce a range of

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output rather than a single level of output as in the traditional theory of cost. Firms construct industrial plants with some degree of flexibility in their productive capacity, so that instead of a single output level, a wide range of output can be produced optimally and at a low cost. The 'Built-in Reserve capacity' allows for flexibility in the manufacturing process. The 'Saucer - shaped' short run average variable costs are explained by the planned reserve capacity. The modern theory of cost emphasizes the role of economies of scale in allowing a firm to continue production at the lowest point of average cost for an extended period of time. In contrast to the traditional theory, where the average cost rises after the firm reaches the optimal level of output, the firm checks diseconomies of scale by planning ahead of time and enjoys production gains. The L-shaped and inverse J-shaped LAC curves are explained by developments in managerial economies.

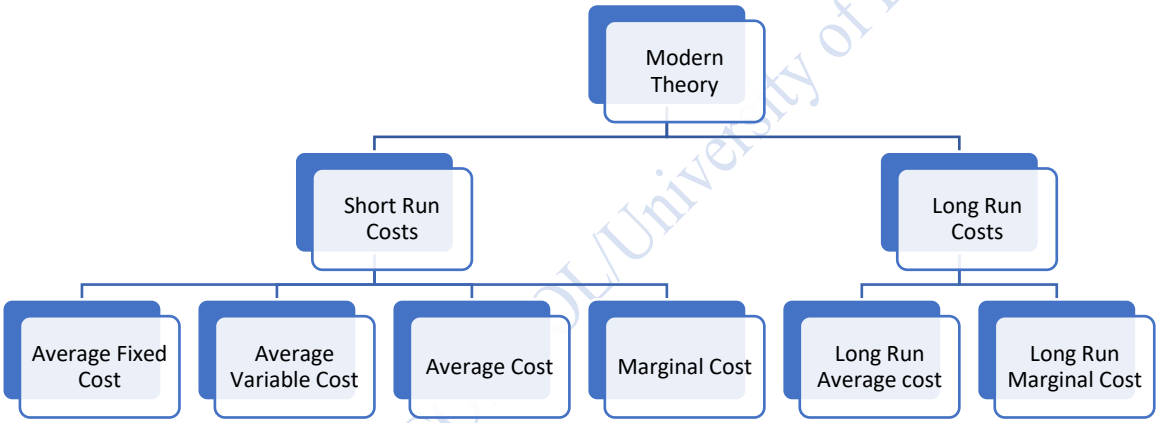

Figure 16: Modern Theory of Costs

4.5.1 Short Run Average Fixed Cost

The average fixed costs in modern microeconomics plot as a rectangular hyperbola, just like in traditional cost theory.

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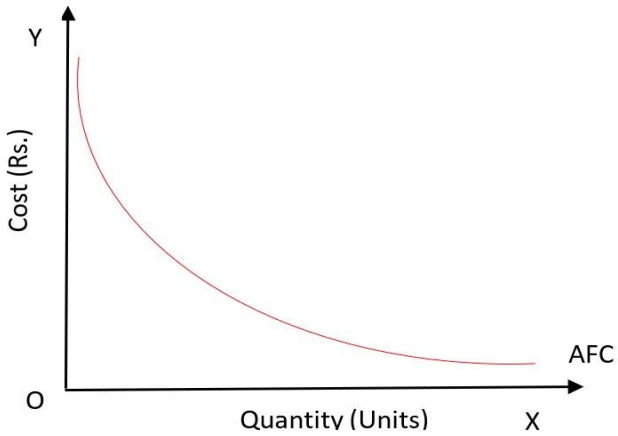

Figure 17: Short Run Average Fixed Costs (Modern Theory)

4.5.2 Short Run Average Variable Cost

According to modern theory, average variable cost is saucer-shaped and has a flat stretch over a range of output. This flat stretch represents the firm's reserve capacity to meet seasonal and cyclical demand changes. The average variable cost curve looks like this:

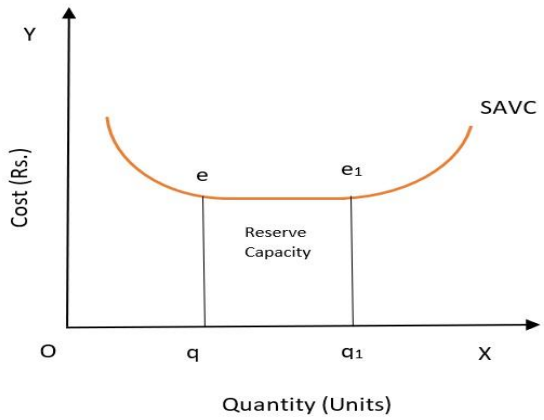

Figure 18: Short Run Average Variable Costs (Modern Theory)

4.5.3 Short Run Average Cost

Average fixed costs and Average variable costs comprise the short-run Average costs. The smooth and continuous fall in the average cost curve is caused by the AFC curve being a rectangular hyperbola and the AVC curve falling and then becoming horizontal within the

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range of reserve capacity. Beyond that, it begins to climb steeply. The average cost curve looks like this:

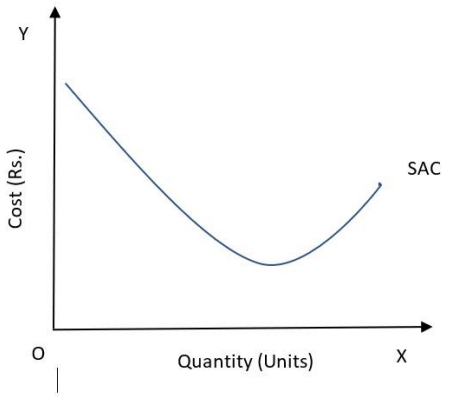

Figure 19: Short Run Average Costs (Modern Theory)

4.5.4 Short Run Marginal Cost

At its lowest point, the MC curve intersects the SAVC curve. Because the SAVC curve reaches its minimum point not at a single point but over the entire flat stretch ee_1, the SMC coincides with the SAVC over the entire range of output corresponding to the flat stretch of the SAVC Curve. The SMC curve will be below the Saucer-shaped SAVC curve for any output less than Oq, and it will be above the SAVC curve for any output greater than Oq_1. As a result, the short-run marginal cost curve coincides with the SAVC Curve over the flat stretch pertaining to Reserve Capacity.

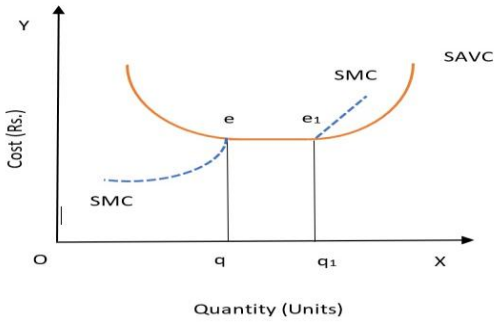

Figure 20: Short Run Marginal Costs (Modern Theory)

4.5.5 Long Run Average Cost

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Modern economists divide long run costs into production costs and managerial costs. In the long run, all costs are variable, giving rise to an L-shaped long run average cost curve. This curve initially slopes rapidly downwards but later remains flat or gently slopes downwards at its right-hand. The long run average cost curve looks like this:

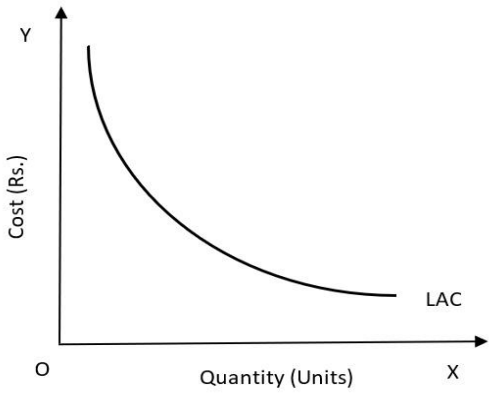

Figure 21: Long Run Average Costs (Modern Theory)

4.5.6 Long Run Marginal Cost

The shape of the long-run marginal cost curve corresponds to the shape of the long-run average cost curve as per the modern theory of costs. The diagram shows that when LAC is L-shaped and the LAC curve is falling, the LMC curve will also fall, and its falling portion will be lower than the LAC curve's falling portion.

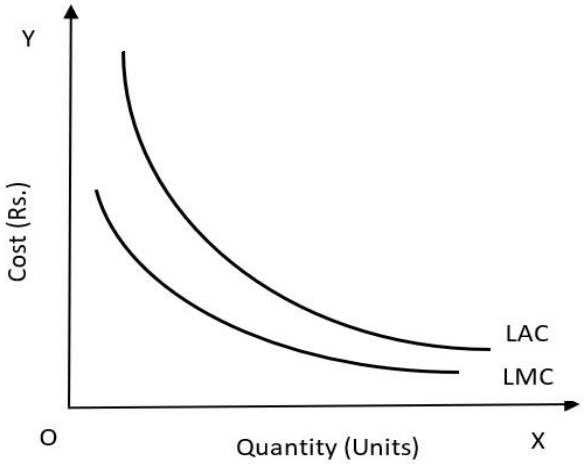

Fig. 22: *Long Run Marginal Costs (Modern Theory)*

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IN-TEXT QUESTIONS

11. According to modern theory, average variable cost is _____shaped.
12. The flat stretch of short-run AVC in modern theory of costs represents the firm's reserve capacity to meet seasonal and cyclical demand changes. True/False
13. Long run average costs as per modern theory of costs is U shaped. True / False
14. The average fixed costs plot as a rectangular hyperbola according to both traditional and modern theory of costs. True/False
15. According to modern theory, average variable cost:
    a) L shaped b) Saucer shaped
    c) U Shaped d) M shaped

4.6 SUMMARY

- Both explicit and implicit costs are considered in the economic cost of production. The actual sums paid to third parties for the acquisition of resources and services are referred to as explicit costs. The opportunity cost connected with using one's own resources for business purposes is one example of implicit costs.
- Economic profit: The difference between a company's total revenue and total costs, where total costs include both explicit and implicit costs.
- Opportunity cost is the cost of the next best option that was skipped.
- Long run and short run costs are distinguished in the traditional theory of costs. In the short run, certain variables are constant while others are subject to change.
- The short run costs of a corporation are the costs associated with using the variable units of production along with the cost of the fixed elements. Total fixed cost (TFC) plus total variable cost (TVC) is added to get the short run total cost (TC), which is denoted as TC= TFC + TVC.
- Total fixed costs are those whose total amount does not fluctuate while the output varies. The TC curve is a horizontal straight line.

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- The change in output level directly affects the variation in variable costs. The TVC curve, which reflects the law of variable proportions, is an inverse S-shaped curve.
- Total fixed cost (TFC) divided by output level (Q) yields average fixed cost (AFC); AFC = FC/Q. The AFC curve is a rectangular hyperbola.
- The average variable cost is calculated by dividing the total variable cost by the number of units of output produced. Therefore, $AVC = \frac{\text{TVC}}{\text{Q}}$.
- Average cost (AC) is the total cost (TC) divided by thelevel of output (AC=TC/Q).
- Marginal cost (MC) is the change in total cost resulting from a unit change in output; $MCn = TC_n - TC_{n-1}$. It is the first derivative of the total cost function. The MC curve is also "U"- shaped. One should remember that MC is independent of fixed costs.
- AC and AVC are both U-shaped, illustrating the law of variable proportions.
- The MC curve intersects the AVC and AC curves at their minimum points. The minimum point of AC comes after the minimum point of AVC. The minimum point of AC is to the right of the minimum point of AVC.
- The behaviour of the AC curve is determined by the behaviour of the AVC and AFC curves.
- Initially, both AVC and AFC are falling, resulting in a precipitous drop in AC. The AVC begins to rise after reaching its minimum point. The AFC is still in decline. The rate of fall of AFC is greater than the rate of rise of AVC until the minimum point of AC.
- Beyond that level of output, the rate of rising AVC offsets the rate of falling AFC, causing the AC to rise. It is also possible to observe the AVC approaching the AC asymptomatically. This is due to the AFC, which continues to decrease as output increases, which in turn shrinks the distance between AC and AVC.
- When AC falls, MC is less than AC and lies below AC.
- At the minimum point of the AC curve, the slope of AC is zero. At this minimum point of the AC curve, AC = MC.
- When the slope of AC exceeds zero (AC is rising), MC will be greater than AC and will lie above it.
- LAC is called the “envelope curve” as it envelops the SAC curve since LAC is derived from the short run cost curves.

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- The U-shape of the LAC curve implies that LMC is also U-shaped. The LMC curve cuts the LAC curve at the latter's minimum point. When LAC is falling, LMC is below it. When LAC is rising, LMC is above it. When LAC is at its minimum point, then LMC = LAC

4.7 GLOSSARY

Short Run- It is a time period in which some factors are fixed, while others are variable.

Long Run- It is a time period in which all factors are variable and none of the variables is fixed.

Fixed Costs- Fixed costs are those that are not affected by changes in output.

Variable Costs- These are the costs associated with the use of variable factors of production, the amount of which can be changed in the short run.

Marginal Costs –These are the costs added to the total cost of producing one more unit of output.

Accounting Costs- These are the expenses that are recorded in the books of account such as profit and loss statements and the balance sheet.

Economic Costs- It is the sum total of explicit and implicit cost.

Opportunity Costs- These are the returns from the firm's second-best use of resources that it foregoes in order to reap the benefits of the best use of resources

Sunk Costs- These are investments that have no opportunity cost.

Historical Costs- The historical cost of an asset is its original cost.

Replacement Costs- A replacement cost is the amount of money that would have to be paid today to replace the same asset.

Incremental Costs- Incremental costs are defined as the change in overall costs caused by specific decisions.

Books Costs- These are costs that do not involve cash payments, but a provision is made in the books of account, and they are taken into account when the profit and loss accounts are finalised.

Out-of-Pocket Costs- These also known as explicit costs, are those that require immediate cash payment.

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Private Costs- Private cost is the cost of production incurred and provided for by an individual firm engaged in the production of a commodity.

Social Costs- The total cost to society of producing a good.

Shutdown Costs- Costs incurred when production operations are suspended.

4.8 ANSWERS TO IN-TEXT QUESTIONS

1. Implicit	9. Average Costs
2. True	10. True
3. b	11. Saucer Shaped
4. Social Costs	12. True
5. False	13. False
6. True	14. True
7. Average Costs	15. b
8. a	

4.9 SUGGESTED READINGS

Koutsoyiannis, A. (1975). *Modern microeconomics*. Springer.

Mankiw, N. G. (2021). *Principles of Microeconomics 9e*. Cengage Learning Asia Pte Limited.

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LESSON 5

MARKET STRUCTURES

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STRUCTURE

5.1 Learning Objectives
5.2 Market Structures
5.3 Perfect Competition
- 5.3.1 Characteristics
- 5.3.2 Equilibrium of Firm and Industry under Perfect Competition
- 5.3.3 Price Determination under Perfect Competition
- 5.3.4 Dynamic Changes under Perfect Competition

5.4 Monopoly
- 5.4.1 Characteristics
- 5.4.2 Equilibrium under Monopoly
- 5.4.3 Price Determination under Monopoly
- 5.4.4 Dynamic Changes under Monopoly
- 5.4.5 Multiplant Firm
- 5.4.6 Bilateral Monopoly

5.5 Pricing Strategies
5.6 Monopolistic Competition
- 5.6.1 Characteristics
- 5.6.2 Equilibrium of the Firm under Monopolistic Competition
- 5.6.3 Price Determination under Monopolistic Competition

5.7 Oligopoly

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5.7.1 Characteristics
5.7.2 Price Rigidity
5.7.3 Collusive vs Non-collusive Oligopoly
5.7.4 Game Theory
5.8 Summary
5.9 Glossary
5.10 Answers to In-text Questions
5.11 Self-Assessment Questions
5.12 References
5.13 Suggested Readings

5.1 LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- Describe the nature and types of markets and recognize the firms operating under different market structure.
- Determine the short-run and long-run optimal output and price for firms and industry under different market conditions.
- Examine the effect of dynamic changes happening in the market.
- Determine the implications of collusion among firms in the market.

5.2 MARKET STRUCTURES

Market structure is the classification and differentiation of various types of firms based on their level competition, types of goods and services offered, number of buyers and sellers, degree of information available, etc. Market structure basically characterizes the marketplace "*where buyers and sellers meet and exchange products and services*" (Kotler, 2012). On the one hand, market structure influences seller's behaviour and on the other it determines the supply of different goods and services.

We can characterize market structures based on the number of buyers and sellers, ability to set the prices, degree of product homogeneity and the autonomy of entry and exit from the market. Based on above criteria markets are generally classified as:

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Perfect competition: there are unlimited number of sellers selling homogenous goods at uniform price. The demand curve of a firm is perfectly elastic parallel to X-axis with freedom of entry and exit from the market.

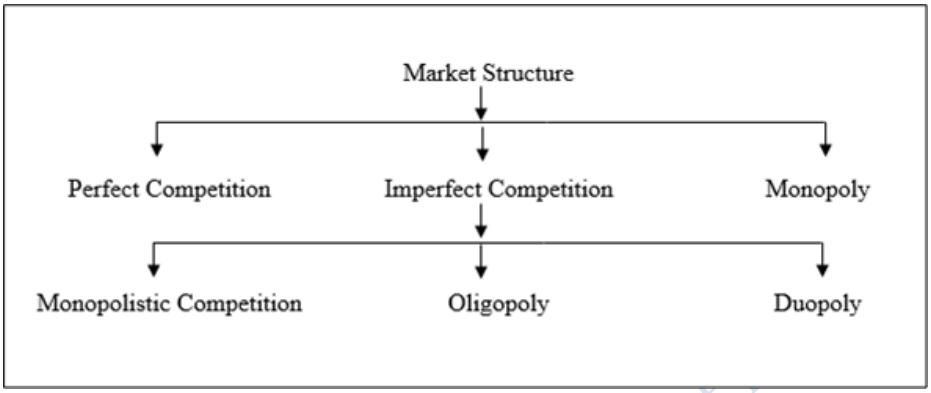

Fig 5.1: Types of Market Structures

Under imperfect competition different types of markets exists such as.

Monopolistic competition: with large number of firms, each having a small market share, selling almost identical goods with slight difference. Each firm can influence the price of their products up to a certain extend.

Monopoly: where only a single seller is operating in the market with strong barriers to entry. The firm can set a price which is more than perfectly competitive market price.

Oligopoly: where few large firms capturing a larger share of the market. The product offered by them can be homogenous or not, and they may form a cartel or compete with other firms in the market.

Duopoly: as the name suggests, this type of market is like oligopoly with only two large companies capturing a significant share of market.

Monopsony: is a special type of market with only a single buyer.

Oligopsony: is a market with only few buyers.

Table 5.1: Characteristics of Different Market Structures

Type of Market	Sellers' Entry & Exit	Nature of goods/services	No. of firms	No. of buyers	Price
Perfect Competition	Free	Identical	Unlimited	Unlimited	Price-takers
Monopolistic competition	Free	Closely related but differentiated	Unlimited	Unlimited	Partial control over price

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Monopoly	Restricted	Differentiated (No Substitute)	Single	Unlimited	Price- maker
Duopoly	Restricted	Identical or differentiated	Two	Unlimited	Price rigidity due to price war
Oligopoly	Restricted	Identical or differentiated	Few	Unlimited	Price rigidity due to price war
Monopsony	Free	Identical or differentiated	Unlimited	Single	Price-taker
Oligopsony	Free	Identical or differentiated	Unlimited	Few	Price-taker

5.3 PERFECT COMPETITION

It is a type of market with unlimited number of small companies selling identical goods at a uniform price. Firms under perfectly competitive market cannot fix the prices and they are considered as 'price takers. They are free to either enter or exit from the market and the consumers have full knowledge about the goods sold in the market.

5.3.1 Characteristics:

- Unlimited producers and buyers
- No barrier in entry and exit from the market.
- Products are homogenous in nature
- Perfectly elastic demand curve horizontal to X-axis where, AR = MR
- Complete information about the product, price, quality and production methods
- Firms are price-takers
- Profit Maximization: firms aim is to maximize its profits
- No transaction costs
- Perfect factor mobility

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5.3.2 Equilibrium of Firm and Industry under Perfect Competition:

It is important to differentiate between firm and industry before analysing the two. Lipsey & Chrystal (2011), have defined, "*Firm is the unit that employs factors of production to produce commodities that it sells to other firms, to households, or to the government*". Industry on the other hand, is a group of firms that sells identical products. For example, Tata Motors, Mahindra and Mahindra, Toyota, etc., are automobile producing firms, whereas a group of such companies is called the automobile industry.

A. Short-Run Equilibrium of a Firm

A firm changes its output in the short-run by changing its variable factors of production. No firm can enter or leave the market in the short run. There are two techniques of determining the equilibrium position of a firm. These are.

(1) Marginal Cost-Marginal Revenue Approach

A firm under perfect competition is in equilibrium at a point where it produces optimal level of output giving him maximum profit. The two conditions for achieving equilibrium are.

(i) MC = MR (first order and necessary condition)

(ii) MC curve must cut the MR from below (second order condition)

A firm can have five possibilities in the short run which are given below.

(a) Supernormal Profits

When the prevailing market price is higher than the SAC, a firm earns super normal profits. As shown in Fig 6.2 (A), the equilibrium point is E_1 where SMC = MR and SMC curve intersects the MR curve from below (i.e., slope of MC > slope of MR). The optimal level of output is OQ, and price is OP. The area as TSE_1P is the supernormal profits for the firm.

(b) Normal Profits

At the equilibrium point E_2, the price equals the SAC, giving only normal profits to the firm (Fig 6.2 (B)).

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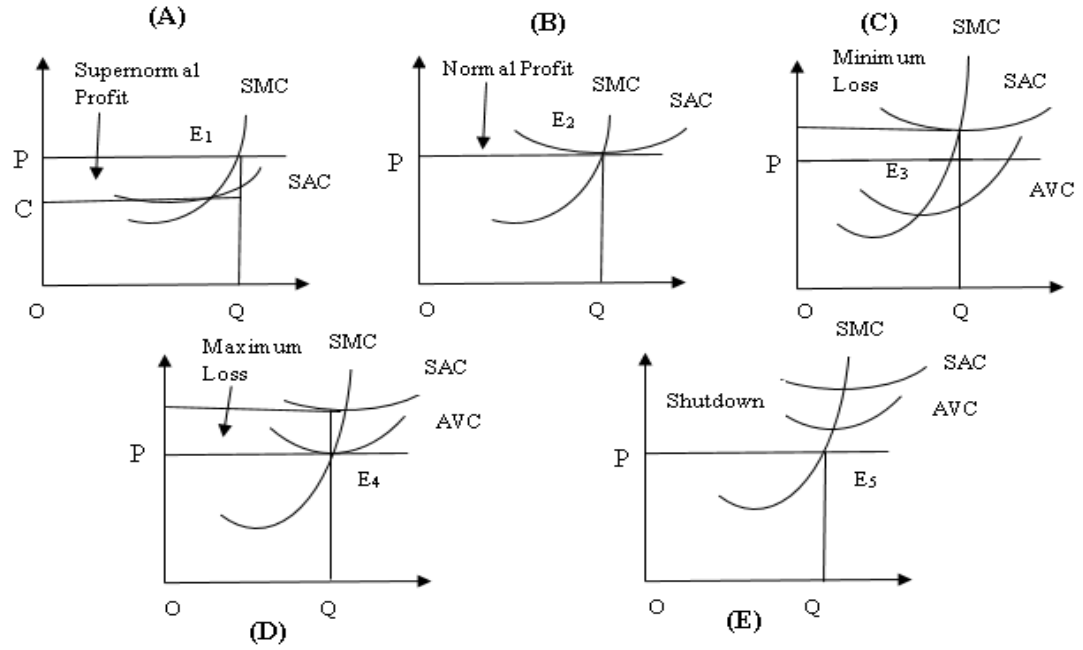

Fig 5.2: Short-Run Equilibrium of the Firm under Perfect Competition (Marginal Cost-Marginal Revenue Approach)

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(c) Minimum Loss

When the price is fixed below the SAC, a perfectly competitive firm incur losses equal to the area PE_3BA as shown in Fig 6.2 (C). Note that the firm will stay in the market as long as it is covering its average variable cost plus some of its fixed cost.

(d) Maximum Loss

But when the price falls to the level of AVC, as shown in fig 6.2 (D), the firm becomes indifferent whether to continue production or shutdown. At point E_4, the firm will just cover its average variable cost. Therefore, point E_4 is the shutdown point for the firm.

(e) Shut Down Point

In Fig 6.2 (E), shut down point is depicted where a firm is unable to cover even its AVC. Therefore, in short run a firm is in equilibrium in all the above explained situations.

(2) Total Cost-Total Revenue Approach

A firm under perfect competition prefers the point of production where the gap between TC and TR is maximum (Fig 6.3). This is the point of equilibrium.

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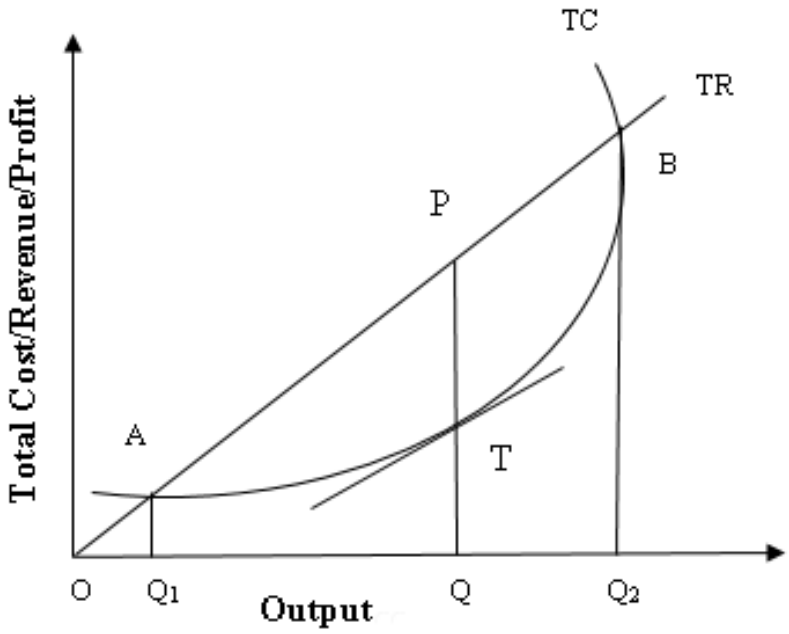

Fig 5.3: Short-Run Equilibrium of the Firm under Perfect Competition (Total Cost-Total Revenue Approach)

B. Short-Run Equilibrium of the Industry

A perfectly competitive industry must fulfil two conditions to reach the equilibrium position in short run. These are.

(i) SAC = AR and

(ii) SMC = MR for all the firms.

This implies that all firms of a perfectly competitive industry must be earning only normal profits. This is totally a coincidence, because we have seen that in short run a firm may earn supernormal profits or incur losses. Even then, there is a possibility of industry to achieve equilibrium when its quantity demanded equals to its quantities supplied at the price which clears the market.

Fig 5.4 depicts the equilibrium of a perfectly competitive industry. At point E, the total demand curve "D" and total supply curve "S" intersects giving equilibrium price OP and output OQ. But one can see that at the prevailing market price OP, some firms are earning supernormal profits PE_1ST, while some other firms are incurring losses.

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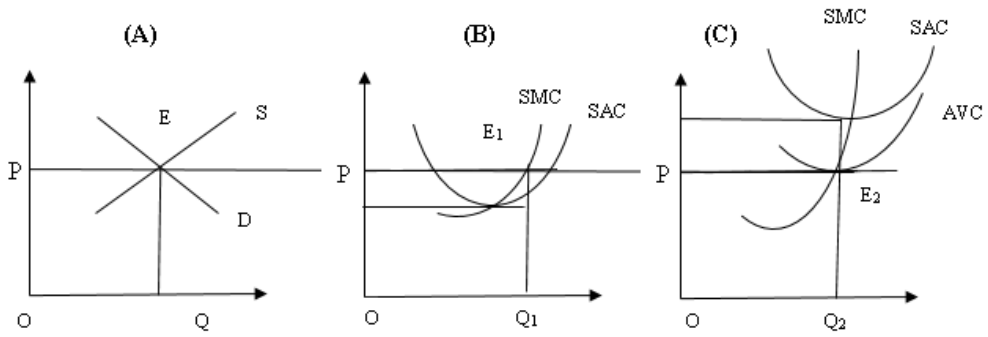

Fig 5.4: Short-Run Equilibrium of the Industry under Perfect Competition

C. Long-Run Equilibrium of the Firm

In the long-run, all costs become variable. This means that the firm can change its production-capacity based on the level of demand. There is an absence of fixed costs in the long-run and optimal production point is at the lowest level of long-run AC curve.

Each firm in the long run is earning only normal profits. Since, free entry and exit are allowed for firms from the market, if some firms are getting more than normal profits, new companies will enter the market. Similarly, if some firms are incurring losses, they will leave the industry.

Thus, each firm of the industry under perfect competition have to fulfil two conditions to achieve the equilibrium point.

(i) LMC = SMC = AR = MR = P = SAC = LAC at its lowest point (first-order condition).

(ii) LMC curve must cut the MR curve from below (second-order condition)

Fig. 6.5 is showing both these conditions being satisfied at point E. Hence, the optimal output is OQ, and equilibrium price is OP giving the firm normal profits.

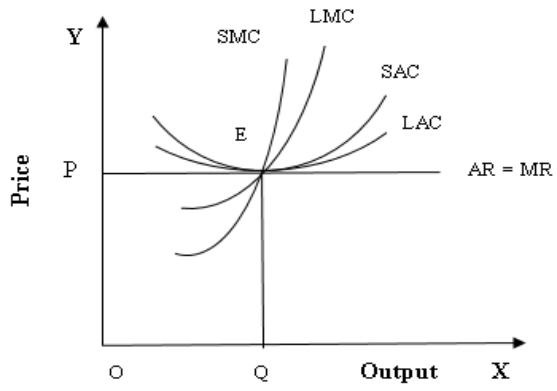

Fig 5.5: Long-Run Equilibrium of the Firm under Perfect Competition

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D. Long-Run Equilibrium of the Industry

The long-run equilibrium condition for an industry operating under perfect competition is when 'LMC = MR = AR = LAC at its minimum level'. At this point industry's total demand is equal to its total supply (fig. 6.6). Note that the supply curve of the industry is determined by the horizontal summation of the supply curves of the individual firms. This can be upward sloping (increasing- cost industry), downward sloping (decreasing- cost industry) or horizontal (constant- cost industry). On the other hand, the demand curve of the industry is downward sloping.

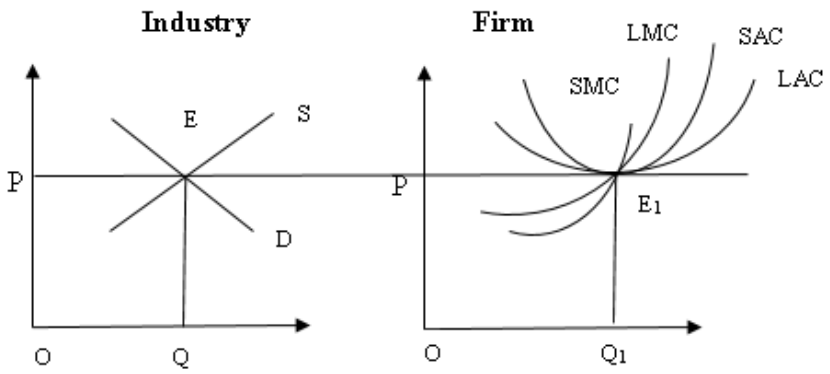

Fig 5.6: Long-Run Equilibrium of the Industry under Perfect Competition

5.3.3 Price Determination under Perfect Competition:

Prices under perfect competition are fixed based on the level of demand and supply. Products sold under perfect competition are homogenous with perfectly elastic demand curve which is horizontal to X-axis. This implies that a firm cannot alter the prices and only accept the prevailing market prices which are fixed by the industry based on interactions of total demand and supply. Hence, the 'law of one price' prevails in this market.

5.3.4 Dynamic Changes under Perfect Competition:

This section will help us in examining the impact of dynamic changes happening in real life on the perfect competition model.

A. A Shift in the Market Demand

First of all, we will examine the impact of shift in market demand on a perfectly competitive firm as well as industry. In the fig. 6.7, let's assume a rightward shift in the demand curve due to rise in the income of consumers.

In the short run, the price will increase from P to P' and the quantity supplied from Q to Q' and the firm will start producing more quantity from X to X'. The firm will earn excess profits equal to the area ABCP' due to rise in market price.

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In the long run, this excess profit made by existing firms will attract newer firms into the market. This incoming of newer firms will result in a rightward shift in the market supply causing price to fall below the short-run equilibrium level P'. The new equilibrium price may either remain above the original level, or it may return to the original price P, based on the magnitude of the shift in the market supply curve. This shift in the market supply curve also reflects the cost conditions prevailing in the industry which indicates the change in factor costs as the industry expands.

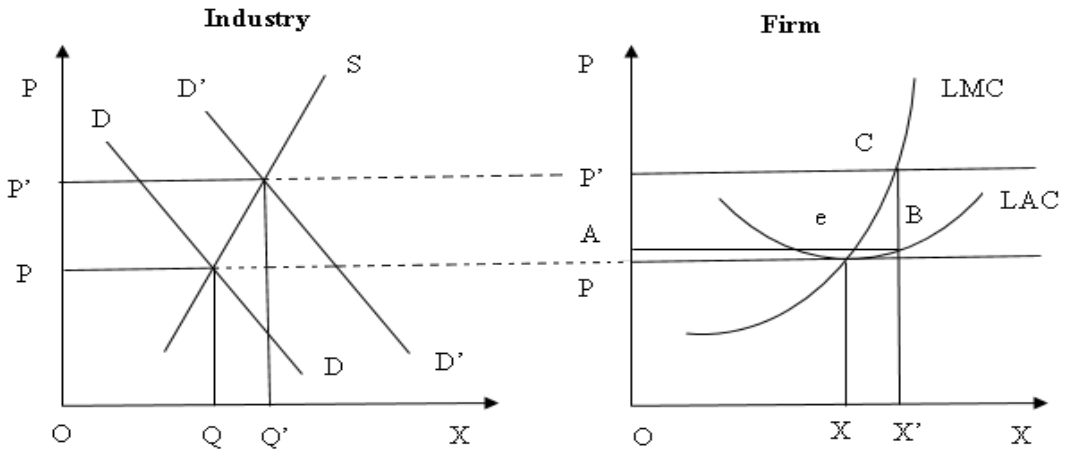

Fig 5.7: Impact of Shift in the Market Demand on Perfect Competition

Let's see three market scenarios, where the perfectly competitive industry is a constant-cost industry, increasing cost industry and decreasing cost industry.

1. **Constant Cost Industry**

An industry is a constant cost industry if the factor prices remain constant as industry output increases. Fig 5.8 depicts the long-run equilibrium of a constant cost industry. The firm is in long-run equilibrium is at a point where the demand-curve price line P is tangent to the long-run and the short-run average total cost curves at their minimum points.

Now we assume that the market demand curve shifts from DD to D_1D_1. This will shift the price to P' in the short-run and the firm will react to this by increasing their output beyond full capacity (from OX to OX'). This will shift the market supply curve form SS to S_1S_1. This situation leads to excess profits to existing firms and attracts newer firms in the market. Since we have assumed a constant-cost industry that means newer firms will also produce at the same level of LAC. New firms will continue to enter until the resulting the supply curve intersects the shifted-demand curve at the initial price P. This will result in the long-run industry supply curve parallel to the X-axis.

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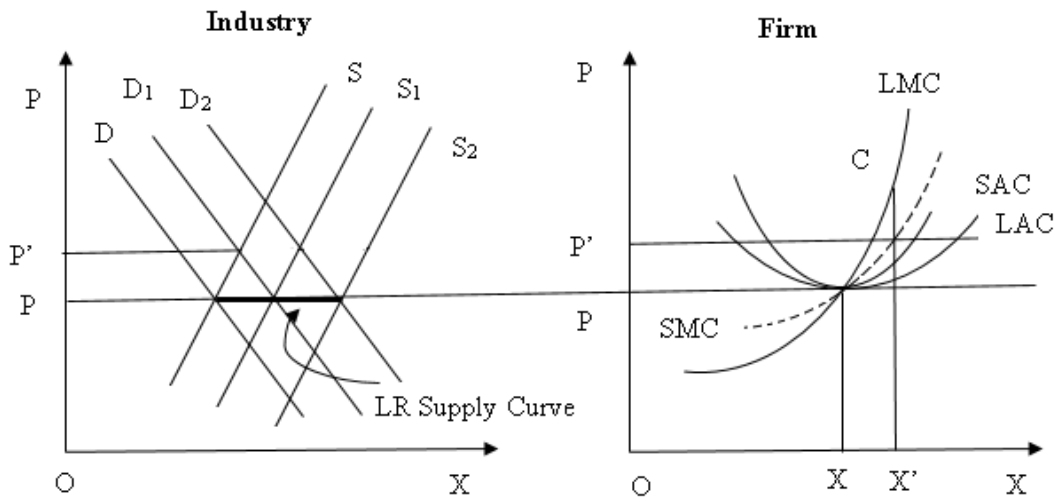

Fig 5.8: Impact of Shift in the Market Demand under Constant-cost Industry

2. **Increasing-cost industry**

In an increasing-cost industry the factor prices increase as the market expands. Under an increasing-cost industry the long-run supply curve of the industry is positively sloped. In the fig 5.9, we can see as the market demand shifts from DD to D_1D_1, the market price increases giving excess profits to existing firms. This will attract newer firms in the market resulting increasing demand for factors of production. Our assumption of an increasing-cost industry will cause an upward shift in the production costs of existing as well as newer firms. Hence, the newer market prices will be higher than the original market price giving an upward sloping long-run supply curve.

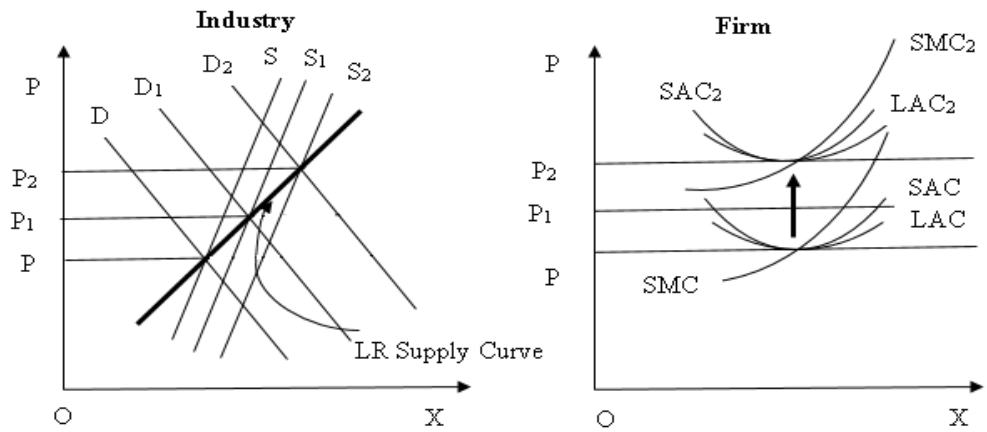

Fig 5.9: Impact of Shift in the Market Demand under Increasing-cost Industry

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3. Decreasing-cost industry

A decreasing-cost industry means the prices of factors of production will go down as the market expands. This gives the industry a negatively sloped long-run supply curve. The situation has been depicted in the fig.5.10 where shift in the market demand DD to D_1D_1 attracts newer firms in the market. As the demand for factors of production increases their price decreases. As a result, the cost of production shifts downwards decreasing the market price. This also results in downward sloping long-run supply curve.

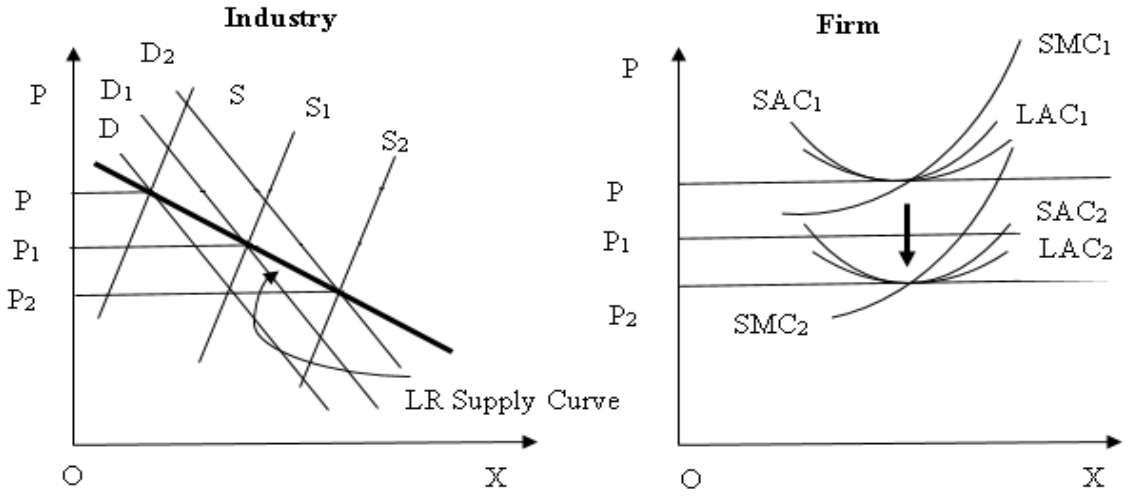

Fig 5.10: Impact of Shift in the Market Demand under Decreasing-cost Industry

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B. A Shift in the Costs due to Changes in Factor Prices

The above shifts in the cost curves of the firms depend on whether the change relates to the fixed or the variable factors. First, let's see the effect of an increase in the fixed cost of the firms.

1. An increase in the fixed cost

In the fig 5.11 we have assumed that the rent of the factory is increased. This leads to an upward shift in both the AFC and the ATC curves, leaving the AVC and the MC curves remains unaffected. Since the MC curve will remain unchanged, the equilibrium position of the firm will remain at the same position in the short run. This means the market output and price will remain at the original position (OQ and OP) respectively.

However, if we assume that the firm was just earning normal profits before the rise in the fixed cost. Now it will not be able to cover its average costs and will go out of business in the long run. Resulting a leftward shift in the market supply curve in the long run that increases the market prices and decreases the market output due to lesser numbers of firms in the industry.

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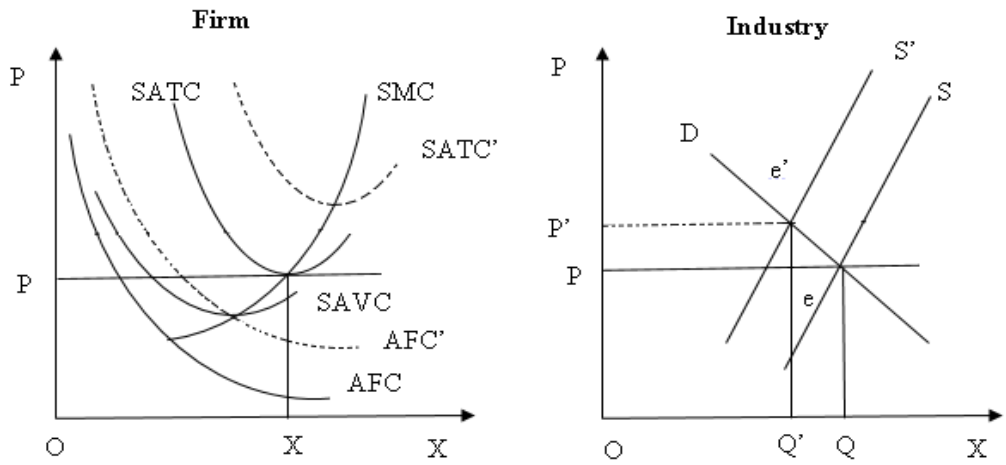

Fig 5.11: Impact of an Increase in the Fixed Cost under Perfect Competition

2. **An increase in the variable costs**

Now we assume that the labour wages have increased that shifting the AVC, ATC and the MC curves to the left (fig.6.12). Since the MC curve is also the supply curve of the firm, the rise in the variable costs will shift the market supply curve to the left at the going market price.

Given the market demand curve, the price will rise to P' due to the shift in the market supply curve in the short run.

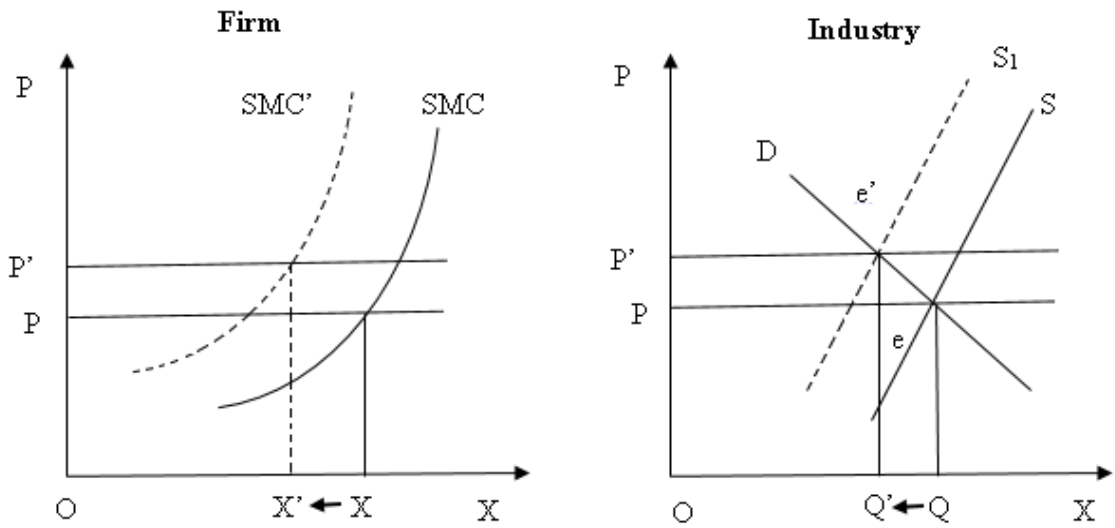

Fig 5.12: Impact of an Increase in the Variable Cost under Perfect Competition

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C Effects of Imposition of Taxes

The dynamic changes also include imposition of various taxes by the government. Here, we will see the effect of individual taxes on competitive firms and industry.

1. **Imposition of a Lump-sum Tax**

The imposition of a lump-sum tax affects the firms and industry the same way as in the case of an increase in the fixed cost that we have studied in the previous section. Thus, in the short run it will not affect the MC curve and the firm will continue to produce the same level of output as before. However, if we assume that the firm was earning just normal profits prior to the tax, it will now not be able to cover its ATC at the going market price and will close down in the long run. Thus, the market supply curve will shift leftwards lowering the output and there will be a rise in the market price in the long run.

2. **Imposition of a Profits Tax**

It is a tax on net profit of the firm whose effects are same as lump-sum tax. It will reduce the profits of the firm, but the MC curve will remain unaffected in the short run. However, the firm will exit the market if it is not able to cover its ATC in the long run at the going market price. Thus, the new equilibrium will reach at a higher price and lower output.

3. **Imposition of a Specific Sales Tax**

This tax is imposed on per unit of output produced by a firm. This tax affects the variable costs of the firm, shifting the MC curve to the left and reducing the output. Increase in variable costs also shifts the market supply curve to left which increases the market price. It is to be noted here that by how much will the price rise is depends on who is going to bear the specific tax. The burden of the tax is in turn depends on the price elasticity of supply.

The higher the price elasticity of supply the higher proportion of the tax borne by the buyers. In contrast, the lesser the price elasticity of supply the higher proportion of tax borne by the seller. As long as, the market supply curve is positively sloped the burden of tax will fall partly on both buyers and sellers.

In the fig. 5.13, the demand curve is identical in both the graphs and the pre-tax price P is also the same. But we can see that the supply curve is more elastic in section part II than part I. Specific tax equal to ab increases the price by □Pin I and □P_1 in II (□P < □P_1). This clearly shows that the burden of tax that falls on the buyer is greater in section II (where price elasticity of supply is more).

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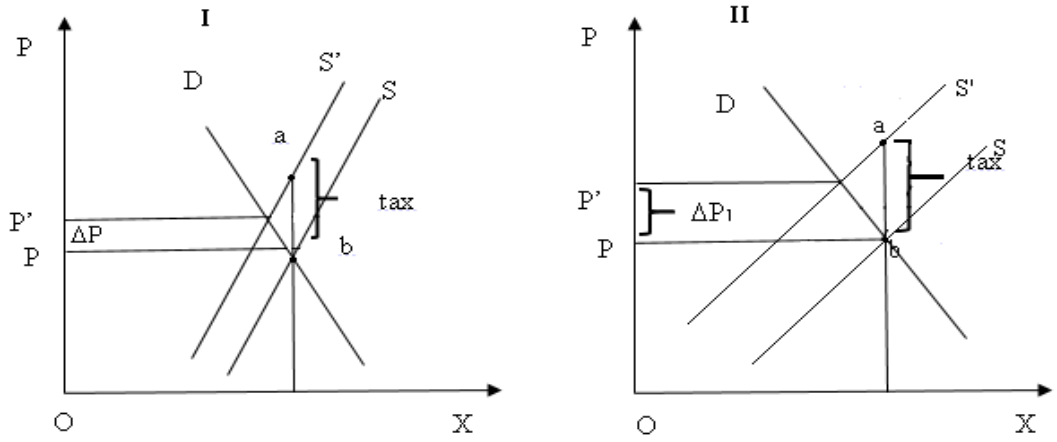

Fig 5.13: Impact of Imposition of Specific Sales tax on Perfect Competition

5.4 MONOPOLY

Under monopoly market a single firm represents the whole industry. It captures the entire market and faces no competition. The firm set the prices for its products. This can be due to sole access to resources, government licenses, Intellectual Property Rights (IPR) over the product, or high initial setup costs. Under monopoly, the market forces become irrelevant as the consumer lose all their power to negotiate and become price-takers. Although, a pure monopoly is very rare but few examples that are close to monopoly are local electricity supplier, supplier of Uranium and Thorium (raw materials for nuclear power plants), etc.

5.4.1 Characteristics:

- Single firm with not rival or direct competition
- Entry of new firms is completely blocked due to technical, legal or economic reasons
- Firm decides its price, 'price-maker'.
- Demand curve is downward sloping
- Monopolist can either set its prices or the quantity but not both
- The concept of supply curve is meaningless under monopoly
- Monopolist practices price discrimination to extract maximum profit
- Monopolist can earn super normal profits even in long-run

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5.4.2 Equilibrium under Monopoly:

Just like perfect competition, there are two approaches through which equilibrium position can be determined in monopoly. These are.

A. Marginal Revenue and Marginal Cost Approach

B. Total Revenue and Total Cost Approach

A. Marginal Revenue and Marginal Cost Approach

There are two conditions that needs to be fulfilled to achieve under monopoly.

(i) MR = MC (first-order condition)

(ii) MC curve must cut MR curve from below (second-order condition)

a. Short Run Equilibrium

A monopolist in short-run cannot change its fixed factors of production like, plant and machineries and can increase its production by increasing variable factors only. In short-run, three situations can occur for a monopolist. These are.

Super Normal Profits

A monopolist can earn super normal profits when the price charged is more than the SAC. The equilibrium point is at E, where the MC curve cuts the MR curve from below giving equilibrium quantity (OQ_1). At this point the price charged is (AO) which is more than SAC giving super normal profit equal to the area ABDC (fig 6.14).

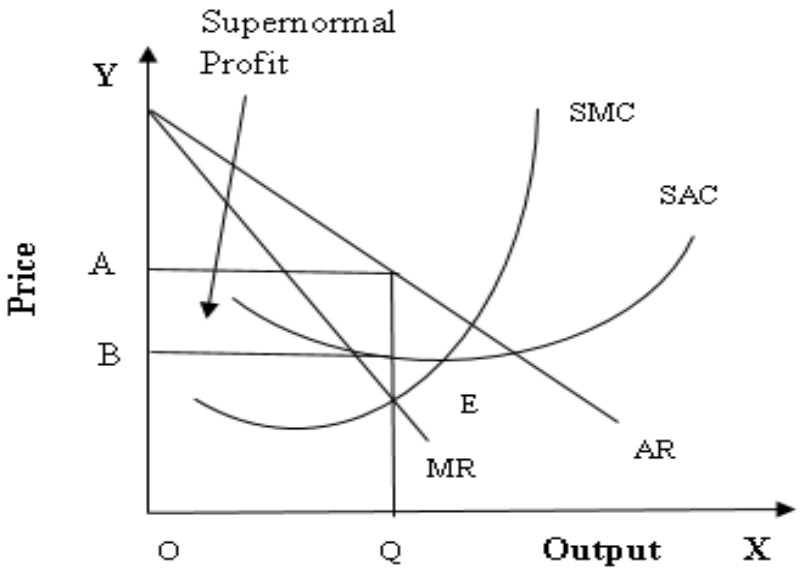

Fig 5.14: Super normal Profits of a Monopolistic Firm

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Normal Profits

A monopolist will earn only normal profit when the price charged is just equals to the SAC (i.e., AR = SAC). In fig 6.15, the equilibrium point is at E where, MC = MR and the optimal output is OM and price is OP.

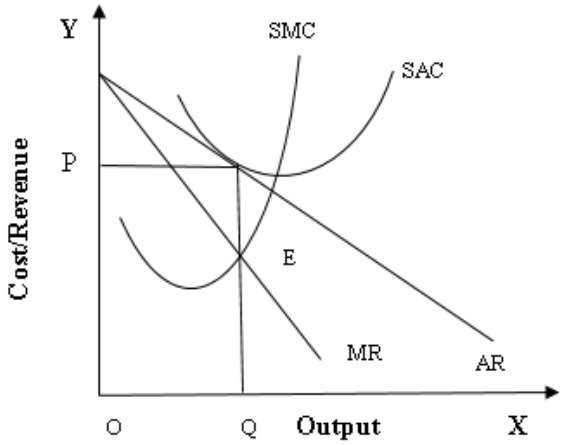

Fig 5.15: Normal Profits of a Monopolistic Firm

Minimum Losses

When the monopolist fixes the price below the variable cost, it incurs losses. In fig 6.16, the price is fixed at P_1 which is equal to the SAVC, which means the monopolist is able to cover only the average variable cost. Below this point the monopolist will discontinue production call the shutdown point.

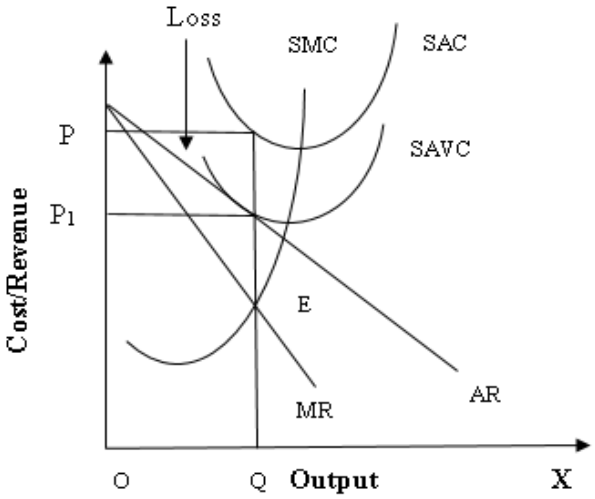

Fig 5.16: Loss of a Monopolistic Firm

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b. Long Run Equilibrium

The long-run equilibrium condition for a monopolist is same as the short-run that is at point where the LMC curve cuts the MR curve from below (i.e., slope of LMC > slope of MR). In fig 5.17, the equilibrium point is at E where the optimal output is OM, and the equilibrium price is OP, and the monopolist earns maximum profit equivalent to the area $PJHP_1$.

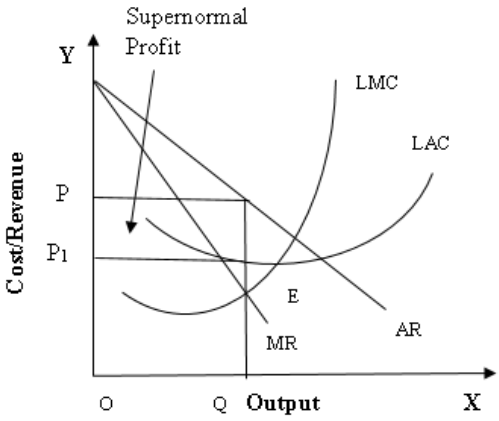

Fig 5.17: Long-run Equilibrium under Monopoly (Marginal Cost-Marginal Revenue Approach)

B. Total Revenue and Total Cost Approach

The equilibrium is reached at a point where the distance between TR and TC is maximum. A monopolist uses trial and error method to fix different prices to find out the optimal level of output that gives maximum profits. In fig. 6.18, the equilibrium is achieved at point E, here the gap (AB) between TC and TR is maximum.

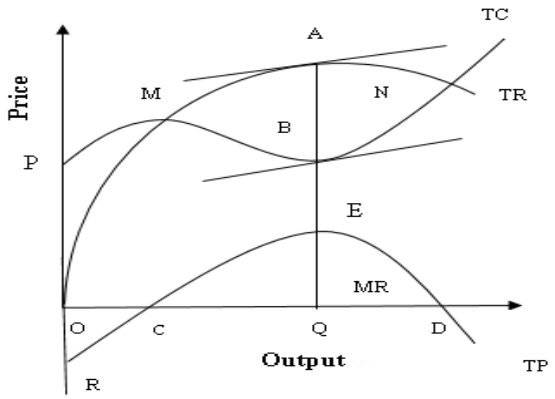

Fig 5.18: Long-run Equilibrium under Monopoly (Total Cost-Total Revenue Approach)

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5.4.3 Price Determination under Monopoly

Under monopoly the price is determine by single firm. Generally, monopolists use trial and error method to fix the prices which gives maximum profit. Monopolist also practices price discrimination in order to extract maximum revenue for their products.

5.4.4 Dynamic Changes under Monopoly:

This section explains the effects of dynamic changes happening in real life on the monopolist's equilibrium. We will first start with shift in the market demand under monopoly model.

A. A Shift in the Market Demand

In the previous section, we saw that an upward shift in the market demand curve results in a new market equilibrium with a higher price and a lower output in the short run. This may not be true in the case of a monopoly market. An upward shift in the market demand in the short run will result in a new market equilibrium with larger quantity and price may be higher, lower or constant.

In the fig. 6.19, first possibility is depicted where the price remains constant while the quantity supplied increases in the new equilibrium position. As the demand curve shifts from D_1 to D_2, the MR curve also shifts to MR_2. Given the MC curve, the new equilibrium position results in larger quantity supplied (from OX_1 to OX_2) at the same price P.

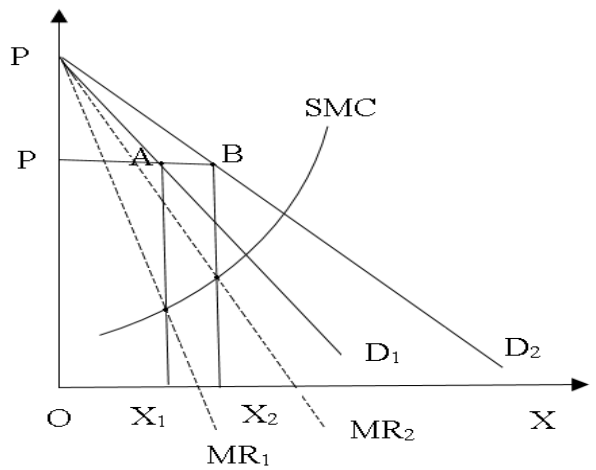

Fig 5.19: Impact of Shift in the Market Demand on Monopoly

This shift in the demand curve will result in higher revenue ($OPBX_2 > OPAX_1$) as well as higher profits for the monopolist firm (fig 6.20). Since, the SATC curve is decreasing over the range between X_1 and X_2, the profits will be higher for the monopolist in the newer equilibrium position than the initial profits (PK'MB > PKCA).

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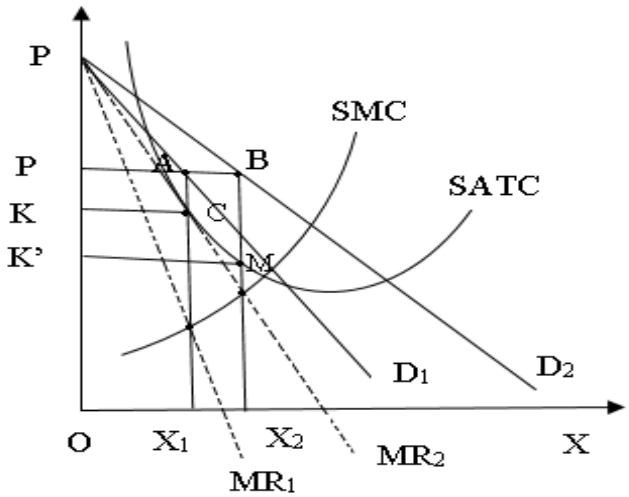

Fig 5.20: Impact of Shift in the Market Demand on Monopoly (A)

Now we will see the second possibility, where both the quantity and price increases in the new equilibrium position. In the fig 6.21, the demand curve shifts from D_1 to D_2 shifting the newer equilibrium position to the right. This shift increases both the price ($P < P_1$) as well as quantity supplied ($OX_1 < OX_2$).

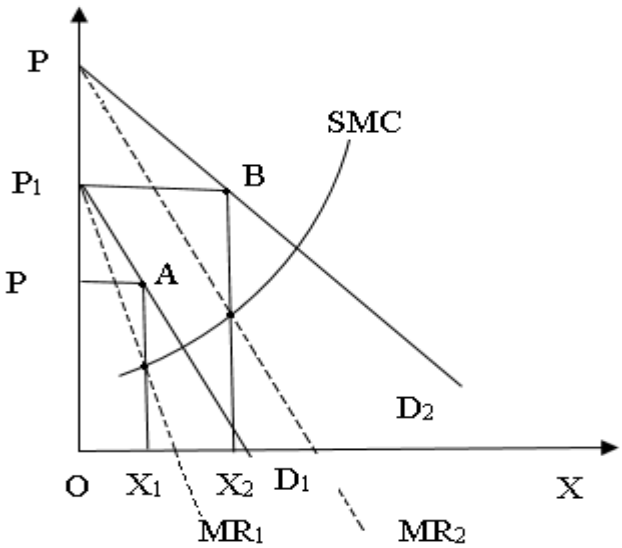

Fig 5.21: Impact of Shift in the Market Demand on Monopoly (B)

Fig 5.22 depicts third possibility where the price falls while the quantity supplied increases at the new equilibrium position. As the demand curve shifts upwards from D_1 to D_2,

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the equilibrium position shifts rightwards resulting increase in quantity supplied ($OX_1 < OX_2$). However, the price falls from P_1 to P_2 due to this shift in the demand curve.

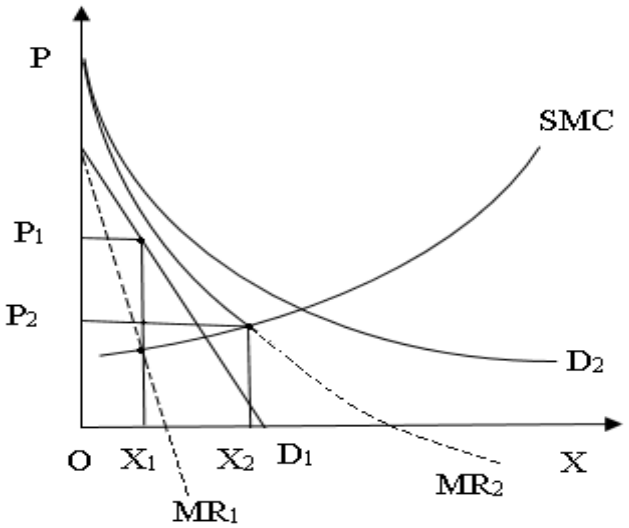

Fig 5.22: Impact of Shift in the Market Demand on Monopoly (C)

B. A Shift in the Costs due to Changes in Factor Prices

Just like purely competitive market model, the effects of a change in costs are same in case of a monopoly market.

1. An increase in fixed costs

The short-run equilibrium position is not affected by an increase in the fixed costs of the monopolist firm. This is because the demand curve of the firm is given and increase in fixed cost does not affects his SMC. This situation is same as pure completion. In the long run also the equilibrium of the monopolist firm will not be affected as long as the rise in fixed costs are covered by the excess profits earned by the firm. However, if the rise in fixed costs is large that it shifts the SATC above the market demand, the firm will not be able to cover its total costs and have to shut down.

2. An increase in the variable costs

An increase in the variable cost shifts the MC curve upwards to the left. This increases the price and quantity supplied falls. This consequence is same as pure competition with only one difference, that is the changes in price and output is lesser in monopoly than pure competition. This is because the monopolist equates his MC to his MR (and not to price) while a purely competitive firm equates his MC to price.

Fig 5.23 depicts the effect of an increase in the variable cost in both monopoly and pure competition market model. Here we assumed that the market demand and increase in

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variable cost is identical in both the market shifting the MC curves identically. Since, the slope of the MR curve is steeper than the AR curve in the monopoly market than pure completion with MR = AR = P. Consequently, an identical shift of the MC curves in both the markets results in a larger fall in the quantity and larger rise in the prices of the firm under pure competition as compared to monopoly.

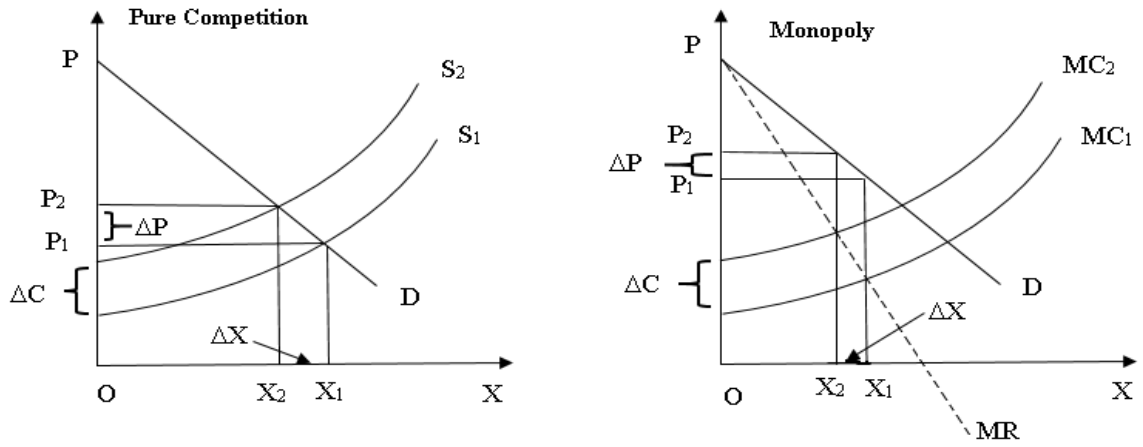

Fig 5.23: Comparison between Pure Competition and Monopoly

C Effects of Imposition of Taxes:

Dynamic changes also involve the imposition of taxes on a monopolist firm. In this section we will examine the impact of the taxes on the equilibrium of the monopolist firm.

1. **Imposition of a lump-sum Tax**

We have already seen that a monopolist can earn super normal profit even in long-run. So, it is not necessary to distinguish between the short-run and the long-run in a monopoly market model to see the impact of imposition of a lump-sum tax. A lump-sum tax increases the total fixed cost of the firm and reduces the excess profit without affecting the MC curve. This means that the equilibrium position will remain unaffected as long as the tax is not exceeding the excess profits earned by the firm.

2. **Imposition of a Profits Tax**

The effects of imposition of profit tax on monopoly is same as lump-sum taxes. The tax reduces the excess profits without affecting the equilibrium position of the firm. So, the firm will remain in business as long as the tax imposed is lower than the normal profits earned by the firm, and it is covering its total costs.

3. **Imposition of a Specific Sales Tax**

The effects of a specific tax are broadly the same in both the markets. An imposition of the specific tax shifts the MC curve upwards changing the equilibrium position. In the new

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equilibrium position, the price is higher, and the output is smaller. The change in the price may be lower, equal or higher than the specific tax, as in the case of pure competition.

If the MC curve is positively sloped as shown in the part I of the fig 6.24, the increase in the price for a monopoly will be smaller than the specific tax, as compared to pure competition.

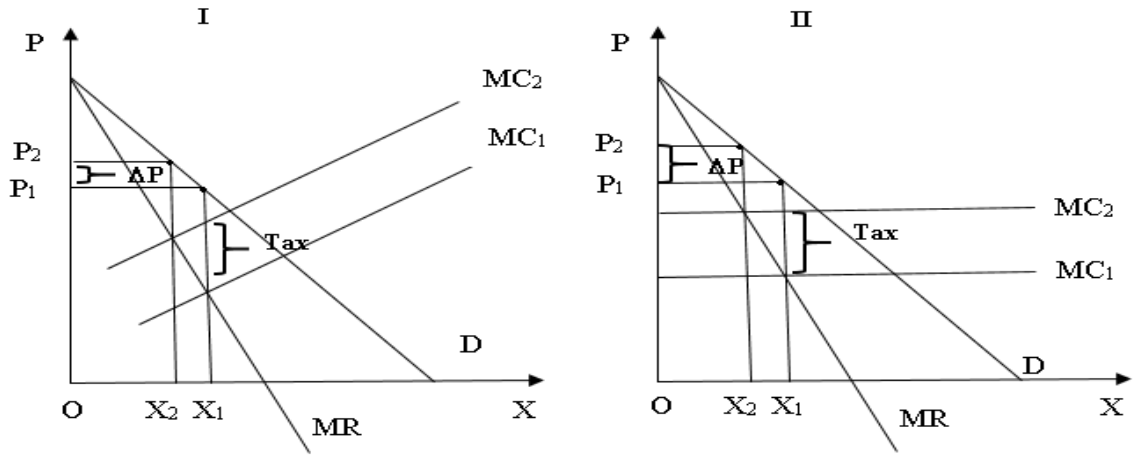

Fig 5.24: Impact of Imposition of Specific Sales tax on Monopoly

If the MC curve is horizontally sloped, the price will rise in a lesser proportion to the tax as compared to pure competition. The monopolist in this case will bear some portion of the tax.

5.4.6 Multiplant Firm:

A monopolist may have multiple plants where he produces homogenous goods. In this section, we have assumed that the monopolist has two plants with different cost structures. In this case, the monopolist has to make two decisions. Firstly, how much quantity to produce in total and at what price to sell it so as to maximise profit. Secondly, how to allocate the production of the optimal (profit-maximising) quantity between the two plants. The monopolist is aware of his market demand and the corresponding MR curve and the cost structure of the different plants he owns. The total MC curve of the monopolist is computed from the horizontal summation of the MC curves of the individual plants

$$MC = MC_1 + MC_2$$

The monopolist maximises his profit at point of intersection of the MC and the MR curves and marginalistic rule ($MC_1 = MC_2 = MR$) will be applied to allocate the production between the plants (fig 6.25). This implies that the monopolist will allocate the production to each plant up to the level at which $MC_1 = MC_2 = MR$.

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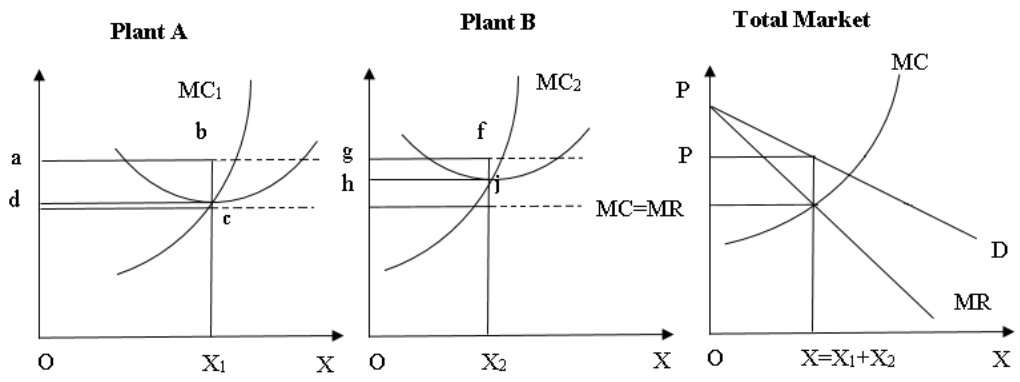

Fig 5.25: Equilibrium under Multi-plant Monopoly

5.4.7 Bilateral Monopoly:

Bilateral monopoly is a market situation in which there is a single seller (monopolist), and a single buyer (monopsonist) operates. For instance, if a single mining firm extracting all the coal in a country and if only a single thermal power plant consuming the entire coal, this results in a bilateral monopoly situation. In such market conditions demand and supply alone cannot determine the equilibrium level. It is determined based on the bargaining power, skill and other strategies of the firms.

Taking forward the above example of coal mining firm and thermal power producing firm. Since, both the firm wants to maximise their profits, the equilibrium of the mining firm will reach at the intersection of his MR and MC curves (fig 6.26). The mining firm would maximise his profit at OX_1 level of output selling at OP_1 price.

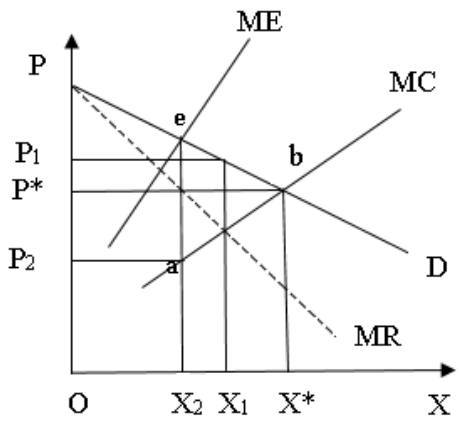

Fig 5.26: Equilibrium under Bilateral Monopoly

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However, this cannot be the market equilibrium position because the mining firm is dealing with a monopsonist firm which possess some power to affect the market price. Hence, the mining firm cannot attain the profit-maximising position. The monopsonist firm also interested in maximising his profit by putting some terms and conditions to the agreement. Since, the upward sloping MC curve of the mining firm is the supply curve to the thermal power producing firm which indicates that the monopsonist has to pay higher price as he purchases higher quantity. This is the marginal expenditure for the monopsonist, and the firm will maximise its profit at a point of intersection between demand curve DD and ME curve at point e. Thus, he would like to buy OX_2 quantity at a price P_2.

We clearly see a situation of indeterminacy in the market where the seller is offering its product at a price P_1, and the buyer is willing to pay only P_2. In such situation, both the firms will start negotiations and will settle at somewhere between P_1 and P_2 depending on the bargaining skill and power of the firms.

IN-TEXT QUESTIONS

1. The demand curve of a firm under perfect competition is unitary elastic. (True/False)
2. A firm under perfect competition is a 'price-taker' because:
   A. the firm's management doesn't know what price to set.
   B. the output of the firm is too small to influence the market price.
   C. the firm is following a price leader
   D. the firm produces less output to set a higher price.
3. A perfectly competitive firm will accept a _____ price and also produce _____ quantity than a monopolist.
4. There is no unique supply curve under monopoly. (True/False).

5.5 PRICING STRATEGIES

Every economic activity involves pricing decisions. From house rent to consultant fee, insurance premium or salesman commission. There involve some kind of pricing decisions. Similarly, every business firms adopts a certain type of pricing strategies based on the type of products being sold, type of market structure, season in which business is being carried, quantity in which products are being sold, etc.

There are various other factors that affects the pricing strategies of a firm. These are.

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- **Pricing objective:** whether the firm is pursuing survival, maximum profit, maximum market penetration, pricing leadership, etc.
- **Demand of the product:** whether the product is highly price sensitive, just like in the case of perfect competition, or the product is price inelastic in case of highly essential commodities.
- **Cost of production:** every firm wants to cover its production cost and some proportion of profit from sale of their products. If the firms are not able to recover its AVC, its shutdowns its business.
- **Competitors pricing strategies** generally seen in imperfect competition like oligopoly, where there are only few firms are operating in the market. Here, competitors pricing strategies affects the firms pricing decisions.
- **Other factors:** like government regulations, number of substitutes, product life cycle, method of production, brand value, etc.

Based on these the pricing strategies are broadly classified into four major categories. These are.

A. Cost Based Pricing Strategies: As the name suggests the major factor is the cost of production that decides the firms' pricing policy. There are various pricing strategies under cost-based pricing.

(i) Full Cost/ Cost plus Pricing: Here, the prices are set just equal to the average cost, also called 'break-even' pricing (no profit no loss). Or prices include some share of mark-up/ margin of profit. It is generally used for pricing public utilities.

(ii) Incremental Cost Pricing: Similar to full cost pricing, but here average variable cost is used as a yardstick in place of average cost.

(iii) Marginal Cost Pricing: Here, marginal cost is used to determine the prices of the products.

(iv) Target Pricing: Similar to cost plus pricing but here the firm fixes the mark-up based on certain targets that it wants to achieve.

B. Competition Based Pricing Strategies: The competitors pricing strategies becomes the dominating factor in deciding the prices.

(i) Going rate Pricing: under this pricing method firms fixes the prices that are prevailing in the industry.

(ii) Sealed Bid Pricing: Very common in cases where some kind of bidding is involved. Here, the prospective companies give their bids in a sealed cover. The firms must have to stick to their pricing quotes, or they may lose their contracts.

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C. Demand Based Pricing Strategies: The pricing decision is based on the demand of the products.

(i) Dual Pricing: As the name suggests, here two prices are set. Certain fixed price is applied to part of the product and remaining product is sold at prevailing market price. Sugar prices in India is fixed based on dual pricing strategy.

(ii) Price Lining: Prices are fixed on the size, quality, quantity, colour, flavour, etc. of a same product. For example, in case of garments size XXL may be priced higher than the size S or M.

(iii) Cyclical Pricing: Every firm goes through some kind of cyclical fluctuation also called trade cycle. The prices are fixed based on the phase in which firms are in. For example, prices are high during prosperity phase and vice-versa.

D. Strategy Based Pricing: Different businesses adopts different strategies for their products based on the nature of the product.

(i) Penetration Pricing: When the firm wants to capture larger market share for their products, they go for this type of pricing strategies. Here, the prices are fixed at a lower side to cover larger customer segment and after establishing the product credibility in the minds of the consumers prices are increased to recover the losses.

(ii) Skimming Pricing: Just opposite to the Penetrative pricing, here the prices are fixed on the higher side in the beginning to attract elite customer segment. Firms spends huge sum on Research and Development of their products and wants to recover the cost as soon as possible. When they believe that the product that they are offering are innovative and have no close substitute they go for such pricing strategy. This type of pricing is also used in case of a products having high brand value. For example, Apple company fixes the prices of their products very high whenever they launch an updated version of their I-phones.

5.6 MONOPOLISTIC COMPETITION

It is a type of an imperfectly competitive market with the characteristics of both the perfect competition and monopoly. Here, the firms sell identical but slightly differentiated products in terms of quality, looks, taste, flavours, brands, etc. for example, shampoo, soap, washing powder, etc. The products are close but not the perfect substitutes. Each company is therefore the sole owner of a particular brand or commodity.

5.6.1 Characteristics:

- Large number of firms selling closely related goods
- Downward sloping demand curve

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- Products are not the perfect substitutes: differentiation is created in terms of quality, colour, packaging, taste, etc.
- Firms are free to enter and exit from the market
- Firms have a degree of control over price
- High advertisement cost: Chamberlin introduced U-shaped selling cost curve.
- Excess capacity in the long run

5.6.2 Equilibrium of the Firm under Monopolistic Competition

Short-run Equilibrium

In the short run, each firm under monopolistic competition act as monopolists. As new firms are not allowed to enter the market in the short run, they can earn supernormal profits or may incur losses. The equilibrium condition for a firm in the short run is at a point where SMC = MR. Fig 6.27 depicts the equilibrium position E, where the optimal output and price are OQ and OP respectively, and the firm earns profit equivalent to the area BPAR.

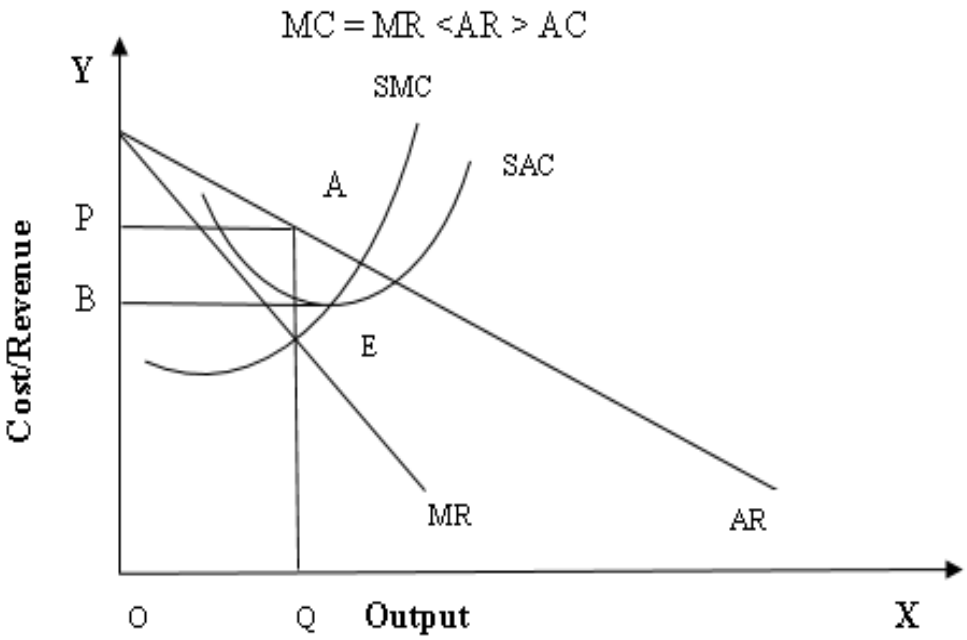

Fig 5.27: Short-run Equilibrium for a Firm under Monopolistic Competition

Note that in the short run, a firm may earn only normal profit if SMC = MR < AR = SAC occurs and may incur loss if SMC = MR < AR < SAC happens.

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Long-run Equilibrium

A firm under monopolistic competition act as perfectly competitive firm and earns only normal profit in the long run. This is due to the fact that in the long run they are free to enter and leave the market.

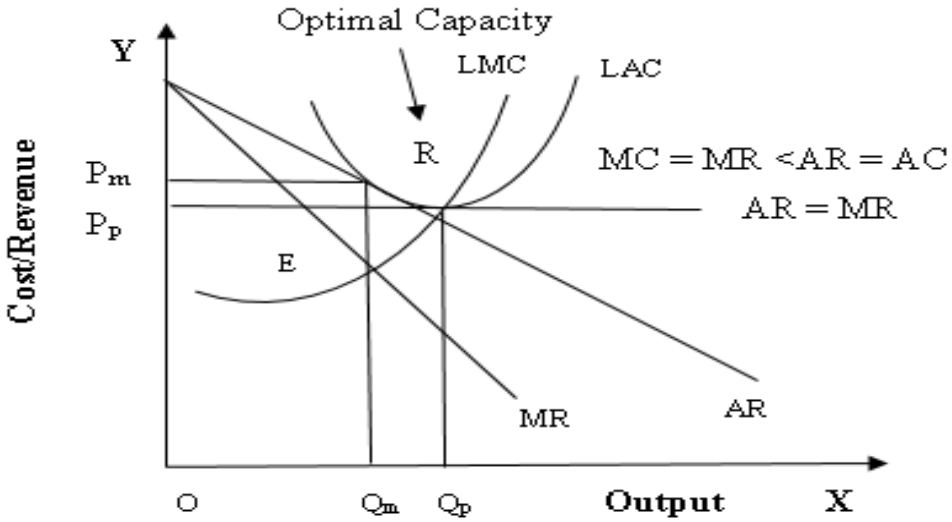

Fig 5.28: Long-run Equilibrium of a Firm under Monopolistic Competition

The long-run equilibrium condition for a firm is at a point where LMC cuts the MR from below (Fig 5.28). The equilibrium level of output and price are OQ_M and OP_M. Note that the price under monopolistic competition is higher and the output is lower than the perfectly competitive price and output P_P and Q_P respectively.

5.6.3 Price Determination under Monopolistic Competition:

Each firm under monopolistic competition have a slight control over the prices as they ignore the market price and sets its own prices. Since the products offered are not perfect substitutes a firm may increase its prices up to a certain extent without losing its market share. Firms in order to create a differentiation in the minds of customers for their products from the competitors incur heavy advertisement expenditure resulting higher costs. The prices are fixed at the point where the MC curve cuts the MR curve from below both in short-run and long-run.

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Hindustan Unilever Limited: Leading the Monopolistic Competition in India

When it comes to Monopolistic Competition, the Indian Fast Moving Consumer Goods (FMCG) sector is a perfect example. It consists of large number of domestic and foreign players competing with each other. Hindustan Unilever Limited (HUL) is one of the leading firms in the FMCG sector.

It is a subsidiary of a British-Dutch company Unilever, which controls more than 50% shareholdings in HUL. HUL was formed in the year 1956 and currently have more than 35 brands spread across 20 different categories such as detergents, shampoos, soaps, skin care, toothpastes, coffee, tea, ice creams etc. It covers 6.3 million retail outlets reaching the entire urban population and 250 million rural consumers. The mission statement of HUL is, "add vitality to life".

SWOT analysis of HUL

Strengths

- Established target audience in every segment: premium, mid-priced and popular
- Largest company in FMCG sector with global presence
- Top position in soap and detergent market share
- Wide range of products
- Continuously innovates to meet the expectations of the market by adding value to its existing products

Weakness

- Few popular products appealing to the mass has been kept in premium pricing range, due to which people prefer cheaper products offered by the rival companies.

Opportunities

- Rising demand of premium and mid-priced products in the rural areas
- Soap sector's growth is expected at 7% p.a

Threats

- Rising competition from other emerging companies
- ITC's sudden growth in the soap market

Conclusion

HUL's continuous innovation and close study of consumer behaviour has helped them to achieve a market leader position in this competitive market. One of the most important success criteria for any company is to seize the right opportunity at the right moment and make the most use of the available resources.

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5.7 OLIGOPOLY

Oligopoly comes from the combinations of two Greek words 'oligo' and 'pole' which means 'few' and 'merchants' respectively. Hence, oligopoly is a market structure with few companies selling identical or differentiated goods and services. Given firms are few in number, competitive strategies depend on the move of other firms. Firms in this market either compete with another firm or collaborate together to form a cartel. In either case they have significant control over the prices and can earn supernormal profits in the long-run as well unlike in perfect competition where they are price-takers. Few examples of oligopoly market are Steel industry, Film, mobile phone, natural gas, etc. Given below are the key characteristics of oligopoly for your reference.

5.7.1 Characteristics:

- Few large sellers
- Goods can be identical or differentiated in nature
- Profit maximization: at point where MC equals MR
- Firms are price setters: They have a strong influence over prices
- Barriers in entry and exit
- Companies can earn super normal profits even in long-run
- Firms having complete knowledge of their own cost and demand functions.
- Kinked-demand curve: because firms follow price reduction by the competitors but not the price rise.
- Non-price competition among firms
- High selling costs: advertisements, promotions, loyalty schemes, etc.

5.7.2 Price Rigidity:

Paul Sweezy is an American economist who argued that the pricing decisions under oligopoly are guided by competitors' actions rather than by cost or demand objectives. He introduced the 'Kinked Demand curve' for an oligopolist firm, where a price reduction by the firm is followed by its rivals but not the price rise.

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In the fig 5. 29, we can see that, the upper portion of the demand curve is more price elastic than the lower part. It is due to the price-rigidity among firms. Also, note that the MR curve is discontinuous in shape and the equilibrium condition is at a point where, MC = MR.

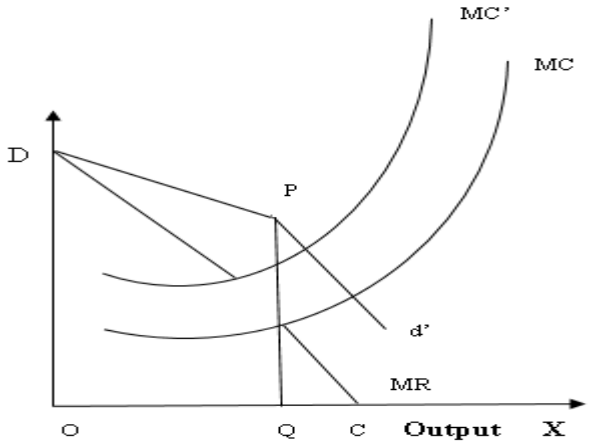

Fig 5.29: Kinked Demand Curve under Oligopoly

Hence, the above situation leads to a never ending 'price war'. In order to overcome this problem, oligopolists generally form a cartel. Let's understand the situation of a cartel.

5.7.3 Collusive vs Non-collusive Oligopoly:

In this section we will observe two types of oligopoly models, collusive oligopoly and non-collusive oligopoly models. Under collusive oligopoly firms get into an agreement to act jointly and share the market among themselves. They generally do this by forming a cartel or by following a leader in the market. Another type of oligopoly model lacks such collusion and firms act independently without considering the actions of their rivals.

First, we will start from two non-collusive oligopoly models given by Cournot and other by Bertrand.

A. Cournot's Duopoly Model

French economist Augustin Cournot had developed the earliest duopoly model in 1838. Cournot explained his model with the example of two firms each owning a spring of mineral water, which is produced at zero costs. Hence, the basic assumption of his model was that the duopolists have identical products and identical costs. The market demand curve is downward sloping straight line, and both the firms assume that its rival will not change its output. From the fig. 6.30, let's assume that firm A starts producing and selling mineral water. It will produce quantity A (where MC = MR), at price P where profits are at a maximum. At point A, the elasticity of market demand is equal to unity and the total revenue of the firm is highest. Since the firms are producing at zero costs, highest revenue implies highest profits.

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Now the second firm B will assume that the firm A will keep its output fixed at OA and considers its own demand curve is CD'. The firm B will produce the half the quantity that has not been supplied by the first firms. With its output at AB, firm B will earn maximum profit.

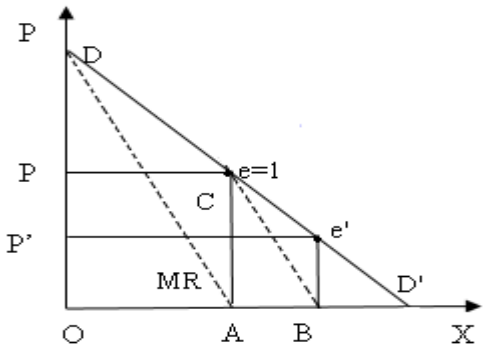

Fig 5.30: Cournot's Duopoly Model

In the next period, firm A will assume that firm B will keep its output at AB will produce half the quantity that has not been supplied by firm B. Since firm B is only producing one-quarter of the total market demand, firm A will produce ½(1-¼) = 3/8 of the total market demand.

Firm B will again produce one-half of the unsupplied portion of the market demand ½ (1-3/8) = 5/16. And again, this action-reaction pattern will continue in the next period by both the firms until they both reach to an equilibrium. Each firm will eventually produce only one-third of the total market demand and together they will supply only two-third of total market demand. Both the firms will display a naïve behaviour of never learning from their past experience of their competitors. Even though they manage to maximise their individual profits, but industry profits are not maximised.

The firms would be better-off if they recognised their interdependence (open collusion) and would have earned higher joint profits. Under the situation of open collusion, they would have acted as monopolists by producing only one-half (¼+ ¼ = ½) of the total market demand at price P and sharing profits equally.

If there would have three firms in the industry, each firm produce one-quarter of the total market demand and together they will supply only ¾ of the total market demand. Cournot model can be extended to n number of firms where each firm will produce 1/(n+1) of the total market demand and together they will cover n/(n+1) of the total market demand.

Hence, the Cournot solution leads to stable equilibrium, where the market price is lower than monopoly price but higher than pure competition and quantity supplied is higher than monopoly but lower than pure competition. As the number of firms increases in the industry, the price and quantity supplied will reach to pure competition level. Several

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unrealistic assumptions lead to the criticism of this model for example, the naïve behaviour of firms, constant production of output by each firm, n number of adjustment periods and zero-cost production.

Cournot equilibrium can also be determined with the help of reaction-curve approach which is based on Stackelberg's indifference-curve analysis. Under reaction-curve approach we relax the assumption of identical costs and identical demands and uses iso-profit curves of the rivals. An iso-profit curve for firm A is the locus points of different levels of output of firm A and firm B, which gives firm A the same level of profit. Fig 6.31 depicts the reaction-curves of both the firms along with the iso-profit maps.

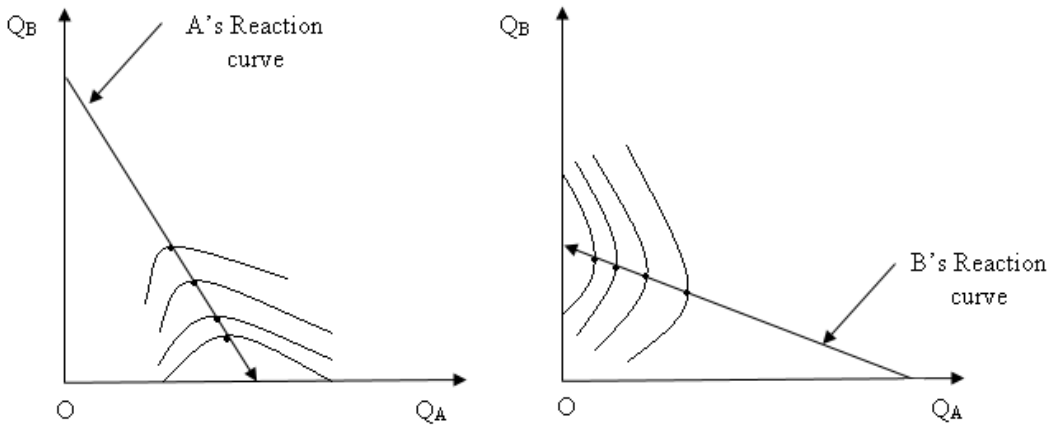

Fig 5.31: Reaction Curves of Firm A and Firm B

Cournot's equilibrium is reached at the intersection of the two reaction curves (fig 6.32). At the equilibrium level each firm will maximises its profits, but the industry profits do not maximise.

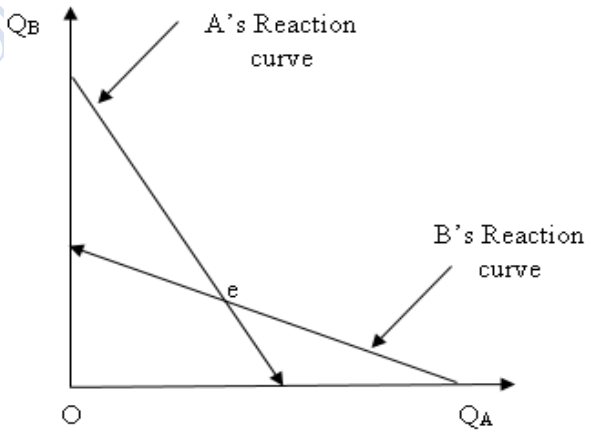

Fig 5.32: Equilibrium under Cournot's Duopoly Model

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B. Bertrand's Duopoly Model

Bertrand gave his duopoly model in 1883 which differs from Cournot's model. Here, each firm assumes that the rivals will keep its price constant, irrespective of its own decision about pricing.

This model uses convex shaped iso-profit curves and reaction curves to explain the behaviour of rival firms (fig 6.33). An iso-profit curve for a firm gives the same level of profit which would earn by the firm from various levels of prices charged by this firm and its rival. The lower the isoprofit curve, the lower the level of profits for the firm because for any price charged by firm B there will be a unique price of firm A which maximises its profit. This unique profit-maximising price is determined at the lowest point on the highest attainable isoprofit curve of A.

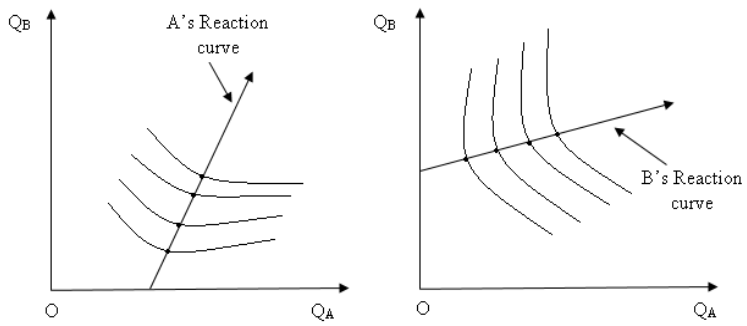

Fig 5.33: Reaction Curves of Firm A and Firm B

The Bertrand's model leads to a stable equilibrium, determined at a point of intersection of the two reaction curves (fig 6.34). This point however does not result in joint (industry) profit maximisation because of the naïve behaviour of the firms of not learning from the past and assuming that their competitor will keep its price unchanged.

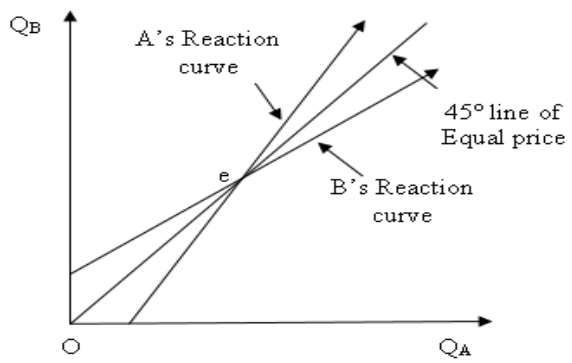

Fig 5.34: Equilibrium under Bertrand's Duopoly Model

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C. Collusive Oligopoly

The uncertainty arising from interdependence in an oligopolistic model can be avoided by entering into collusive agreements. Such collusion is mainly of two types, cartels and price leadership.

1. Cartels

Cartels is a direct agreement among the rival firms to reduce the uncertainty arising from their mutual interdependence. Firms generally join cartels to maximise their joint profits. Taking example of a pure oligopoly model where firms selling homogenous goods. These firm forms a cartel and appoint a central agency that decides total quantity to be offered at what price along with allocation of production and sharing ratio of profits among members.

The central agency has access to the production costs of each firm and by their horizontal summation the MC curve for the industry is derived. The central agency act as a multiplant monopolist and fix a price at the intersection of the industry MR and MC curves. Fig 6.35 shows that total production is OX, and it is sold at a price P. The central agency allocates the output and distributes the profits among two firms.

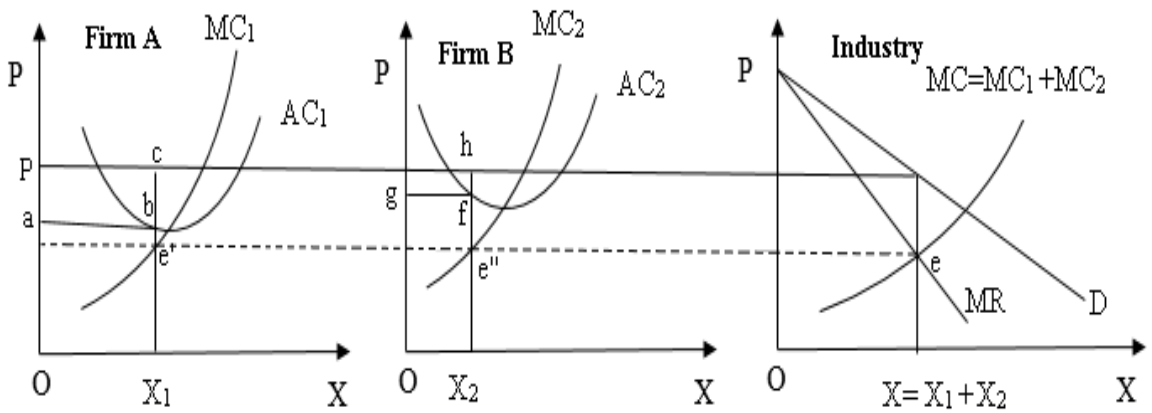

Fig 5.35: Impact of forming a Cartel

2. Price Leadership Model

Under oligopoly, firms generally form an imperfect collusion, where they follow one leader. Price leadership could be of various forms; a) Low-cost Price Leadership, b) Dominant Price Leadership and c) Barometric Price Leadership.

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a) **Low-cost Price Leadership:** Under this, a low-cost firm would charge a lower price and this price is followed by other firms in the market. This may not be a profit-maximizing situation for the followers but is a necessary step to avoid a price war between the firms where the one with lowest price will easily win.

b) **Dominant Price leadership:** As the name suggests, under this model the dominant firm (one with largest market share) act as a monopolist and fixes the prices at a point where his MC = MR. This situation leads to a profit maximization for the leader but on the other hand, the followers act as price-takers and supply the remaining share in the market at a prevailing price.

c) **Barometric Price Leadership:** It is a formally/informally agreed market situation where all the firms follow the prices set by a barometric (leader) firm. This leader firm may not have the largest market share or lowest curve but have a good market knowledge and can better forecast the market demands. It is interesting to note that a firm from other industry could be chosen as the barometric leader. For instance, a firm in the semi-conductor industry may be selected as a barometric leader for price changes in the Information and Communication Technology (ICT) hardware industry like laptops, desktops, mobiles, etc.

5.7.4 Game Theory:

Traditional economic theories cannot answer the complexities and uncertainties of oligopolistic market. Here, interdependence of firms and rivals' reactions decides the suitable strategies to be adopted by firms. Even the collusive models, limit-pricing models, managerial models, and behavioural models, cannot explain the decision-making process of oligopolist firms.

'Theory of Games and Economic Behaviour', published in 1944 by Von Neumann's and Morgenstern provided a different approach to the study of the oligopoly market. At present times, economists are using high-speed computers to conduct experiments to predict oligopolistic behaviours based on game theory.

Firms generally uses various tools and instruments to achieve their desired goals. These instruments could by production, pricing, costing, marketing, R&D, etc. also called strategies. A strategy is a specific course of action with clearly defined objectives to achieve specific aim. For example, a strategy could be setting a price below market price, selling products using different channels, producing goods of better quality or at minimum price.

To each of these strategies the rival firms may react in different ways, that is, by adopting different strategies. They may follow the same or different strategies adopted by the first firm. Thus, different options available to each competing firm and they adopt the one with maximum advantage. Hence, the payoff of a strategy is the 'net gain' it will give to the firm considering the counterstrategy of the rivals. This payoff is measured in terms of the objectives of the firm. For instance, if the aim of the firm is to earn maximum profits, then the payoffs of a strategy will be measured in terms of profit levels that it gives. Therefore, for

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every strategy and counterstrategy there is a payoff associated. All this can be depicted in a form of a payoff matrix.

In the table 6.2, we have assumed two firms where firm I can choose five strategies (A_1……A_5) and firm II can react by using any one of six counterstrategies ($B_{1....}$ B_6). It should be noted that the counterstrategies of the competitive firm are probable but not certain. Thus, a total of 5 x 6 = 30 payoffs are possible (G_{11} ..... G_{56}).

Table 5.2: Payoff Matrix

		Firm II's Strategies					
		B_1	B_2	B_3	B_4	B_5	B_6
Firm I's Strategies	A_1	G_{11}	G_{12}	G_{13}	G_{14}	G_{15}	G_{16}
	A_2	G_{21}	G_{22}	G_{23}	G_{24}	G_{25}	G_{26}
	A_3	G_{31}	G_{32}	G_{33}	G_{34}	G_{35}	G_{36}
	A_4	G_{41}	G_{42}	G_{43}	G_{44}	G_{45}	G_{46}
	A_5	G_{51}	G_{52}	G_{53}	G_{54}	G_{55}	G_{56}

The Prisoner's Dilemma

A prisoner's dilemma is a situation that explains the behaviour of firms that are uncertain about their rivals' action. It goes like, two suspects are arrested on the charge of bank robbery. However, the evidence is not adequate enough to put them behind the bars unless one or both suspects confess. Each suspect is interrogated in isolation from his mate so that no communication is possible between them. The District Attorney promises no punishment for the suspect who confesses and a heavy sentence of twenty years' imprisonment for the other party. If both suspects do not confess, both will go free. If both confess, they will get the sentence prescribed by the law for the crime of robbery, for example ten years' imprisonment. Thus, each suspect has two 'strategies' open to himself, to confess or not to confess, and is faced with the dilemma: to confess (and go free if the other does not confess or get the ten-year sentence) or not to confess (and go free if the other does not confess or get the heavy twenty-year sentence if he is betrayed by the other suspect).

The payoff matrix of the two prisoners is shown in table 6.3. Given the lack of communication between the suspects and the uncertainty as to the 'loyalty' of the other prisoner, each one of them prefers to adopt the second strategy, that is, to confess, so that both get a ten-year sentence.

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Table 5.3: Payoff Matrix of Prisoner's Dilemma

		Prisoner B's Strategies			
		No Confession		Confession	
Prisoner A's Strategies	No Confession	A 0	B 0	A 20	B 0
	Confession	A 0	B 20	A 10	B 0

Clearly this is a worse situation as compared with the adoption of the 'no confession' strategy by both robbers. The 'dominant' strategy, which implies the rule 'expect the worst from the other' leads to a worse position than the robbers need be in. If communication were possible, or if from past experience the fellows had learned to trust each other, they would both plead 'not guilty' and had gone free, thus maximising their 'gains'. This is the prisoner's dilemma which leads to a suboptimal solution for the competing firms.

IN-TEXT QUESTIONS

5. The basic difference between monopolistic competition and monopoly is the barrier to entry. (True/False)
6. Cartels are very common in _____ market structure.
7. Which of the following is the feature of monopolistic competition?
   A. Product differentiation
   B. Large number of sellers
   C. Huge selling costs
   D. All of the Above
8. Organization of the Petroleum Exporting Countries (OPEC) is an example of?
   A. Monopolistic Competition
   B. Cartel
   C. Perfect Competition
   D. Non-collusive Oligopoly
9. A Prisoner's Dilemma explains the behaviour of firms operating under
   A. Monopolistic Competition
   B. Cartel
   C. Monopoly
   D. Oligopoly

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5.8 SUMMARY

We see different types of market structures that in real life. Some are specialized in a particular goods, some offers products at uniform prices, and some have very limited number of sellers and so on. In economics, we divide these markets into perfect competition, imperfect competition and monopoly. In this chapter we have analysed each of these market structures and defined them along with that determined their equilibrium conditions and pricing strategies.

While companies in the short run in any market structure can earn super normal profits. However, the level of competition and freedom of entry decides the long-run profits. We studied that on the one hand, firms under perfect competition are price-takers and earns normal profits, and on the other hand a monopolist using its monopoly power sets its prices to earn super normal profits even in the long-run. We also saw how a monopolist firm segregate its customers and practices price discrimination to extract entire consumer surplus.

Similarly, under monopolistic competition and oligopoly firms which are closer to real world market uses different promotional tools to differentiate their products from the competitors.

In the absence of collusion among oligopolist firms, the monopoly solution (i.e., the point at which the joint industry profit is maximised) is hard to achieve. Generally, cartels are formed either to maximise the industry profits or to share the market output. And lastly, the Game theory approach is a useful tool to generalise the decision-making process of oligopoly market in a controlled environment.

5.9 GLOSSARY

Bilateral Monopoly: a market situation where a single seller (monopolist) and a single buyer (monopsonist) operates.

Consumer Surplus: It is "the difference between the maximum amount of money that the consumers are willing to pay and the amount they actually pay".

Collusion: It is an agreement between firms to share market output and profits. It is generally seen in oligopolistic markets.

Firms: Individual unit selling products or services.

Game theory: It is a tool developed to generalise the oligopolistic market behaviour.

Industry: Group of firms selling identical products.

Marginal Revenue: is the addition to the total revenue by selling one additional unit of output.

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Price Discrimination: Charging different prices to different customers for identical products.

Total Revenue: Total amount of money/income received by the company from the sale of a certain quantity of goods and services.

5.10 ANSWERS TO IN-TEXT QUESTIONS

1. False	6. Oligopoly
2. B.	7. D All of the Above
3. Lower, Higher	8. B. Cartel
4. True	9. D. Oligopoly
5. True	

5.11 SELF-ASSESSMENT QUESTIONS

1. Define market structure? Differentiate between perfect competition and monopolistic competition.
2. Explain with the help of a diagram how a monopolist firm can earn super normal profits even in the long run.
3. What is price discrimination? Why firms choose to practice price discrimination?
4. Absence of a unique supply curve is a unique feature of a monopoly market. Discuss with the help of a diagram.
5. "Under monopolistic competition too many firms each producing too little." Comment.
6. What are the different types of pricing strategies adopted by firms?
7. What is Prisoner's Dilemma? Why it leads to sub-optimal solution?

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LESSON 6

OLIGOPOLY

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STRUCTURE

6.1 Learning Objectives
6.2 Introduction
6.3 Oligopoly
  6.3.1 Meaning
  6.3.2 Features of Oligopoly
6.4 Oligopoly Models
  6.4.1 Cournot
  6.4.2 Bertrand
  6.4.3 Sweezy kinked demand
6.5 Game Theory
6.6 Summary
6.7 Self-Assessment Questions
6.8 References

6.1 LEARNING OBJECTIVES

After reading this chapter, you will be able to:

- Describe the oligopolistic market structure and characteristics.
- Identify those factors which are responsible for creating oligopolistic industries.
- Learn that there is a small group of dominating companies, strategic interaction is important because one company's sales are affected by what its rivals do.
- Understand oligopolistic models that explain the price and output determination in oligopolistic market structure.
- Describe the cooperative and non-cooperative behaviour of oligopolistic firms.

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6.2 INTRODUCTION

Till now, we have learnt about different types of market structures, in which we have discussed perfect competition, monopoly, and monopolistic competition, and their pricing decisions and output decisions. Here we are going to learn about oligopoly market structure in which we are trying to understand how oligopolistic firms take decisions regarding price and output.

In this chapter, we are going to examine oligopoly market structure and begin discussing the meaning, features and sources of oligopoly. Later on, we will examine different models of oligopoly, like the Cournot model and the Bertrand model. An oligopolistic market is one market structure where there are few sellers of a homogeneous or differentiated product. All these few sellers are so interdependent that the actions of one seller can have a large impact on the profits of all other sellers. This chapter's objective is to examine how this interdependence affects the behaviour of the sellers or companies.

Whenever you are planning to buy a two-wheeler (petrol), it is likely that you will come home with one of four companies' brands: Hero, TVS, Honda, or Bajaj. These four companies manufacture nearly all the two-wheelers sold in India. Together, these companies produce all the units of two-wheelers and given the market demand curve, the price at which two-wheelers are sold. The two-wheeler market does not fit either the perfect competition, monopolistic, or monopoly market structures. The extreme forms of market structure are perfect competition and monopoly. We all know that perfect competition occurs when there are many companies selling identical products, and a monopoly occurs when there is only one seller who is going to sell the product in the entire market. When we talk about monopolistic competition, there are a large number of sellers that are selling the same category of products, but there is a slight difference in terms of price, quality, and promotion. So, which market category would you put the two-wheeler market in (because there are few sellers)? We can also take other industries like cement (Ultra tech, Birla, ACC, Ambuja), steel (Tata Steel, Jindal Steel, JSW), and airlines (Air India, Indigo, AirAsia India, Vistara). All these are examples of an oligopoly market structure. Oligopoly is the most interesting of all the market structures. Although it is one of the most realistic market structure kinds, it is also the most challenging to characterise as a theory. But when it comes to the application part of it, or when it comes to the implementation of this form of market, it is generally the most realistic as compared to any other kind of market structure like perfect competition, monopoly, or monopolistic.

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6.3 OLIGOPOLY

6.3.1 Meaning:

Basically, word oligopoly derives from the Greek word's oligo, which means few, and polo, which means to sell. It follows that an oligopoly market is one where there are few sellers. So, to put it simply, an oligopoly is a market with few sellers; either they produce a differentiated product or a homogeneous product while constantly being aware of their competitors' behaviour.

From the above definition, we can say that there are just a few dominating sellers, and they are completely aware of their rivals' actions. This, in my opinion, is the most important characteristic of an oligopoly. This means that regardless of whether they produce differentiated products or homogeneous products, they always make a decision on price and output based on how their competitors will react to those decisions. In an oligopoly market structure, the firms depend on each other because they think about how their competitors will react when they are making decisions. Due to this, there is intense competition, in which rival companies spend a lot of money on advertising and promotions (such as discounts and cash back incentives). This leads to pricing rigidity, in which a single price prevails in the market, much like in a situation of perfect competition. However, the price is controlled by a dominating company rather than by market forces.

The conclusion is that in an oligopolistic market structure dominated by a few companies, in which they are selling differentiated products or homogeneous products, under the continuous awareness or consciousness of rivals' actions.

Who is dominate company or firm in Oligopoly?

A dominating company is a company that has a large market share compared to rival companies. This company is going to take decisions regarding the price of the product. These dominating companies get this dominance power because of their efficiency in production and large market share. And their rivals are going to follow their decisions.

In fact, in real life, you have seen these things on a daily basis, like Amul and Mother Dairy, two dominating companies in dairy products (especially in Delhi NCR). Amul is the first company that is going to increase the price, then Mother Dairy and other companies will also increase their product prices. The same thing will be observed in the telecom industry, where first Jio will raise the prices of various plans, followed by other companies such as Airtel and VI (Vodafone -Idea Ltd.)

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6.3.2 Features of Oligopoly:

Characteristics of oligopolistic market structure are:

1. **Few dominant sellers-**

   As we all know, in an oligopoly market structure, there are a few larger sellers who dominate the market, although the word "few" is confusing and does not identify a specific player count. But, when we see in the real world, a few large companies are doing business and competing with each other, we call it an oligopoly market structure.

   In India, there are a lot of industries where we will find oligopoly market structure. Like in the two-wheeler(petrol) industry, where we can count the number of companies that are selling two-wheelers, Honda, Hero, Bajaj, and TVS are a few leading companies in this industry. As well, we can also easily count the number of players in the automobile industry (a few leading affordable car manufacturers are Maruti, Hyundai, Honda, Mahindra, and Toyota). In both of these industries, each and every company tries to differentiate their cars from those of their rival companies on the basis of colour, shape, AI features, and other features, and we see these things on our TV or phone through promotional videos or advertisements.

2. **Products-**

   We have already established that in an oligopoly, firms sell either differentiated or homogeneous (identical) products. When we talk about differentiated products, we always think about the automobile, two-wheeler, and beverage industries (Pepsi and Coke), the electronics appliance industry, and in these industries, companies are continuously trying to differentiate their products from their rivals. On the other hand, there are a lot of industries where companies are selling homogenous or identical products, and in general, you would not be able to notice the difference in those products. In real life, we are able to notice the difference between these products on the basis of their company names or brands. Examples of these industries include aluminium, gold, steel, and petroleum

3. **Mutual inter-dependence**

   The oligopolistic firm is aware of its dependency and always takes the competitors' response into account when determining prices, output targets, advertising expenditures, and other business policies. Thus, as we discuss the interdependence of firms, it is important to note that these firms are aware of this interdependence and constantly take the competitors' reactions into account when setting their prices, determining their output, allocating their advertising budget, and discussing their policies and strategies. They do this by always keeping in mind how the competitors will respond.

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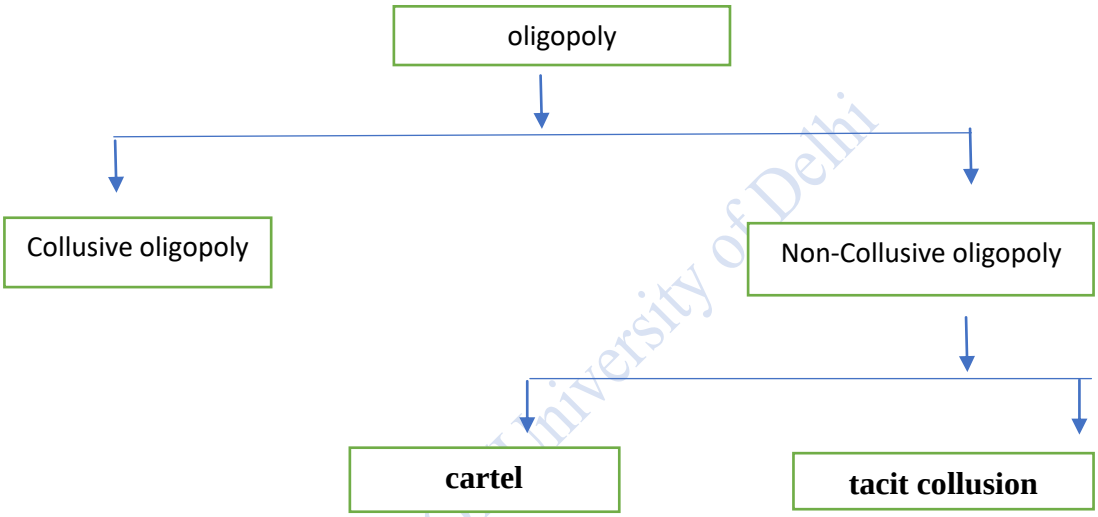
4. Collusive and non-collusive oligopoly-

We can divide the oligopoly market into two categories: collusive and non-collusive. Collusive oligopoly refers to a situation in which all of the firms or companies are cooperating with each other rather than competing with one another. Therefore, there is no competition, and in this case, the group dynamics or group behaviour is that everyone colludes to maximise profit. This situation is known as a "collusive oligopoly." Furthermore, we can divide collusive oligopoly into two categories:



Let's take the example of OPEC (Oil and Petroleum Exporting Countries), which is a perfect example of an **explicit collusive oligopoly (also known as cartels)**. I hope you have heard about OPEC somewhere. Basically, it's an international group or cartel of oil exporting or supplying countries. Under this cartel, they have publicly decided to charge a single price for the product all over the world.

Now let's talk about another form of collusion oligopoly, which is **tacit collusion**. Here we will see that there is no formal contract between the companies, though indirectly they agree to sell products in separate markets or fix a uniform price. An example could be the **telecom industry in this situation if we keep other things constant.** Here you will see three different companies are selling the same price plan for prepared users. It means they are selling identical products, but at the same time, each and every company is providing some extra benefits, and that creates a difference in the consumer's mind. Another thing you will notice here is that there is no price competition among companies.

	Airtel	Jio	Vi
Price	Rs 479	Rs 479	Rs 479

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Data	1.5GB/day	1.5GB/day	1.5GB/day
Validity	56 days	56 days	56 days
Calls	Unlimited	Unlimited	Unlimited
Benefits	Three months Apollo 24|7 Circle, Rs 100 cashback on FASTag, Free Hellotunes, Wynk Music Free	Jio apps suite	Vi Movies and TV premium

On the other hand, when we talk about a non-collusive oligopoly, it occurs when there is competition among the oligopolistic firms. In this case, the firms are still interdependent, but they are not colluding; instead, they are competing with one another.

5. **Barriers to entry-**

Even though there is no legal barrier in an oligopolistic market like in a monopoly market, there are still some things that can affect your decision to enter into an oligopolistic market structure. These are:

There is a **huge amount of money need for investment.** So, if anybody wants to get into the market, they need to arrange a lot of money to establish their business in an oligopolistic market because they have to compete with their products and their prices. So, it's quite difficult for individual people to arrange this amount of money. And ultimately, it creates a barrier to entry. For example, if you want to set up a cement factory, power plant, steel factory, or automobile factory, then you will need a lot of money.

Strong consumer loyalty to the existing brands can be another barrier. Like, there are many firms, but only a few firms have the most market share. This is because customers are very loyal to those few companies. When customers are very loyal to existing brands, it can be hard for new companies to get into the market and compete.

Another barrier can be **economies of scale**, as we all know that in an oligopolistic market, only a few large sellers dominate the market. Existing sellers have already achieved economies of scale. So, when you try to enter the market or operate in the market, you have to compete with them with a high cost of production. This creates an entry barrier for you (the new entrant), because you know that if you enter that market, you will have to compete with a high cost of production.

Mergers can also create barriers in oligopolistic markets. A merger is the coming together of two or more businesses into one. This is how we can reduce competition

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in the market. It led to the establishment of oligopolistic companies. The main reasons for mergers are getting more market power; getting access to more resources; getting economies of scale; and growing the market, among other things.

Sometimes, an oligopolistic market can also be created by **legal restrictions, licenses, or bidding processes**, as you have seen in the Indian power sector, where there are a few companies that have exclusive rights to produce and distribute electricity and a few other industries, like the telecom industry through bidding for spectrum and the coal mining industry through bidding for coal mines, and this exclusivity is provided by the government through licenses, bidding, etc.

Causes or Reasons due to which oligopolistic market structures exist

- Huge amount of money need for investment
- Strong consumer loyalty to the existing brands
- Economies of scale
- Mergers
- Legal restrictions, licenses or bidding processes

6. Non-price competition-

In general, oligopoly firms avoid price wars because doing so will only benefit consumers, not the firms. Instead of competing on price, they use other methods to increase sales, such as aggressive advertising, product bundling, influencing the consumer's perception of value, branding, and offering better service packages, which are typically ways to increase sales rather than engaging in price competition.

Why don't companies engage in price competition in an oligopolistic market structure?

Let's get the answer to this question through a diagram. Suppose there are two companies in the market, P and Q. Both companies are selling or producing homogeneous products. If we assume that the price is initially Price1. Q will always believe that if I lower the price, I'll gain a sizable market share, and because they are dependent on each other, since Q has lowered the price, P has lowered the price and increased its market share. Q will now use that plan (as used by P by lowering prices) and lower its prices to try to get a bigger share of the market. Now, again what will be the reaction of P, knowing that Q has already reduced the price to get the market share, also P will reduce again, and reduce the price in order to get the market share, what will be the reaction of Q; P has already reduced again to gain the market share, Q will also reduce, this will continue again this will continued by Q; this is the price2 now, at this point, the firms P and Q will feel that, if they are going beyond this, it is

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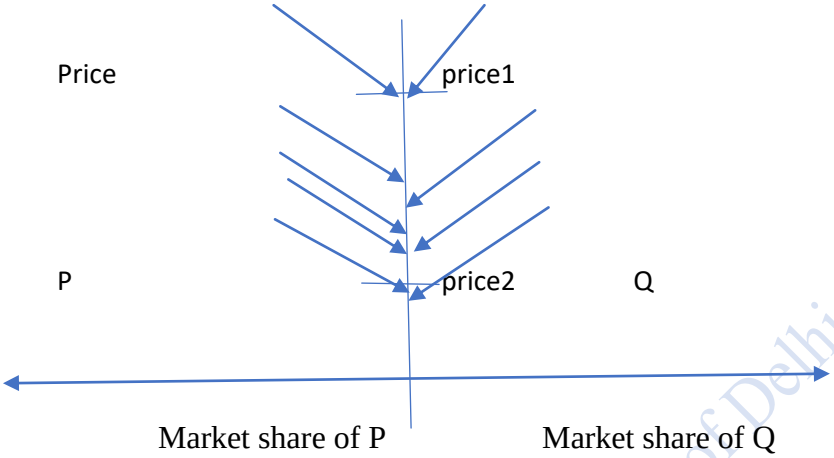
no longer profitable for them (If they go beyond this price2, then it will be beneficial for the consumer, not for companies or producers).



Because of this, they won't compete on price alone or get into price wars. Instead, they'll use other tactics, such as aggressive advertising, product bundling, influencing the consumer's perception of value, branding, and better service packages.

6.4 OLIGOPOLY MODELS

Now we will talk about oligopoly models. First, we will discuss the Cournot model and then the Paul Sweezy model, and both of these models we will explain by using the duopoly. because it is quite easy when we make the assumption that there are only two companies. If we take five, six, or a few companies, then it becomes difficult to explain price and output determination in an oligopolistic market.

Oligopoly does not have fixed prices or output like other market structures. Due to firm interdependence, market uncertainty is a constant. It is challenging to determine the equilibrium pricing and output for oligopolistic companies in the market. An oligopolist cannot presume that, if it changes the price or output, its rivals won't alter their prices and/or output. Suppose one company is going to change the price, and other companies will also follow the price shift, which will change the demand circumstances of the company. As a result, unlike in other markets, the demand curve for any firm is not fixed. Therefore, it is challenging to estimate the equilibrium price and output in the absence of a stable demand (average revenue) curve. But economists have made some price-output models to help them figure out how oligopolistic businesses work. So, let's discuss these models.

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What is duopoly?

It's a form of oligopoly in which there are only two sellers or producers in the market. There is no difference between oligopoly and duopoly except the number of players in the market. For example, in the beverage industry, Coca-Cola and Pepsi, and India's telecom industry to some extent, you can consider it a duopoly if two companies sustain in the market, either Jio and Airtel or Airtel and Vi or Vi and Jio.

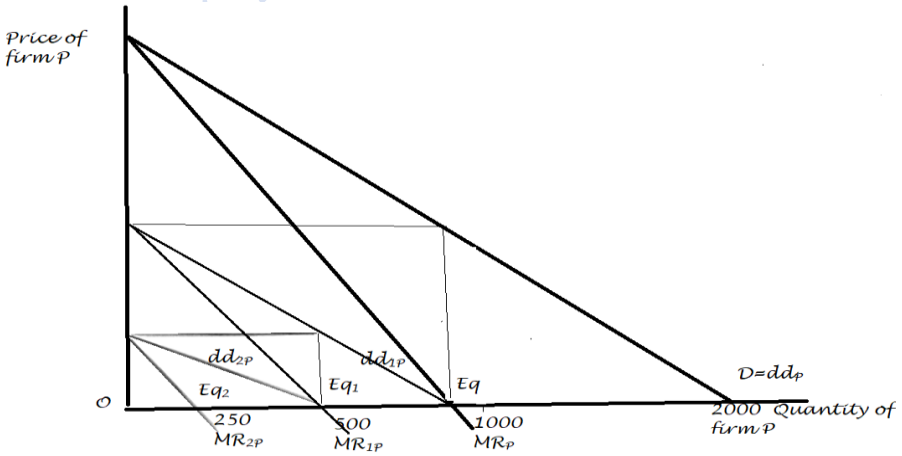
6.4.1 Cournot Duopoly Model:

This model was developed by a French economist, Augustin Cournot, in 1838. This model shows us that interdependence exists among oligopolistic firms.

This model is based on the following assumptions:

1. There are only two firms (P and Q) that are selling identical products, i.e., spring water.
2. It is assumed that there are no production costs because the customers bring their own containers to the springs.
3. One behavioural assumption is that each firm, while trying to maximise total profits, assumes that the other firm will hold its output constant at the existing level.
4. Companies are not permitted to form cartels.

Suppose there are two firms, P and Q. Now we will try to figure out how firm P's output decision is impacted when firm Q enters the market. As a result, the profitability of firm P depends on how much it estimates the production level of firm Q.



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dd_P- It's basically firm P's demand curve, and right now, we can see that firm Q is producing zero units, so that's why firm P's demand curve and the market demand curve are both the same (ddp=D).

MC- There is no marginal cost; the MC curve coincides with the horizontal axis.

MR_P – The marginal revenue curve, which corresponds to the D demand curve.

Point E- It is the point where firm P is earning a maximum profit because the MR curve and MC are both equal at this point, and it is Firm P's equilibrium point (MR = MC). At present, the firm P is producing 1,000 units.

dd_{1P}- Here you can see the diagram, Firm P is assuming that firm Q will produce 1000 units, so firm P cuts down on their production by 1000 units. And this is how firm P's demand curve shifts leftward.

MR_{1P}- The marginal revenue curve, which corresponds to the dd_{1P} demand curve.

Eq1- It is Firm P's equilibrium point (MR_{1P} = MC). At present, the firm P is producing 500 units.

dd_{2P}- You can see the diagram, Firm P is assuming that firm Q will produce 1500 units, so firm P cuts down on their production by 1500 units. And this is how firm P's demand curve shifts leftward.

MR_{2P}- The marginal revenue curve, which corresponds to the dd_{2P} demand curve.

Eq2- It is Firm P's equilibrium point (MR_{2P} = MC). At present, the firm P is producing 250 units.

Now let's take the extreme point where firm Q will produce 2000 units and firm P will produce nothing.

What we have seen so far in this model is that firm P's production is decreasing as firm Q's production is increasing. To define this relationship, we need one curve. That curve is the **reaction curve. It shows us the relationship between a firm's profit-maximising level of output and the amount it assumes its rival firm will produce.** If we want to draw P's reaction curve from the above diagram, assuming that Q's output level is 0 units, at that time P's profit-maximizing level output will be 1000 units. Further, assuming that Q's output level is 1000 units, at that time P's profit-maximizing level output will be 500 units. If we assume that Q's output level is 1500 units, then at P's profit-maximizing level, output will be at 250 units. Finally, if we assume Q's output is 2000 units, at the time P's profit maximising level output would be zero units. If we put all these points on a diagram, we call it firm P's

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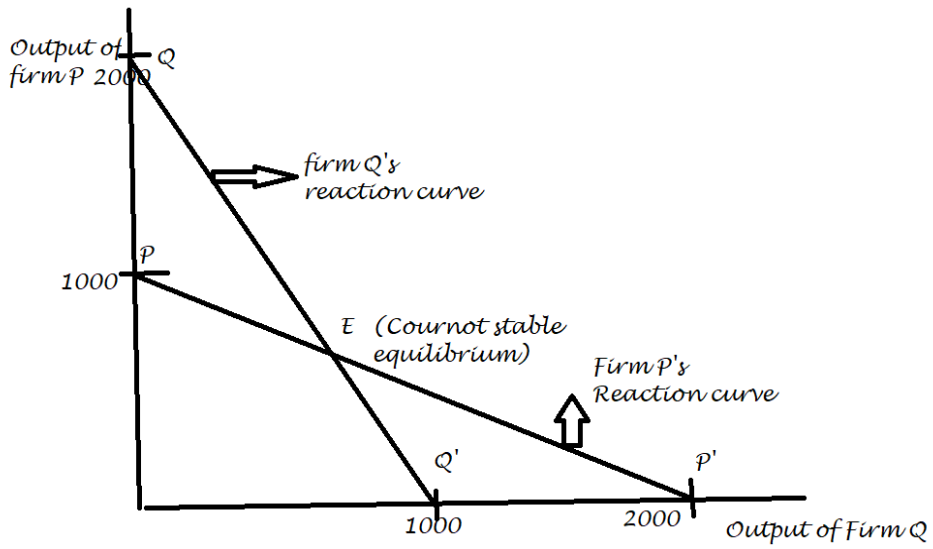
reaction curve PP'. Put all these combinations in tabular form so that it will be quite easy for us to understand this firm P's reaction curve.

Assuming firm Q's output	Firm P's Profit maximising level output
0 unit	1000 units
1000 units	500 units
1500 units	250 units
2000 units	0 unit

In a similar way, we can also obtain firm Q's reaction curve while assuming that the marginal cost of firm P and the marginal cost of firm Q are the same.

Cournot Equilibrium-



The intersection of two reaction curves can be seen in this diagram at point E. At point E, each company is producing at the output level that, given what the competitor is producing, maximises its profit. Basically, Cournot equilibrium is a Nash equilibrium, which means that in an equilibrium situation, each firm is doing as best it can give the actions of its rivals. Each company chooses its own output under Cournot's equilibrium in order to maximise its profit in view of what its rival company is producing.

Limitations of Cournot model-

1st – Cournot's duopoly is naive because he never learns from his mistakes. This shows that his rival is aware of his own sales decisions.

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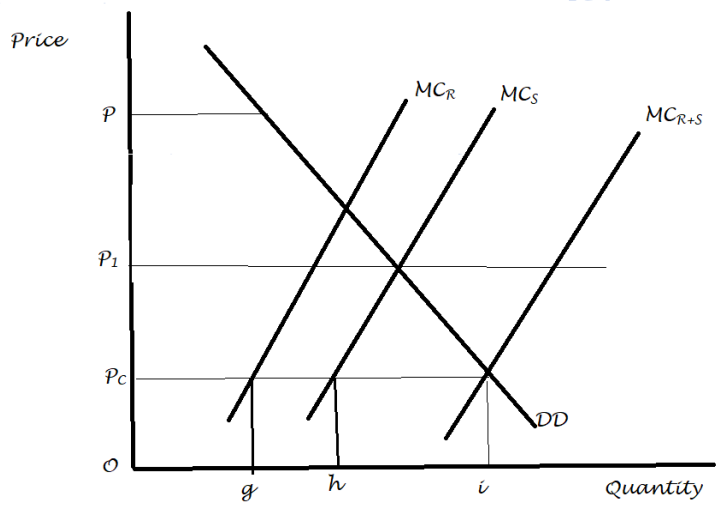
2nd - One of the first criticisms of Cournot's model was that it didn't take into account a firm's desire to cut its price and increase sales.

3rd – This is a closed model – does not allow entry.

6.4.2 Bertrand Duopoly Model:

French mathematician Joseph Bertrand proposed a counter-question to the Cournot model in 1883. Joseph Bertrand asked if the oligopolistic competition is based on price charged rather than quantity produced. His proposition became the Bertrand model. Again, in this model, we will consider only two firms, i.e., a duopoly.

If the duopoly company follows Bertrand's theory, it thinks that if it slightly lowers its price (compared to other prices), it can get the whole market. The duopolist wants to increase its sales as long as the price is higher than the marginal cost. This is because every extra unit sold adds to its operating profits. The other company does the same thing, and a price war starts. The process of cutting prices to win the market continues as long as the price is higher than the firm's marginal cost at its current sales. Let's understand this model by making a diagram.



The initial price P is more than firm A's and firm B's marginal costs. As a result, there is intense price competition, which leads to ongoing price reductions. For example, when MC_R and MC_S both equal P_1, the output level has reached a point where it is higher than both market demand and sales. As a result, there will be fewer sales than expected. It is likely that the marginal costs of either R or S or both will be less than P_1 when sales are at a level that is lower than the desired level. They now have an incentive to increase their sales by lowering their prices even further. As a result, the price battle will continue until a competitive price point is achieved.

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The market's demand corresponds with the combined supply of the two companies at the competitive price, and the marginal costs of both companies are equivalent to the market price. The price that can be considered competitive is denoted by the symbol P_C. Given this price, R supplies the g portion of the market, while S supplies the remaining portion, i.e., h. On the other hand, Bertrand's model does not ensure that equilibrium will be reached at a competitive price. If the price drops below pc, it is possible that it will stay there despite the fact that there is an excess of demand. This is due to the fact that whoever raises the price in response to excessive demand will have a part of the market taken away from them.

The Bertrand's model can be criticised on the same grounds as the Cournot model-

1st – The behavioural pattern emerging from Bertrand's assumption is naïve: firms never learn from past experience.

2nd- Each firm maximizes its own profit, but the industry profit is not maximised.

3rd – This is a closed model – does not allow entry.

6.4.3 Sweezy Kinked Demand Model:

According to the sweezy kinked demand model, each and every company in an oligopolistic market doesn't want to involve themselves in price war situation. That's why, instead of a price war, they focus on other non-price competitive strategies like advertising, sales promotion, and product differentiation. This is how they try to expand their market and compete with rivals. As a result, in an oligopolistic market, price will remain stable or rigid. So now we will discuss behavioural assumptions that explain why prices will remain stable or rigid in an oligopolistic market.

The first one is that if one company reduces its price, other companies will also reduce their price of the product. The reason is very simple: in an oligopolistic market, products are very similar to each other (close substitutes), so other companies would worry that the first or former company would get a large market share. Because of this, the company that lowered its prices in the beginning doesn't get the benefit it was hoping for, and its demand curve is very elastic. A price cut will give the company some initial gains, but because competitors will do the same thing, this increase in demand will not last.

The next behavioural assumption is that if one company increases its price, other companies will either not follow this strategy or not increase their price of the product. The reason is very simple: in an oligopolistic market, products are very similar to each other (close substitutes), so in this case, other companies would not increase their price of the product, so the first or former company would lose a large number of its customers to other companies or rivals due to the substitution effect. Because of this, in an oligopolistic market, company has no other choice but to keep its pricing at the current market price.

Now let's discuss the diagram. If you see this diagram, you will notice that there is a kink in the diagram at point K, and it divides the demand curve into two parts. When you

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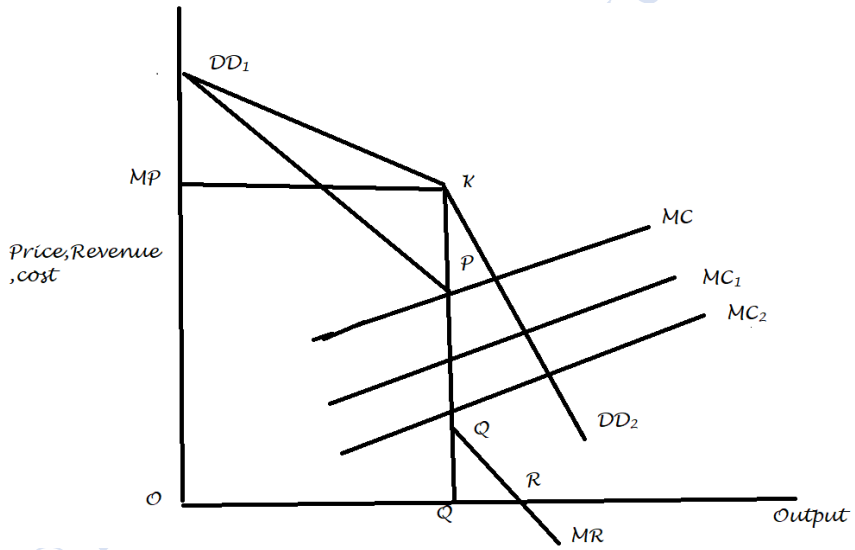
observe this, you will see that DD_1 to K is more elastic, and K to DD_2 is a less elastic demand curve. To put it another way, the demand curve above the kink is more elastic than the demand curve below the kink (below the kink demand curve is less elastic). MP denotes the current market price at which an oligopolistic firm can sell a product, and OQ denotes the total quantity. If we see that DD_1 to K is more elastic because if any company is going to increase the price, i.e., if anyone sells a product above the market price, then other companies will not respond. When we talk about K to DD_2, why is it less elastic?

If an oligopolistic company reduces its price, then other companies will also respond in the same manner (they will also reduce the price). The kink or discontinuity in the demand curve creates a discontinuity in the MR curve as well. The reason for this discontinuity in the MR curve between points P and Q is the discontinuity in the demand curve at point K. In this diagram, the MR curve DD_1PQR, so now DD_1P is in correspondence with DD_1K's demand curve and QR's marginal revenue curve is in correspondence with KDD_2.



At point K, the marginal revenue of any firm in an oligopolistic market will be constant between points P and Q, so the company will produce a certain quantity of output, i.e., OQ, irrespective of marginal cost, whether they are operating at MC, MC1, or MC2 because profit maximising quantity is OQ. It means we can say that if the marginal cost fluctuates between MC and MC2, then the company will not change its output nor price. Companies will change their output or price when marginal costs move above P or below Q.

Limitations of this model-

The model explains why prices in oligopolies remain constant. However, it falls short of outlining how the industry-wide pricing was initially set. Although the concept explains

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why oligopolists are reluctant to alter their pricing, it offers no explanation for how the initial price was established. It doesn't explain how businesses arrived at the starting pricing or why they didn't set a different price.

Instead of being an explanation, it is more valuable as a description of pricing rigidity. Price rigidity can be explained by the prisoner's dilemma and businesses' aim to prevent harmful price competition.

Second, the model's predictions have not been supported by empirical study. Due to this, the analysis provided by Sweezy's model has come under scrutiny. Numerous studies have demonstrated that oligopoly enterprises frequently replicate one another's price increases during an inflationary time. This goes directly contrary to what this model assumes.

6.5 GAME THEORY

As we've seen, oligopolistic businesses want monopolistic results, but to get there, they have to work together, which can be hard to do at times. In this section, we go into more detail about the problems people face when they want to work together but find it hard to do so. In order to study the economics of cooperation, we need to learn about game theory.

So here comes game theory to figure out how this kind of strategic behaviour works. So, **game theory is a method that is often used to analyse this kind of strategic interaction or behaviour. It looks at how people make choices when they know that their actions affect each other and when they take this into account. So, when one firm makes a decision, they know that it will affect not only their own firm but also the other firms. So, in this case, game theory looks at how each firm acts when they know that their actions affect not only their own company but also the other companies in the market.** So, it is a mathematical tool that is often used to study the situation or behaviour of a strategy. As we all know, in an oligopolistic market, there are few sellers in the market, so each seller has to act strategically. Every company knows that their profit depends not only on how much they produce but also on how much is produced by other companies. As a result, in an oligopoly, each company should think about how their decision will affect others.

What is strategic behaviour or decision?

"Strategic behaviour" is when what is best for A depends on what B does, and what is best for B depends on what A does. So, strategic behaviour is when the end output or profit price output decision or the strategy of one firm doesn't depend on its own price and output decision or strategy decision. Rather, it depends on the other company's strategy and how they are going to make decisions regarding price and output.

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Why do we discuss game theory only in an oligopolistic context and not in other market structures?

The first point to mention is that game theory is not important for competitive markets or monopoly market structure. When we look at the perfect competitive market, all firms are just part of the whole market. They are insignificant, which means they can't impact the price and output of the market or other firms in the market. It doesn't matter whether they are cooperating or not with other firms in the market. And when we see a monopoly, strategic interactions are absent because there is only one firm. But in an oligopoly market, it is very useful for understanding the behaviour of oligopolistic firms.

Prisoners' Dilemma-

The Prisoners' Dilemma emphasizes the value of cooperation. The two participants in the game have two options: cooperate or defect. The concept is that both players benefit when they cooperate, but if only one of them does, the other player, who defects, will benefit more. If both parties cheat or defects, then both lose (or win very little), but not as much as the cheated or deceived co-operator, whose cooperation is not returned. If both parties cheat, then both parties lose.

So now let's discuss this prisoner's dilemma through an interesting story. The story begins like this: The two suspects (Mr. P and Mr. Q) in an armed robbery have been arrested. They are brought into prison and soon separated. The police believe they have sufficient evidence to convict Mr. P and Mr. Q of armed robbery, which would result in each of them serving a sentence of two years in prison. They were instantly separated, and there is no information or communication between them. The police also believe these two guys are responsible for a bank robbery in which a victim was seriously hurt. But until one or both of the suspects admit to the robbery, the evidence isn't strong enough to prove that they did it. Separate interrogation rooms are set up for Mr. P and Mr. Q, and the police make each of them the following offer:

1st – If you both confess to a crime, your imprisonment will be for 7 years.

2nd – If one of you confesses to a crime, the other remains silent. In this case, the one who confesses will get 1 year in jail, whereas the other will get 25 years in jail.

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3rd- We have sufficient evidence against both of you for armed robbery, for which you will get 2 years of imprisonment.

Now we are going to make a payoff matrix table in which there are two players, Mr. P and Mr. Q, and imprisonment years are the payoff or outcome. And each individual has two strategies: confession or remaining silent. As we already discussed in the introduction of game theory, here's the sentence of imprisonment each prisoner gets depending on their own strategy and the strategy chosen by the other person. One more interesting point is that here, neither player has any information regarding which strategy will be chosen by the other player.

Prisoner's Dilemma

	Mr. Q Remains silent	Mr.Q Confess
Mr. P remains silent	Both will get 2 years of imprisonment And it's a win-win	Mr. P will get 25 years Mr. Q will get 1 year. And here Mr. P loses, Mr. Q wins.
Mr. P Confess	Mr. Q will get 25 years Mr. P will get 1 year. and here Mr. Q loses, Mr. P wins	Both will get 7 years. And it's Lose-Lose

If we think from Q's perspective, he will think like this: if I confess and the other (P) remains silent, I will get one year of imprisonment. Another thing is that the other person(P) confesses. Still, my best strategy is to confess because I will get 7 years of imprisonment rather than 25 years. So, regardless of what the other person (P) is going to do, my best strategy is to confess. This is called dominating strategy in game theory. And confessing is also a dominant strategy for Mr. P. Finally, both of the players will confess and get 7 years of imprisonment.

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What is Dominant strategy?

A strategy that is best for a particular player in a game, regardless of the strategies chosen by the other players.

Oligopolies as a Prisoners' Dilemma –

The prisoner's dilemma model in game theory is a good way to understand how to act strategically in an oligopolistic market. When companies in an oligopoly depend on each other, it's like when two people play the prisoner's dilemma game and run into trouble.

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Oligopolistic firms also choose their strategies when they are uncertain of how their competitors will react.

Suppose there are only two companies in the market (P Ltd. and Q Ltd.), and both are supplying water, so we can consider them to belong to a duopoly market. Following lengthy negotiations, the two water suppliers agree to maintain production at 60 gallons in order to maintain their high prices and maximise their combined profit. However, after they reach an agreement on production levels, each of them must choose whether to work together and stick to this agreement or to rebel against it and produce at a higher level. Let's make a diagram in which we will try to show how the strategies used by the two producers affect how much money they make.

P ltd. & Q Ltd. Oligopoly Game

	P Ltd. Decision: High production: 80 Gallons	P Ltd. Decision: Low Production: 60 gallons
Q Ltd. Decision: high Production: 80 Gallons	P Ltd. gets Rs. 3200 Profit Q Ltd. gets Rs. 3200 profit	P Ltd. gets Rs. 3000 profit Q ltd. gets Rs. 4000 profit
Q Ltd. Decision: Low production: 60 Gallons	P ltd. gets Rs. 4000 profit Q Ltd. gets Rs. 3000 profit	P Ltd. gets Rs. 3600 profit Q Ltd. gets Rs. 3600 profit

Let's say you are P Ltd. You can think like this: As we had agreed, I could continue producing at the current level of 60 gallons, or I could increase it and sell 80 gallons. If Q Ltd. honours the deal and maintains her output at 60 gallons, I will make Rupees 4,000 with high output and Rupees 3,600 with low output. In this instance, increased productivity is preferable for me. In the event that Q Ltd. breaks the terms of the deal and produces 80 gallons, I will earn Rupees 3,200 for high output and Rupees 3,000 for low production. Once again, high productivity is better for me. Therefore, I am better off breaking our agreement and producing at a high level regardless of what Q Ltd. decides to do. For P Ltd., producing 40 gallons is a key strategy. Naturally, Q Ltd. comes to the same conclusion, and as a result, both of them produce the greater amount of 80 gallons. The end result is an inferior outcome (from P Ltd. and Q Ltd. perspectives), with little profit for each of the two producers. This illustration shows why oligopolies struggle to sustain monopoly profits.

6.6 SUMMARY

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The oligopolistic market structure dominated by a few companies, in which they are selling differentiated products or homogeneous products, under the continuous awareness or consciousness of rivals' actions. Oligopolistic market characteristics are few dominant sellers; products (differentiated or homogeneous); collusive and non-collusive oligopoly; mutual interdependence; barriers to entry; non-price competition. The causes or reasons for the existence of an oligopoly market structure are a huge amount of money required; strong consumer loyalty to the existing brands; economies of scale; merger and legal restrictions; licences or bidding processes.

In an oligopoly, we cannot determine price and output like we do in other forms of market structure. Because in the oligopoly market, each and every company is dependent on another, the price and output of one firm are affected by other firms in the market. There is no general theory of oligopoly to determine price and output.

We have the Cournot model and the Bertrand model, which state that a firm can maximise its profit assuming that a rival firm will hold its output constant. And in game theory, when companies in an oligopoly depend on each other, it's like when two people play the prisoner's dilemma game and run into trouble. Oligopolistic firms also choose their strategies when they are uncertain of how their competitors will react.

6.7 SELF-ASSESSMENT QUESTIONS

Q1. What exactly is the prisoners' dilemma, and how does it relate to the concept of an oligopolistic market?

Q2. Can we apply game theory to explain the behaviour of firms in perfect competition or monopoly or monopolistic competition? Give logic to support your answer.

Q3. What is the distinguishing characteristic of oligopoly in relation to other forms of market structure?

Q4. In which sector of the Indian economy is oligopoly most prevalent? why?

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LESSON 7

MARKET FAILURE

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STRUCTURE

7.1 Learning Objectives
7.2 Introduction
7.3 Market Failure
  7.3.1 Types of Market Failure
  7.3.2 Causes of Market Failure
  7.3.3 Externalities
  7.3.4 Public Goods
  7.3.5 Market Control
  7.3.6 Asymmetric Information
  7.3.7 Consequence of Market Failure
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7.6 Self-Assessment Questions
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7.1 LEARNING OBJECTIVES

This chapter aims to impart the following learning objectives:

L1: Introduction to cycle of economic activities.

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L2: Introduction to the concept of market failure and types of market failure.

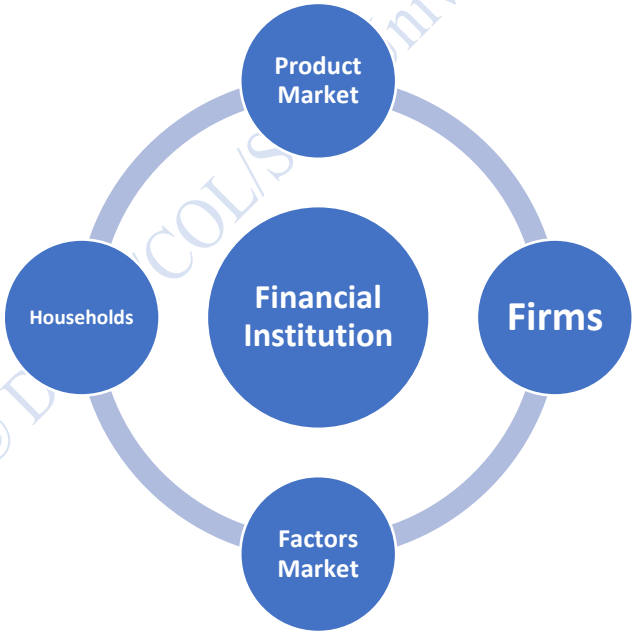
L3: Introduction to causes of market failure.

L4: Introduction to consequences of market failure.

L5: Introduction to remedies of market failure.

7.2 INTRODUCTION

Economies witness simultaneous interplays of innumerable factors and stakeholders. This simultaneous interplay of innumerable factors and stakeholders in the economic system makes the economy a very complex system and a design to completely understand the actual impacts of complex and cyclical economic activities and respond to. Moreover, the whole economic system is arranged in a systematic hierarchy of horizontal and vertical structures. It includes the governments, regulators, consumers, producers, global inter-governmental organizations and specialists (think tanks)/lobbyists (interest groups) as the main stakeholders. These stakeholders of the economy altogether act and react to create demand and supply in any economic system while the market itself tries to bring the economic system in equilibrium.



In any economic system, there are millions of buyers, consumers, sellers, producers and other commercial and non-commercial institutions along with many regulators. The flows of economic activities are circular in nature. The economic activities undertaken by any stakeholder have direct or indirect impact on that stakeholder as well as the economic activities too. Because of the presence of a large number of stakeholders interacting

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simultaneously, the whole economic system and the impacts of the economic activities on the stakeholders as well as the economic activities become very complex. These impacts are of varying degrees and directions further increasing the complexities.

CASE STUDY

The Impact of Economic Activities in Circular Ways

Let's take the example of interaction between a car buyer and a car manufacturing company ABC Cars. In a car, there are thousands of small and big spare parts which have to be assembled together to make a car. Normally a car manufacturer doesn't manufacture every part. Rather the car manufacturer sources those spare parts from hundreds of other suppliers. Those suppliers may also be sourcing some of their raw materials and spare parts from other suppliers. So, in this process many layers of buyers and suppliers are involved. Similarly, ABC Cars sources spare parts and equipment from hundreds of companies.

If a consumer buys a car from ABC Cars, the money that is paid by the buyer would go in the hands of a large number of stakeholders in varying amounts who have directly or indirectly contributed to the manufacturing of the car along with sales of the car. However, the buyer is working for one of the suppliers of automotive microchips for ABC Cars. This creates a very complex cycle of economic activities in which every stakeholder plays a very important role and any disturbance with any of the stakeholders in any ways would lead to a lot of problems for almost every stakeholder in the cycle.

Due to the Coronavirus pandemic, ABC Cars had to face shortage of automotive microchips. As a result, the cost of microchips increased significantly leading to increased car prices. This has adversely impacted ABC Cars as well as the automobile industry as a whole. The adverse impact of automotive microchips was not limited to only the ABC Cars and automobile industry but the whole economy also along with the consumers and buyers.

In the economic decision sphere, the government has three fundamental functions such as macroeconomic, microeconomic and distributive. This chapter focuses on the microeconomic function of the government. In the context of the microeconomic functions, the government has two main roles: (1) to regulate the private market by defining and enforcing rules and intervening in case of market failures, and (2) to provide some certain goods and services which are not or cannot be provided by the private market.

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Private markets can function efficiently only in an economic environment which is based on a well-defined rule of law promulgated by the government, enforced by the police and courts. A well-defined property right is the key instrument for the private market to function. It should be noted that the nature of the property rights as well as the ethos of property rights keep on changing over time along with the scope of the property rights. In India the right to property was a fundamental right but after the 44th Constitution Amendment in 1978, the right to property ceased to be a fundamental right however it still continues to be a constitutional legal right.

IN-TEXT QUESTIONS

Fill in the blanks.

16. Economic activities are ……. in nature.
    (a) Straight (b) Closed (c) Circular (d) Open
17. A well-regulated …… is necessary for the private market to flourish.
    (a) Economic System (b) Country (c) Government (d) Bank
18. Well-defined …… are not the key instrument for the private market to function.
    (a) Fundamental Rights (b) Property Rights (c) Economic Rights
    (d) Private Rights

7.3 MARKET FAILURE

It is a general assumption that the markets are capable of optimally allocating resources in an economy. However, this is not always true. In certain circumstances, markets fail to optimally allocate resources leading to inefficient economic outcomes for some. Every stakeholder takes the most rational and correct decision in self-interest, but those decisions together prove to be wrong as a whole in which a few stakeholders or individuals are left worse-off than if they had not acted perfectly in rational self-interest.

Market failure refers to a situation in which the free market fails to efficiently distribute the goods and services as a result of misallocation of scarce resources. In other words, there exists a market distortion in form of difference in the quantities of goods and services demanded and supplied and as a result, the true costs of the goods and services are not reflected in the prices of the goods and services. Market failure does not imply that the market is not working at all. Rather it means that the market is not functioning efficiently and unable to produce the goods and services which are wanted by the consumers.

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In a typical free market economy, the prices of goods and services are determined by the forces of demand and supply. Any change in the one force results in the price change and corresponding change in the price of the other force. These changes lead to price equilibrium. However, in a situation of misallocation of resources and resultant inefficient distribution of the goods and services, a state of disequilibrium in the market comes into force and it is known as the market failure.

Air pollution is caused by many economic activities undertaken by individuals and businesses in an economy. These economic activities are undertaken by individuals and businesses in their respective rational self-interest. However, this air pollution proves to be very costly for the whole economy and society and millions of people across the globe are left worse-off while the users and producers don't pay any cost. A report by Lancet Commission on Pollution and Health found that in 2019, 1.6 million people in India and nine million people across the globe died due to air pollution. This is a classic example of market failure in which the economic decisions of a group of individuals and businesses in rational self-interest are resulting in inefficient economic outcomes for the economy and millions of people left worse-off (died).

7.3.1 Types of Market Failures

Market failures can be categorized into two categories as follow:

Complete Market Failure

Complete market failure is a situation in the market in which there is no supply of some specific goods and services at all even though there is some demand for those goods and services. These goods and services can be public goods as well as profitable goods both. For example, in late 1980s and early 1990s, India was in a state of complete market failure as far as the mobile telecom services were concerned. It was a time when the mobile telecom services in developed countries were becoming very popular and the rich of India also wanted to use mobile telecom services but there was no supply at all. However, there is often very little likelihood that profitable goods or services are not supplied at all in the market even after some demand. Complete market failure is often an ideal situation in today's modern economic world. Possibly there are no goods and services which are not being supplied if there is some demand for.

Partial Market Failure

Partial market failure is a situation in the market in which the market is functional, but the supply of the goods and services are either inadequate in quantity or prices disproportional. Basically, when the market for the particular goods or service is in its initial stage, it is natural that there exists some form of partial market failure. This is a very common phenomenon and most of the goods and services at one point of time in their life cycle have to face such market failures. For example, the mobile telecom services in late 1990s in India

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were experiencing a state of partial market failure as the supply of mobile telecom services were very limited and prices were disproportional.

IN-TEXT QUESTIONS

4. Market failure is
   (a). Government Failure (b). Economic Failure (c). Constitutional Failure
   (d). Free Market Failure to Efficiently Distribute Goods and Services
5. The types of market failure are
   (a). Complete Market Failure (b). Partial Market Failure (c). Ambiguous Market Failure (d). a & b both
6. Partial market failure is very common in case of new products markets during
   (a). Introduction Phase (b). Growth Phase (c). Decline Phase (d). Stable Phase

7.3.2 Causes of Market Failure

There are several reasons due to which market failure occurs in the market. A few of those reasons are as below:

Externalities

In economics, externality or the external cost refers to the indirect cost or benefit to an involved third party who is not associated with the transaction. In other words, an externality is the costs or benefits that result from a transaction and has impact on a third party who is not associated with the transaction but has to be affected with the benefit or cost. Air pollution caused by motor vehicles is an example of externalities. The cost of air pollution caused by motor vehicles in an economy is neither paid by the users nor producers while the society and the economy have to suffer from the air pollution as a whole and millions of people become sick and die every year from the air pollution.

Types of Externalities

The impacts of externalities can be positive or negative. So, externalities are categorized as positive externality and negative externality.

Positive Externality

A positive externality is an externality that impacts the third party positively. In positive externality, the un-associated third party is benefited from transactions of other parties. Education, motor insurance, green technologies and advertising about the welfare schemes are some examples of the positive externalities.

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Sarva Siksha Abhiyan is a centrally sponsored scheme which is implemented across India with the help of the state governments with the purpose to provide quality education to every child. It is an example of positive externality. Access to quality public education to every child directly educates the children but the benefits of the quality education to every child spill over to the whole society and economy in the form of more informed citizens and employable youth for the economy.

Negative Externality

A negative externality is an externality that impacts the third party negatively. In case of negative externalities, the negative effects of a transaction are borne by the un-associated third party. Cigarette smoking, air pollution, water pollution and noise are some examples of the negative externalities.

Smoking of cigarettes is primarily harmful to the smoker. However, the negative impact of cigarette smoking is not limited only to the smoker but the people around the smoker also experience negative health impacts even though they don't smoke. Here smoking is a negative externality and the people around the smoker are the third parties who pay the cost of being around the smoker. The cost of non-smokers being around the smoker does not reflect in the prices of cigarettes and neither the producers nor the smokers bear the costs of the third parties. This is a market failure.

Public Goods

Public goods are goods or services whose consumption or use by an individual does not reduce the available quantity of goods or services to other individuals along with no impact on prices of goods or services. Public goods are consumed or used by a large number of the population and the prices of those public goods don't increase even if the numbers of consumers or users increases. Market failure occurs in case of public goods as the non-payers keep consuming or using the goods. This problem is also known as the free rider problem.

The public goods can be allocated to everyone efficiently without any change in the price or even at no cost. The public goods are accessible and available to everyone, and none can be excluded from the access to the public goods. Even the non-payers have access to the public goods. So basically, the public goods are non-rivalrous as well as non-excludable in nature. The typical laws of demands and demands along with state of equilibrium don't apply to the public goods. Public goods create a situation of market failure if a section of consumers or users keep on consuming or using the public goods without paying for it in the same ways as the payer does. Police services, national defence, toll-free roads and highways are some examples of public goods.

People keep on using the services of police without paying for the services irrespective of whether they pay taxes to the government or not. Even if the service providers of police want to exclude the non-payers from enjoying the services of police, it wouldn't be possible and non-payers would keep enjoying services as every citizen is entitled to enjoy these services.

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Same is true in the case of national defence, toll-free roads and highways. Every citizen uses the toll-free roads and highways as per their needs without limiting the availability of these services to other citizens.

Market Control

Market control is a situation in which either the buyer or seller has the power to determine the prices of goods or services in the market. Because of this power to determine the prices of goods or services, forces of demand and supply don't apply in the market. Rather either the buyer or the seller decides the prices of the goods and services. This situation of market control leads to market distortion and inefficient distribution of goods and services and as result, there occurs market failure in the market.

Market control can happen either from the supply side or from the demand side.

Market Failure Caused by Supply Side

In a market, market failure can be caused by the supply side. In a market where the sellers control the prices of goods and services, they cause market distortion leading to market failure. It is possible either in the case of a monopoly or oligopoly. A monopoly is a market condition in the market in which there is one large seller along with many small sellers. An oligopoly is a market condition in which there are a few large sellers along with many small sellers.

Monopoly

In a monopoly, there is a single large seller in the market and the monopolist decides the prices of the goods and services and the rest of the sellers in the market follow the monopolist. To maximize profits, the monopolist may set the prices of goods and services higher than what should be the prices of goods and services in a state of equilibrium. Apart from the price decision, the monopolist can control the quantity of goods and services in the market to create artificial scarcity to justify the increase in the prices. In such cases, the natural forces of demand and supply fail to work, and a situation of market distortion occurs that leads to market failure.

Oligopoly

In the case of oligopoly, the large sellers may collude to decide the prices of goods and services with their profitability objectives and as a result prices of goods and services in the market might be set higher than the state of equilibrium. Apart from the price decision, the sellers in an oligopoly can collude to control the quantity to create an artificial scarcity of goods and services to justify the increases in prices. In such cases, the natural forces of demand and supply fail to work, and a situation of market distortion occurs that leads to market failure.

Market Failure Caused by Demand Side

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In a market, market failure can also be caused by the demand side. In a market where the buyers control the prices of goods and services, they cause market distortion leading to market failure. It is possible either in the case of monopsony or oligopsony. Monopsony is a market condition in which there is one large buyer along with many small buyers. Oligopsony is a market condition in which there are a few large buyers along with many small buyers.

Monopsony

In a monopsony, there is a single large buyer in the market and the monopsonist decides the prices of the goods and services and the sellers in the market follow the monopsonist. To maximize profits, the monopsonist may set the prices of goods and services lower than in a state of equilibrium. In such cases, the natural forces of demand and supply fail to work, and a situation of market distortion occurs that leads to market failure.

Oligopsony

In the case of oligopsony, the large buyers may collude to decide the prices of goods and services with their profitability objectives and as a result price of goods and services in the market might be set lower than the state of equilibrium. In such cases, the natural forces of demand and supply fail to work, and a situation of market distortion occurs that leads to market failure.

Asymmetric Information

In modern times, information is one of the most important pillars of businesses and lack of information or information not in time can prove fatal to businesses as well as individuals. Information asymmetry is a situation in which all the market players don't have access to the same information at the same time and as a result, their responses to the same events during the same time span is different.

Market failure may occur due to asymmetric information available in the market. Due to asymmetric information available to buyers and sellers, the responses of the buyers and sellers in the market would not be rational. As a result, the prices of goods and services would not follow the laws of demand and supply and the prices would not reflect all the benefits or costs associated with the goods and services. In such circumstances, neither the distribution of goods and services would be efficient, nor would the allocation of resources be optimal. As a result, the economic output would not be efficient and market failure would occur.

The lack of information or asymmetric information has different impacts on the buyers and sellers. Lack of information about the actual benefits of the goods services on the buyer's side may result in the willingness of the buyer to pay a higher price. This would lead to market distortion as the laws of demand and supply would not apply. Similarly, the lack of information on the seller's side may result in the sellers' selling goods and services at lower

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prices than the actual opportunity cost of the goods and services. This would again lead to market distortion. As a result, in such a situation, there occurs market failure in the market.

IN-TEXT QUESTIONS

7. Externalities affect the
   (a). First Party (b). Third Party (c). Second Party (d). Forth Party
8. Costs or benefits of externalities are reflected in the price of the
   (a). Water (b). Education (c). Burger (d). Goods and Services
9. A situation of asymmetric information causes
   (a). Government Failure (b). Economic Failure (c). Market Failure (d). Legal Failure

7.3.3 Consequences of Market Failures

There are several consequences of market failures in an economy. The consequences of market failures for any economy may vary from time to time and in magnitude and can be felt over different time durations. In some cases, the consequences might be felt for a short term with very low magnitude while in some cases, the consequences of market failure can be felt in the long term with very high costs for the economy and the market. The consequences of market failures are always grave for the economy in the general and the affected group in particular. The cost of market failure is not just limited to the economy and the affected groups, but it is self-inflicting also. In the long term, market failures, mainly caused by monopolies, tend to harm the monopolies too.

It is not an easy task to map all the possible consequences of market failures. However, some of the consequences of market failures are as follow:

Market Dominance by Monopolies

The market failure caused by monopolies in the market has an overreaching impact on the markets. As a result of monopolies, the monopolists may affect the market from two sides, i.e., the price side as well as the quantity side. It is quite possible that the monopolist may charge higher prices for the goods and services than the associated benefits. Similarly, the monopolist may create a situation of artificial scarcity of goods and services through under-production. These conditions would have a negative impact on consumer welfare and the interest of the consumers would be compromised as a result. However, in the long term, market failures are self-inflicting for the monopolies too. BSNL, MTNL and VSNL are some examples of market dominance by monopolies.

Factor Immobility

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Factor immobility refers to a situation in which the factors of production like capital and labour are challenging to move between the various geography of an economy. Market failures in the market often lead to a situation of factor immobility which results in increased unemployment due to under-production and loss of productive efficiency in the market. Geographical immobility is an example of factor immobility. Due to the high cost of living, rent and other related expenses, it becomes unaffordable for people to move from one area to another area. Another example of factor immobility is occupational immobility. Due to a lack of skills or experience, it is difficult to move between different jobs.

Rising Inequality

In case of market failures, the market can cause a situation in which the distribution of income is less unequal, and the income and wealth may concentrate in a few hands. As a result of market failure, poverty in the economy may increase leading to more complex problems in the economy such as malnourishment, lack of healthcare services, increasing gap in the education level of the citizens and discrimination in different contexts.

Super-normal Profits

Another consequence of market failure is super-normal profits earned by the monopolist or the firms in an oligopoly. This super-normal profit not only distorts the market but directly impacts the consumers in form of high prices also as well as it becomes an instrument for killing the competition in the market as well as unchecked and possibly unethical practices. Lack of competition may result in underdeveloped markets and no incentives for new inventions and processes as well as innovations. In today's modern times when new technologies, innovations, new knowledge, and processes are keys for economic growth, the super-normal profits earned by the monopolist may lead to status-quo in the market and as a result, the market may be left behind the developments taking place in the new world order.

In the telecom sector in India, before mobile communication took off in the late 1990s, BSNL, MTNL and VSNL were the monopolies for voice and data services in India, but India couldn't catch up with the rest of the world as far as the technology was concerned. Not only the technology but the telecom services were not accessible to most of the citizens and were considered to be luxury.

Undersupply of Public Goods

Normally public goods are not economically profitable for businesses. So, these public goods are often not on the lists of the profit and rent seeking businesses. However, these public goods are very important for any economy for economic growth and development along with the businesses in that particular market as well. As a result, there may be an undersupply of public goods if there is no government intervention.

Pollution

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Pollution is another result of market failure. When the polluting industries and goods and services that emit or increase pollution levels remain unchecked in an economy and the cost of the pollution is not priced in those goods and services, the social and economic cost is huge and very often unmanageable. The Lancet report clearly indicates that in 2019, 2.6 million individuals and more than 9 million individuals died due to air pollution and pollution respectively in India alone.

IN-TEXT QUESTIONS

10 Undersupply of public goods is a consequence of
(a). Market Failure (b). Economic Failure (c). Government Failure (d). Individual Failure

11 Which is not a consequence of the market failure?
(a). Flood (b). Immobility Factor (c). Super Normal Profits (d). Rising Inequality

12 Which is an example of consequences of market failure?
(a). Smoking (b). Cars (c). Pollution (d). Rain

7.3.4 Remedies of Market Failures

It is very important for economies to eliminate failures. In order to eliminate market failures, there are many remedies that can be implemented. Those are as follows:

Use of Legislation

Legislations are one of the tools that are used by the government to correct market failures. Most legislation aimed at correcting market failures focuses on changing the behaviours of the stakeholders. For this purpose, the government uses redistributive or punitive taxation to reinforce the desired behaviour in individuals and businesses. Imposing high penalties on vehicles without pollution certificates or banning cars with a life of more than 15 years in some cities in India is an example of the use of legislation to correct market failures. These punitive taxation or measures are aimed at bringing change in the behaviours of the citizens and businesses.

Price Mechanism

Price mechanisms are some policy responses from the government designed to change the behaviours of the producers as well as the consumers both with one single tool. With the help of a price mechanism, the government aims to either discourage or encourage a habit. The products that cause harm to consumers, the government increases the taxes on them with the

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purpose to decrease consumption by creating a barrier in the form of high prices. For example, the government imposes very high taxes on cigarettes and alcohol to decrease the consumption of these products to bring down the negative impact on third parties. The products that are good for consumers or the ecosystem, the government provides subsidies or decreases the taxes to reinforce a particular habit. For example, the government is providing subsidies on electric vehicles so that people use electric vehicles more so that pollution can be checked.

Price Floor and Price Ceiling

The government uses the strategy of the price floor and price ceiling to support a particular group of industries or consumers to make their life better. By doing so the government ensures that the interests of consumers or the producers are protected. The government uses the strategy of price floor to ensure that a particular set of producers gets the minimum price for their products. The minimum Support Price (MSP) for agriculture products in India is an example of a price floor. Under the MSP, the farmers are entitled to sell their agricultural products at MSP so that their financial well-being is taken care-off. The government uses the strategy of a price ceiling to ensure that the prices of particular sets of goods and services don't breach the desired levels. The sale of grains using the Public Distribution System (PDS) in India is an example of a price ceiling. The government of India sells different grains at zero price or subsidized rates with a price ceiling with the purpose to provide food to everyone in the country.

Advertising

Advertising can prove to be an important tool in the hands of governments and regulators in dealing with market failures. An advertising campaign can discourage consumers from consuming and using those goods and services that generate negative externalities. For example, the advertising campaign against child labour is such an effort by the government to make people aware about the harms of child labour in the society.

7.4 ECONOMICS OF INFORMATION

Markets operate in a very complex environment in which large numbers of buyers and sellers interact with each other simultaneously. When many buyers or sellers are chasing the same goods or customers, information becomes very vital and important for the businesses and buyers. It is capable of changing the whole game. As a result, information economics or economics of information has evolved over time as a branch of microeconomics.

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Information economics is formally related to game theory. The access to the information as well as time taken in accessing the information is the most important factor in information economics. Considering different games, access to the information may be perfect, complete and incomplete with different results due to these pieces of information. Time lags in accessing the information are another important aspect of information economics which affects the results of the games.

Adverse Selection

Adverse selection is a situation in which the market participants have different levels of information access and as a result, the choices of the market participants lead to one party having an advantage over the other party. The adverse selection process may lead to market failure and consequently market collapse. Basically, it is related to information asymmetry. One the most famous and classical examples of adverse selection is illustrated by George Akerlof in 'The Market for Lemons'.

Moral Hazard

A moral Hazard is a situation in which an economic actor has an opportunity to get an incentive by increasing its exposure to risk. This risk can be unusual, and the economic actor does have to bear the cost of the increased risk. For example, a real estate management company decides to not incur any additional cost to maintain the old but insured building and allows an adverse situation so that it collapses. In such cases, the real estate management company would have an incentive in allowing the collapse of the building.

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IN-TEXT QUESTIONS

13 Adverse selection may lead to
(a). Market Failure (b). Economic Failure (c). Government Failure (d). Legal Failure

14 Which is not an example of remedies of the market failure?
(a). Advertising (b). Legislation (c). Minimum Support Price (d). Rising Inequality

15 One of the classical examples of adverse selection by George Akerlof is
(a). Market for Car (b). Education (c). Pollution (d). Market for Lemon

7.4 CONCLUSION

Markets always don't lead to efficiency. In case of market failure, the economic outcomes are inefficient, and the allocation of resources is not optimal. As a result, market failure leads to

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underproduction, inefficient skilling of labour, high unemployment, and income inequalities. In such situations, government intervention can correct market failures leading to better market conditions with lower negative externalities.

7.5 SUMMARY

- The flows of economic activities are circular in nature.
- India is a mixed economy with a private market in which buyers and sellers exchange goods and services for money or other goods and services.
- In certain circumstances, markets fail to optimally allocate resources leading to inefficient economic outcomes. Every stakeholder takes the most rational and correct decision in self-interest for themselves, but those decisions together prove to be wrong as a whole in which a few stakeholders or individuals are left worse off than if they had not acted perfectly in rational self-interest.
- Market failure refers to a situation in which the free market fails to efficiently distribute goods and services as a result of the misallocation of scarce resources.
- In a typical free market economy, the prices of goods and services are determined by the forces of demand and supply.
- Market failures can be categorized as complete market failure and partial market failure.
- There are several reasons why market failure occurs in the market such as externalities, public goods, market control and asymmetric information.
- There are several consequences of market failures in an economy such as market dominance by monopolies, factor immobility, rising inequality, super-normal profits, undersupply of public goods and pollution etc.
- There are many remedies that can be implemented to correct market failures such as the use of legislation, the price mechanism and advertising etc.

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7.6 GLOSSARY

Market Failure: Market failure refers to a situation in which the free market fails to efficiently distribute the goods and services as a result of misallocation of scarce resources.

Externality: An externality is a cost of benefit experienced by the third party but caused by producers and not financially incurred.

Public Goods: A public good refers to a commodity or service that is made available to all members of society.

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Information Asymmetry: Information asymmetry is a situation in which all the market players don't have access to the same information at the same time.

Factor Immobility: Factor immobility refers to a situation in which the factors of production like capital and labour are challenging to move between the various geography of an economy.

7.7 ANSWERS TO IN-TEXT QUESTIONS

1. c. Circular	8. (d). Goods and Services
2. a. Economic System	9. (c). Market Failure
3. b. Property Rights	10. (a). Market Failure
4. (d). Free Market Failure to Efficiently Distribute Goods and Services	11. (a). Flood
5. (d). a & b both	12. (c). Pollution
6. (a). Introduction Phase	13. (a). Market Failure
7. (c). Second Party	14. (d). Rising Inequality
	15. (d). Market for Lemon

7.8 SELF-ASSESSMENT QUESTIONS

1. What is market failure?
2. Differentiate between the private goods and public goods.
3. What are the causes of the market failure?
4. What are externalities? Discuss the positive and negative externalities.
5. What is the free rider problem? Discuss with examples.
6. Why is pollution considered to be the source of the market failure?
7. What are consequences of market failures on output and prices?
8. How price floor and price ceiling can be useful in correcting market failure?

7.9 REFERENCES

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Master of Business Administration (MBA)

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ACCOUNTING FOR MANAGERS

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LESSON 1

ACCOUNTING THEORY

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Objectives of Accounting
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1.22 Self-Assessment Questions
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1.1 LEARNING OBJECTIVES

After reading this chapter, students will be able to understand:

- Basic concept of Financial Accounting, Accountancy and Book-keeping
- Relationship between Accountancy, Accounting and Book-keeping
- Difference between Book-keeping and Accounting
- Users of accounting information both Internal and External.
- Merits and Demerits of Accounting.
- Basic Accounting terms and concepts
- Double Entry System of Book-keeping
- Fundamental Accounting Assumptions and Accounting Principles.
- Accounting Standards and International Financial Reporting Standards and their difference with each other.
- Basis of Accounting (Cash vs. Accrual).

1.2 INTRODUCTION

As per the definition of Accounting given by the AICPA:

Accounting is an art of recording, classifying and summarising the transactions and events which are monetary and business related in a significant manner as per accounting rules and principles and interpreting the financial results.

Accounting aims to provide quantitative financial information about economic and business entities with respect to their financial position and performance so that users can use the information in making prudent economic decisions.

It is a logical and sequential process of identifying, collecting, recording, classifying, summarising and communicating financial information (monetary transaction and events related to business) to the users for their own customised judgment, analysis and decision-making.

1.3 OBJECTIVES OF ACCOUNTING

Accounting is done to achieve the following objectives:

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1. **Keeping systematic, accurate, structured and complete records** of financial transactions and events in the primary and secondary books of accounts such as journal, ledger as per specified accounting principles, rules and standards to avoid omission, error and fraud.
2. **Calculation of the profit earned or loss incurred** by a business during a particular accounting period to assess the financial results and operating efficiency of business activities.
3. **Determination of the financial strength or position** of the business through a position statement known as balance sheet which shows the application of funds in the form of current and non-current assets and sources of funds in the form of Equity (Capital and Reserves and Surplus) and External Liabilities.
4. **Providing useful accounting information to users** of financial information such as owners, prospective investors, suppliers, banks, employees and government authorities, regulators, customers, etc. who analyse and interpret them as per their own customised requirements such as investors use information for investment decisions, bankers use for assessing creditworthiness to make lending decisions.
5. **Providing financial information to the management** to faceplate them to take decisions regarding expansion, diversification, shutdown, to prepare budgets and forecast the results and financial position so as to prepare projected financial statements.
6. **Safeguarding assets and detecting and preventing frauds** by maintaining regular and systematic accounting records of the business transaction and events relating to the acquisition and disposal of assets, earning revenue and incurring expenses.

1.4 MERITS/ADVANTAGES OF ACCOUNTING

The significance and importance of accounting can be considered through following points:

1. Provides information to management, facilitating them to make prudent economic decisions.
2. It help owners to compare results of current years with past year results and with the results of other entities in same industry, it also helps to identify trends and the factors which leads to changes and evaluate the competitive performance.
3. It provide information regarding financial position of the business enterprise through balance sheet which shows the application of funds in the form of assets and sources of funds in the form of capital and external liabilities.
4. It help in keeping accounting records in a structured, systematic, accurate and complete manner of business related transactions and events in the books of accounts

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as per specified generally accepted accounting principles, which is accepted by the regulators, authorities and courts as valid evidence to settle various litigations.

5. It helps in correct determination of tax liabilities under various taxes such as Income tax, GST and Custom duties, etc.

6. It facilitates costing of products, job, activity and project so that proper pricing decision can be taken.

1.5 LIMITATIONS OF ACCOUNTING

Inspite of many advantages, accounting suffers from many limitations discussed below:

1. **Historical in nature:** Accounting is concerned with transactions and events already occurred in the past. It does not provide a tool for future decision making. Further it does not shows the business assets and investments at their current market value as per the demand and supply of securities in the market or as per the current value prevailing for the assets in the relevant market because it does not take into account the effects of changes in price level.
2. **It ignores qualitative aspects:** It accounts and recognises only transactions and events which can be expressed in terms of money because of Money measurement concept. It does not considers qualitative aspects such as efficiency with which the management works, quality of operations, loyalty and sincerity of employees, customer's satisfaction level, etc.
3. **It allows scope for window dressing:** It might involve manipulation in accounts to present a more favourable or unfavourable results and financial position than its actual position to serve the vested interests of the insiders.
4. **It is subjected to personal bias and judgment:** Since different people hold different opinions with respect to accounting estimates such as useful life of asset to determine amount of depreciation, provision for doubtful debts on the basis of likelihood of the default by the debtors, etc.
5. **It is based on concepts and conventions:** Since accounting is based on concepts and conventions which sometimes distort the disclosure of true and realistic financial position and results of a business enterprise. For example as per Historical Cost Concept, Fixed assets in balance sheet are shown at their purchase cost less depreciation and not at their current market value prevailing in the market if they are sold in the relevant market.

1.6 BOOK KEEPING

Book keeping is identification and recording of business transactions and events only. It is the recognition component of accounting system which involves the recording of monetary

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business transactions and events in a defined manner as per the standards and principles given in the relevant Financial Reporting framework.

It is concerned with only the recording part whereas accounting covers both the recording, summarizing, communicating and interpretation part of an accounting system.

The differences between Book keeping and Accounting can be described as under:

Basis	Book keeping	Accounting
Component	It is the recording phase involving recording of business transactions and events in journal and other accounting books.	It is much wider than book keeping as it covers recording, summarizing, communication, and interpretation part of an accounting system.
Stage of accounting	It is the first and primary stage and forms basis for accounting.	It is the secondary and subsequent stage, cover the part where the book keeping ends.
Nature/Skill or Knowledge requirement	It involves activities which are routine and clerical in nature and does not require any specialised skills or knowledge in their application.	It involves activities which are analytical in nature and requires specialised skills or knowledge of accounting ratios and other analytical tools.
Level of staff required	It is carried out by junior level employees called book-keepers	It is carried out by senior level employees called accountants.
Depiction of Financial position	Financial position and performance cannot be determined on the basis of journal entries.	It provides the complete and summarised blue print of the financial position and performance of an entity.

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1.7 COMPONENTS OF ACCOUNTING INFORMATION/ STATEMENTS

Accounting information comprises of following components:

1. **Statement financial performance:** The statement of profit or loss (in case of companies)/ profit or loss account/ income statement (in case of non-corporates)

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shows the net profit earned or loss incurred from business operations during a particular accounting period which is usually a financial year.

2. **Information relating to financial position:** Balance Sheet is a statement which shows the application of funds in the form of assets and sources of funds in the form of capital and external liabilities.

3. **Schedules and Notes to Accounts:** which forms the part of balance sheet and statement of profit and loss to give detailed information of various line items shown in balance sheet and income statement and significant accounting policies relating to recognition, valuation, classification and disclosures, which are used in the preparation and presentation of financial statements.

4. **Cash Flow Statement:** It shows the inflows and outflows of cash and cash equivalents from three activities operating, investing and financing.

1.8 BRANCHES OF ACCOUNTING

Accounting can be classified into following sub fields:

1. **Financial Accounting:-** It is that subfield/branch of accounting which is aimed at generating General Purpose Financial Statements covering identification and recording of business transactions and events of financial nature (which can be expressed in monetary terms) in a systematic and significant manner as per generally accepted accounting principles, to ascertain the financial performance/results (profit earned or loss incurred) during the accounting period and to depict the financial position or health of the entity in the form of assets and liabilities.

2. **Cost Accounting: -** It is concerned with ascertainment or calculation of total cost or per unit cost of object which can be goods produced or services rendered, job work performed or project undertaken.

3. **Management Accounting: -** It involves obtaining financial information to help the management in planning, organising and controlling the operations by setting benchmarks and also facilitates in taking sound business decisions.

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IN-TEXT QUESTIONS

1. Select the correct answer for the following multiple choice questions:
   (a) Accounting includes:
   (i) Identifying the transactions and events;
   (ii) Recording the transactions and events;
   (iii) Classifying and summarizing the transactions and events;
   (iv) All of the above
   (v) None of the above
2. Please indicate if the following statement is true or false.
   (a) Accounting and Book Keeping are same and there is no difference between the two.
   (b) There is no scope for window dressing in Accounting.
   (c) Accounting is subject to personal bias and judgements.
3. Financial Accounting recognises only transactions and events which can be expressed in terms of……...
4. As per ……..concept fixed assets in balance sheet are shown at their purchase cost less depreciation and not at their current market value prevailing in the relevant market if they are sold as such.
5. …….shows the inflows and outflows of cash and cash equivalents from three activities operating, investing and financing

1.9 INTERESTED USERS OF ACCOUNTING INFORMATION AND THEIR NEEDS

There are various categories of stakeholder or users of financial information which are interested in determining the financial position and financial performance of the business.

Users	Category of User	Information need of the user
Internal	**Owners/Proprietor/ Shareholders**	Return on investment, Net profit, financial position of the company/business, growth rate.
	Management	Rate of return from different segments, products and investments.

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	Employees	Profitability of the employer to bargain wages rates and bonus, dues (PF, ESI, etc.) are being deposited regularly.
External	**Potential investors**	Business and financial risk, EPS, future prospects of the business.
	Creditors/Suppliers	Short term liquidity: creditors are interested in knowing financial capability and ability of the business to pay its debts on time.
	Lenders	Repaying capacity, credit worthiness, short term liquidity and long term solvency.
	Tax Authorities	Assessment of income and expenses, tax dues, true and fair disclosure of accounting information.
	Others	Customers, researchers seek different in-formation for different own customised interests and reasons.

1.10 QUALITATIVE ASPECTS OF ACCOUNTING INFORMATION

Usefulness of accounting information for different interested users is determined on the basis of the following attributes of accounting:

1. **Reliability:** Financial information must represent the actual facts and can be verified through source documents (vouchers).
2. **Relevance:** Financial information must be readily available on the time when it is required for decision making and must play an important role in the economic decisions of users of information by helping them to form nearly correct prediction about the future Income and financial position.
3. **Understandability:** Information should be presented in such a manner such that the users can understand and interpret it with much ease and in a concise manner.
4. **Comparability:** Information should be presented and disclosed so that it can compared with entity's past year's figures (intra firm comparison) and other business's in the same industry (Inter firm comparison).

1.11 SOME IMPORTANT ACCOUNTING TERMS

Business Transaction: It refers to a business activity which involves exchange of money or money's worth between parties (buyer and seller). It can be measured in terms of money and

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changes the financial position of an entity e.g. purchase of goods would involve inflow of material and goods (asset) and outflow of cash (asset) or creating an obligation to pay (liability) towards the supplier at a future date. Transaction can be:

1. **Cash transaction:** When the parties (buyer and seller) settle the transaction immediately by making payment in cash or by bank.
2. **Credit transaction:** when the payment is to be settled at a future date as per agreement or mutual consent between the parties.

Account: refers to a summarized record of all relevant transactions relating to a particular item at one place. It has two sides debit side and credit side. The left side of the account is known as debit side and the right side is known as credit side.

Capital: It is amount of resources invested by the owners into the business organisation either in the form of cash or cash equivalents or in kind or assets. The amount can be invested in the form of cash, goods, or any other asset. For Business Entity, capital is a liability towards the owners which is to be settled only in the event of closure or transfer of the business. In case of corporates it is called as share capital.

Drawings: It represents an amount of cash, goods or any other assets which the owner withdraws from business for personal use. E.g. if the life insurance premium of proprietor is paid from the business bank account, goods withdrawn for personal use. It will result in reduction in the owners' capital.

Asset: Asset is a resource controlled by the business entity from which probable future economic assets will flow to the entity by using it for generating future profits. Assets can be tangible and intangible.

Tangible Assets: are the assets which have some physical existence. They can be seen, touched and felt such as:

- Plant and Machinery
- Furniture and Fittings
- Land and Building
- Books and periodicals
- Computers and laptops
- Vehicles

Intangible assets: Assets which have no physical existence (cannot be seen or felt although they help to generate revenue in future) and whose value is determined and restricted by the rights and expected future benefits that their possession confers upon the owner such as

- Goodwill

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- Patents
- Trade-marks
- Copyrights
- Brand equity
- Industrial designs
- Other intellectual property rights, etc.

Assets can also be classified into Current Assets and Non-Current Assets.

Current Assets – Asset which satisfies any of the following:

a. It is expected to be realised in, or is intended for sale or consumption in the company's normal operating cycle,

b. It is held primarily for the purpose of being traded ,

c. It is due to be realised within 12 months after the reporting date, or

d. It is cash or cash Equivalent unless it is restricted from being exchanged or used to settle a liability for at least 12 months after the reporting date.

Current Asset includes:

- Inventory
- Trade receivables (sundry debtors and bill receivables)
- Prepaid expenses
- Current investments
- Cash and cash equivalents
- Short term loans and advances

Non-Current Assets – All other assets which are not classified as current assets are non-current assets such as:

- Plant and Machinery
- Furniture and Fittings
- Land and Building
- Patent
- Trade-mark
- Copyright

Liability: It is the present obligation to be settled through outflow of economic resources. In other words it is the amount of money that the business owes to the other parties. E.g. when goods are purchased on credit, the entity will have an obligation to pay to the supplier the price of goods on an agreed future date or when a loan is taken from bank, there is an obligation to pay interest and principal amount at a future specified date.

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On the basis of the period of holding, liabilities or obligations can be further classified into long term (non-current liabilities) and short term (current liabilities).

Current liabilities – A liability which satisfies any of the following:

a. It is expected to be settled in the normal operating cycle,
b. It is held primarily for the purpose of being traded,
c. It is due to be settled within 12 months after the reporting date, or
d. The entity does not have an unconditional right to defer settlement of the liability for at least 12 months after the reporting date

Note: Terms of a liability that could, at the option of the counterparty, result in its settlement by the issue of equity instruments do not affect its classification.

Non-Current Liabilities – All other liabilities not classified as current liabilities shall be classified as Non-current liabilities such as:

- Debentures
- Public deposits
- Long term bank loan
- Inter corporate loans
- Long term loan from director

Internal Liability: It refers to owner's equity, i.e. all the amounts which proprietors are entitled such as:

- Capital
- General reserve
- Debenture redemption reserve
- Undistributed profits, etc.

Working capital: The assets which are held to maintain the flows of revenue from operation in the form of current assets such as:

- Cash required to pay for expenses or to the creditors
- Inventories required to smoothen production and sale
- Accounts receivables (debtors and bills receivable) to increase the sales.
- Cash at bank
- Prepaid expenses

The total of current assets constitute the working capital of a firm which is termed as Gross working capital.

Gross working capital = Total current assets = long term internal liabilities + long term

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debts + the current liabilities – Non-current assets.

Net working capital is the excess of current assets over current liabilities. It is the amount of current assets that remain in a firm if all its current liabilities are paid. This aspect of working capital is a more realistic concept.

Working capital (net) = Current assets – Currents liabilities.

Receipts: It is the gross inflow of cash and cash equivalents to the entity. It can be further classified into:

1. **Revenue receipts**: these are the receipts which are occurred or received in the normal course of operations of business like amount received through sale of goods and services in the ordinary course of business.
2. **Capital receipts**: these are the receipts which are received from other than principle business operations like proceeds from long term investments or sale of fixed assets.

Expenses: refers to costs incurred (the part of the expenditure whose benefit is already expired during the accounting period) by a business for earning revenue such as:

- Rent
- Wages
- Salaries
- Interest
- Depreciation
- Carriage

Expenditure: It is the amount of outflow of monetary resources or money or incurring a liability for acquiring any asset, goods or services. The expenditure can be further classified into 3 categories:

1. **Revenue Expenditure**: If the benefit of expenditure incurred is utilised within the accounting period in which they are incurred. For example: electricity, insurance, rent, carriage, interest, salary, etc.
2. **Capital Expenditure**: If benefit of expenditure is received or lasts for more than one accounting period, for example: construction of building, purchase of machinery, furniture, etc.
3. **Deferred Revenue Expenditure**: There are the expenditures which are revenue in nature but their benefit is utilised over a number of years. For example: huge Advertisement Expenditure, preliminary expenses, etc.

Profit: It the amount by which revenues exceeds their related expenses during an accounting period is called profit. Profit = Revenue - Expenses

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Gain: It is a profit of non-recurring nature arising from events or transactions which are incidental to business but are not part of principle revenue generating activities of a business enterprise such as sale of fixed assets at a value more than written down value, appreciation in the value of an investment or asset, etc.

Loss: The excess of expenses incurred during an accounting period over its related revenues. Loss = Expenses – Revenue.

Goods: The tangible items in which the business mainly deal in the ordinary course of business. These are the items which are purchased for resale or for use as raw material in further production and are not held or intended for use in the business for administration purposes.

Purchases: procurement of goods by a business for the purpose of resale or for using them as raw material in further production. For a trader of goods, it refers to purchase of stock is trade and in case of manufacturing businesses it is purchase of raw materials and consumable supplies. Purchases may further be classified into cash purchases and credit purchases.

Purchase Return: When goods which are purchased are returned back to the suppliers because they are not as per specifications mentioned in the purchase order, are defective or due to any other reason.

Sales: It is the amount of total revenues earned from customers through sale of goods or rendering of services in the normal course of business. Sales may further be cash sales or credit sales.

Sales Return: When customer return the goods to the business entity due to any reason which can be defect in the goods, inappropriate quality, lack of attributes as specified by the customer.

Debtors: refers to the entities to whom the entity has sold goods or render services on credit and the amount is not completely paid and still to be received by the business entity. These are considered assets of the business, usually current assets.

Creditors/ Sundry Creditors: If the business buys goods/services from the suppliers on credit i.e. the amount is not paid to the suppliers at the time of purchase and payment is deferred to a mutually agreed specified date in future. These are treated as financial obligations/liabilities for the entity (trade payables under current liabilities) which is to be paid usually within the normal operating cycle period.

Bill Receivable: It is a bill of exchange where by debtors (to whom goods are sold on credit) of the business undertakes to pay a certain amount mentioned therein a specified date. These are considered assets of the business, usually current assets.

Bill Payable: It is a bill of exchange where by the business undertakes to pay a certain amount mentioned therein a specified date to suppliers from whom goods are purchased on credit. These are considered liabilities for the business usually current liabilities.

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Discount: It is the amount of rebate given by the seller of goods or services to the purchaser. It can be further classified into:

1. **Trade Discount**: This discount is given to persuade or encourage the buyer to buy more quantity of goods. It is given in the form of agreed percentage of list price at the time of sale of goods. This discount is not recognised in the books of accounts as it is deducted in the invoice/cash memo and taxes like GST are imposed on after trade discount amount.
2. **Cash Discount**: This discount is given to encourage the debtors to pay their dues before the expiry of agreed credit period. This discount is recognised in the books of account as finance cost and charged to statement of profit and loss. It is given as percentage of the dues.

Account: It refers to a summarised record of all the transaction relating to particular head or accounting item at one place.

Income: Income is a very wider term profit as it includes not only profit but also the gains which are non-recurring in nature. Income refers to the increase in the net wealth of a business enterprise over an accounting period.

Stock: It is the amount of total goods (raw material, work in progress, and finished goods) available for sale on a particular date.

Cost: It refers to amount of expenditures incurred (the expired portion of benefits) in manufacturing and processing goods to produce finished goods for sale in the ordinary course of business.

Voucher: It is documentary evidence of a transaction. For example, if goods are purchased for cash, the supplier provide a cash memo, if goods are purchased on credit, the supplier issues an invoice, when the payment is made to creditors, receipt of payment is issued by the creditors.

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1.12 ACCOUNTING PRINCIPLES, CONCEPTS AND CONVENTIONS

The first and foremost objective of accounting is to provide general purpose financial information which is easily understandable, appropriate, relevant and reliable information about the financial results and position of the business to various users or stakeholders so that they can make sound and judicious financial and economic decisions. For this accounting records are to be maintained on the basis of uniform standards, rules and principles.

Generally Accepted Accounting Principles (GAAP): It is the collection of all the accounting principles, policies, concepts and conventions. GAAP provides the very base of Accounting.

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GAAP refers to the rules, principles or guidelines with respect to recognition, valuation, classification, disclosures which are used for recording, classifying, summarising and reporting of business and financial transactions and events so as to bring standardisation, consistency and comparability in the preparation and the presentation of financial statements.

These principles are evolved and developed over a long period of time based on the accounting experiences of the accountants, business-customs and practices, legal decisions, economic environment, etc. These are generally accepted and followed by the accounting practitioners and professionals working over a large geographical area in preparation and presentation of financial statements.

1.13 FUNDAMENTAL ACCOUNTING ASSUMPTIONS

Following are the assumptions used by default in preparation and presentation of financial statements, if these are followed and valid then entity is not required to give any disclosure, disclosure is to be given only if any of the below assumption is invalid:

1. Going Concern Assumption: It is assumed that a business enterprise has an indefinite life or existence. Thus business will continue for long foreseeable period of time and there is neither any intention to liquidate nor to scale down its operations or any of the undertakings significantly.

Implication and Relevance:

1. Distinction between capital expenditure and revenue expenditure can be made.
2. Classification of both assets and liabilities into current and non-current based on this assumption and definition of operating cycle.
3. Depreciation is charged on Property Plant and Equipment/fixed assets as on their acquisition they are capitalised in the balance sheet at book value (after deducting depreciation), irrespective of their current market value prevailing in the market.

2. Consistency Assumption: As per this assumption, accounting practices once selected and applied should be followed and applied consistently year after year. If the accounting policies are followed consistently then it will ensure meaningful analysis and comparison of the financial position as well as performance of the same business for a number of years known as intra-firm and inter-period comparison. It does not mean that practices and policies, once adopted, cannot be changed in the future. When a change is required and desirable as per the requirements of the changing circumstances, it can be changed but proper disclosures as per the applicable accounting standards are given in the financial statements along with its effect in statement of income (profit or loss) and Balance Sheet (change in the value of asset or liability). Any accounting policy may be changed if required by the change in governing law, reporting framework requirements or accounting standard applicable so as to make the

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financial information more relevant and transparent or to give better true and fair view of financial position and performance.

Implication and Relevance: Helps the management and other stakeholders of financial information in decision-making by comparing the current year' financial information with the information of previous years.

3. Accrual Assumption: All revenues and related expenses are recorded/recognized as and when they are earned or incurred irrespective of whether the cash and cash equivalents are received or payment is made at the time of transaction or on a future date for example, if good are sold on credit (with credit given for two months) for Rs. 2,00,000 on 15th march. 2023 and all the risks and rewards incidental to ownership are transferred to the buyer, then the Sale is to be recorded on 15th march. 2023 and not on the date when cash is received after two months from the debtors.

In case of revenue expenses such as salary or rent, if at the end of the accounting period (31st march), salary for four months is due to the employees but not paid, such unpaid salary will be recorded in the current year as outstanding salary and the salary expense account will be debited and transferred to profit and loss statement for the year in which the salary is due, it is not charged to profit and loss statement in the next year when it will be paid to the employees.

Implication and Relevance: Earning of revenue and consumption of a resource (expenses) can be accurately matched with each other relating to a particular accounting period providing the accurate measurement of financial performance.

1.14 ACCOUNTING PRINCIPLES AND CONCEPTS

1. **Business Entity/Separate Legal Entity:** A business entity has a separate existence from its owners and management. According to this principle, business is treated as a separate legal entity, distinct from its owners and managers. Thus, transactions are recorded and analysed, and the accounting records and financial statements are prepared and presented from the view point of business and not the owner or proprietor. The Proprietor/businessman is treated as an inside creditor (Internal liability) for his investment made in the business equal to the amount of capital in the form of cash or other assets invested by him in the business. Interest on capital is treated as an expense. If the private expenses of the owners are paid out of business's money, then it is treated as drawings leading to reductions in capital of the owners.

2. **Money Measurement:** As per this concept, only those transactions and events that can be measured or expressed in monetary terms are recorded and accounted for in the books of accounts of the business enterprise. Non-monetary events like hiring of a loyal and intelligent employee, death of an efficient employee, strikes by workers, disputes with customers etc., are not recognised and recorded because they cannot be

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quantified in terms of money, even though they affect the operations of the business significantly.

Limitations of Money Measurement Concept:

1. It does not considers the qualitative aspect such as efficient and loyal human employees (assets), loyal and satisfied customers (assets) and dishonest and inefficient employees and workers (liabilities), strong and healthy relationships with the suppliers.
2. Since the value of money (currency) is fluctuating on account of inflation. To keep accounting records simple and understandable, transactions and events are recorded using a fixed measurement unit therefore carrying value does not matches with the changes in value of money over a period of time.

3. **Accounting Period Concept:** Even though we assume the business as Going Concern, but the users of financial information are interested in knowing the financial results at regular intervals, therefore as per this concept, the life of any business organisation is split into smaller periods (accounting period) so that its performance can be evaluated and financial position can be determined at regular intervals of time.

   Accounting period refers to the interval of time, at the end of which financial statements comprising profit and loss account/or statement of profit and loss and the balance sheet with notes to accounts are prepared, so that the financial performance can be measured and financial position can be determined at regular intervals and decisions such as shutdown, continue, expansion can be taken to control the affairs on timely basis.

   Accounting period is generally a period of one year starting from 1st April and end on 31st march of next year.

   Relevance of the concept:

   1. Facilitates the classification of expenses into capital expenses and revenue expenses.
   2. Part of capital expenditure which is consumed during the current accounting period is charged to the Statement of profit and loss and the remaining unconsumed portion is recognised as an asset in the Balance Sheet.
   3. Compliance with taxation laws: According to the income tax provisions, income tax is computed on annual basis.
   4. Prompt corrective action can be taken by the management to improve the results and financials.

4. **Full Disclosure:** As per this concept, besides applicable legal provisions, all material facts and information related to the economic activities of the entity should be

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properly disclosed in the financial statements and the accompanying notes to accounts as per applicable financial reporting framework.

The financial statements should act as a means of communicating and not escaping the material and relevant information. The objective of disclosure is to create better understanding and the users may be able to take sound financial decisions. For example following disclosures can be provided in the footnotes such as:

1. Disclosure of Contingent liabilities such as pending claims and litigations of a very big amount against the business, Arrears of dividend on cumulative preference shares, etc.
2. Change in the method of providing depreciation on fixed assets (Property Plant and Equipment).
3. Market value of investment in securities and changes thereof.

5. **Materiality Principle:** Materiality is not defined in exact monetary limits but any item which influences the economic decisions of the users is considered as material. Disclosure of all material transactions and information is necessary but it does not mean that even figures of big amount which are irrelevant are to be mandatorily disclosed in the financial statements. Therefore, items having insignificant effect or which are irrelevant to users is not required to be disclosed separately, it may be merged with other items. Materiality is a subjective item as an item may be material for one enterprise may not be material for another enterprise, e.g., an item of expense of Rs. 50,000 may be immaterial for an organisation having a turnover of Rs. 10,000 crores but it may be material for an enterprise having a turnover of just Rs. 10,00,000.
6. **Prudence/ Conservatism Principle:** As per this principle, prospective or anticipated future profit should not be recognised or recorded but all prospective future losses should immediately be recorded by making a provision for them. The aim of this principle is to protect overstatement of the profit and depiction of a realistic financial picture of the organisation. Where different alternative methods or policies of accounting on a particular subject matter or transaction are available, then the alternative having the least favourable effect on profit should be adopted in formulating and selection of accounting policies, for example:
   1. Stock should be valued at lower of cost or net realizable value (as per AS-2).
   2. Provision should be made for future liabilities or expenses such as provision for doubtful debts and provision for taxation.
7. **Cost Principle:** The major concern is that at what value fixed assets should be recorded. As per this principle, fixed assets are recorded in the books of accounts at its original cost consisting of the cost of acquisition (purchase cost) and all the expenditure incurred for making the assets ready to use and bringing the asset to

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present location and condition (freight, carriage, installation, commission on the purchase of fixed assets).

For Example: A Machinery is purchased for Rs. 4,50,000 and Rs. 60,000 was spent on the installation of machine and Rs 50,000 is paid as purchase commission, then machine is recorded at Rs. 5,60,000 in the books of accounts and depreciation will be charged on this amount. If the market value of the machine in the relevant market increases to Rs. 6,00,000 due to price fluctuation, then the increased value due to market fluctuation will not be accounted for in the books of account. This cost of Rs. 5,60,000 is systematically reduced year after year by charging depreciation in the income statement and the assets are shown in the balance sheet at carrying value/book value (cost – accumulated depreciation).

8. **Matching Principle:** Accounting information is relevant if it provides true and accurate picture of financial performance, therefore as per this Matching concept, all expenses incurred by an enterprise during an accounting period are matched with the related incomes or revenues recognized during the same accounting period. It facilitates the accurate calculation of profit earned or loss incurred in a particular accounting period.

The following accounting treatment are done due to matching principle:

1. Calculation of Prepaid Expenses and recording them as assets.
2. Determination of Income received in advance from the customers as liabilities.
3. Determination of closing stock at the end of accounting period to reduce it from the cost of goods sold.
4. Depreciation charged on fixed assets (Property, Plant and Equipment) in a systematic manner as per their use in the business in earning revenue.

9. **Dual Aspect Principle:** Every business transaction has two aspects - a debit and a credit of equal amount. In other words, for every debit in an account there is a credit of equal amount in one or more accounts and vice-versa. This system of accounting is also known as "Double Entry System". This concept ensures that the two sides of the Balance Sheet i.e. Assets (application of funds) side and Equity and Liability 9sources of funds) side always match and thereby following accounting equation will always holds true at any point of time.

Accounting Equation is expressed as follows:

Assets = Liabilities + Capital

For Example: Sohan started business with cash Rs. 5,00,000. This transaction increases cash in assets side and capital in liabilities- side by Rs. 5,00,000.

Assets (Cash) Rs. 5,00,000 = Liabilities Rs. 0 + Capital Rs. 5,00,000

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1.15 BASIS OF ACCOUNTING

There are two basis of recording transactions and ascertaining profit or loss during the accounting period:

1. Cash Basis and
2. Accrual Basis

Cash Basis of Accounting: as per this basis transactions are recorded in the books of accounts by passing journal entries only on the receipt/ payment of cash and cash equivalents.

The Profit is calculated as the excess of actual cash receipts from sale of goods, services, other non-operating incomes over actual cash payments or outflow of cash and cash equivalents for purchase of goods, wages, expenses such rent, electricity, salaries, interest etc. transactions like credit sale and credit purchases are not accounted for in the books of accounts.

No transaction is recorded when a payment or receipt is merely due i.e., outstanding expenses, accrued incomes are not recognised.

This method is in contravention to the matching principle.

Accrual Basis of Accounting: As per this accrual basis Revenue and expenses are recorded as and when they are incurred or earned. Income is recorded as Income when it is accrued (when transaction takes place, risk and reward incidental to ownership are transferred and obligation are performed) irrespective of whether corresponding cash and cash equivalents are received or not. Similarly, expenses are recorded when they are incurred or become due (when the benefit of the resource or facility is expired) and not when the cash is paid for them.

Items such as outstanding expenses, prepaid expenses, accrued income and income received in advance are identified and taken into account as assets and liabilities.

As per Companies Act 2013, all companies are required to maintain their accounts on accrual basis of accounting.

Basis	Accrual Basis of Accounting	Cash Basis of Accounting
Nature of Transactions	Both cash and credit transactions are recorded.	Only cash transactions are recorded.

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Assessment of Profit or Loss	Profit or Loss is ascertained correctly due to complete record of transactions.	Correct profit/loss is not ascertained because it records only cash transactions.
Capital vs. Revenue items	Makes a distinction between capital and revenue items.	Does not make a distinction between capital and revenue items.
Legal recognition	This basis is recognized under the companies Act.	This basis is not recognized under the companies Act.

1.16 ACCOUNTING STANDARDS

The accounting principles or GAAP (Generally Accepted Accounting Principles) have been developed in the form of concepts and conventions to bring comparability and uniformity preparation and presentation of financial statements. However they allow alternative accounting treatments for the same items.

Different organizations may adopt different accounting policies depending upon their requirements, industry, scale of operations for the same transaction or an entity may follow different accounting policies for different accounting periods. As a result, the financial statements become inconsistence and incomparable. So it was felt to prescribe minimum standards universally applicable, so that the accounting statements possess qualitative characteristics of reliability, relevance, understandability and comparability.

International Accounting Standard Committee (IASC) was set up in 1973 as a non-profit international organisation to improve the financial reporting throughout the world (now International financial Reporting Committee (IFRC)). The Institute of Chartered Accountants of India (ICAI) and the Institute of Cost and Management Accountants of India are also members of this committee.

ICAI set up the Accounting Standard Board (ASB) in 1977 to identify the areas in which accounting standards are to be developed. ASB prepares and submits a draft accounting standard to the Council of ICAI.

The Council of ICAI issues the draft AS for the comments by the Govt., industry, academicians and professionals etc. After due consideration on the comments received, the Council of ICAI notifies it for its use in the financial statements.

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Accounting standards are written statements, issued by autonomous professional accounting bodies such as FASB, IASB, ICAI, etc. specifying standardised rules and practices for preparing and presenting the financial statements.

1.17 OBJECTIVES OF ACCOUNTING STANDARDS

Accounting Standards are formulated and issued with the following objectives:

1. **To ensure Uniformity/Consistency** in selection and application of accounting practices and policies in preparation and presentation of financial statements by proposing standard accounting treatment.
2. **To improve reliability of financial Information:** Since the standards are of high quality and received large scale acceptance which create a sense of confidence and reliance among the users.
3. **To safeguard assets, prevent frauds and manipulation** by codifying the accounting policies, methods and practices which limits the scope of fraud and manipulation.
4. **To facilitate Auditors**: It helps auditors by providing standardised accounting procedure to audit the books of accounts.

1.18 INTERNATIONAL FINANCIAL REPORTING STANDARDS

IFRS refers to the accounting and financial reporting standards issued by International Accounting Standards Board (IASB), London. These standards are made to improve the financial reporting at the international level to help users throughout the world to gain better understanding of financial statements.

Financial Statements under IFRS framework: Following financial statements are prepared and presented under IFRS framework:

1. **Statement of financial position:** Balance sheet which includes the following components:
    a. Assets
    b. Liability
    c. Equity (Shareholder's fund)
2. **Comprehensive Income statement including other comprehensive income**: which includes the following components:
    a. Revenue
    b. Expense

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3. **Statement of changes in Equity** showing transactions with the shareholders and change in their claim over the entity.
4. **Statement of Cash flow** showing inflow and outflow of cash and cash equivalents from operating, investing and financing activities
5. **Notes to accounts and significant accounting policies** showing details of the line items in the Balance sheet and statement of comprehensive income.

Significant differences between IFRS (International Financial Reporting Standards issued by IASB) and AS (Accounting Standards issued by ICAI)

1. IFRS are principle based, they consider the substance over legal form in the transaction while AS are rule based, they require inflexible accounting procedures to be followed based on legal form.
2. IFRS are based on Fair Value in that they require valuations should be based on fair value measures which ensure true realistic valuations while AS are based on Historical Cost in that they require Assets should be recognised initially at their historical cost.

1.19 SUMMARY

Accounting is a logical and systematic process of identifying, collecting, recording, classifying, summarising, interpretation and communicating financial information to the interested users.

Objectives of Accounting:

a) Keeping structured, systematic, accurate and complete records of business transactions and events.
b) ascertain the profit earned or loss incurred
c) ascertain the financial position
d) provide useful accounting information to users
e) provide financial information to the management
f) safeguard assets and detect and prevent frauds

Limitations of Accounting:

a) Historical in nature
b) Ignores Qualitative Aspects
c) Scope for Window Dressing
d) Subject to personal bias and judgment

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e) Based on concepts and conventions

Subfields/Branches of Accounting

1. Financial Accounting
2. Cost Accounting
3. Management Accounting

Interested users of Accountings information:

Internal	Owners
	Management
	Employees
External	Potential investors
	Creditors/Suppliers
	Lenders
	Tax Authorities
	Others

Qualitative Characteristics of Accounting Information:

a) Reliability
b) Relevance
c) Understandability
d) Comparability

Accounting Principles, Concepts and Conventions

GAAP refers to the rules, principles or guidelines with respect to recognition, valuation, classification, disclosures which are used for recording, classifying, summarising and reporting of business and financial transactions and events so as to bring standardisation, consistency and comparability in the preparation and the presentation of financial statements.

Fundamental Accounting Assumptions:

Going Concern Assumption: It is assumed that business will continue for long foreseeable period of time and there is neither any intention to liquidate nor to scale down its operations or any of the undertakings significantly.

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Consistency Assumption: Accounting practices once selected and applied should be followed and applied consistently year after year.

Accrual Assumption: All revenues and related expenses are recorded/recognized as and when they are earned or incurred irrespective of whether the cash and cash equivalents are received or payment is made at the time of transaction or on a future date.

Accounting Concepts:

Business Entity/Separate Legal Entity: A business entity is treated as a separate legal entity, distinct from its owners and managers.

Money Measurement: Only those transactions and events that can be measured or expressed in monetary terms are recorded and accounted for in the books of accounts of the business enterprise.

Accounting Period Concept: The life of any business organisation is split into smaller periods (accounting period) so that its performance can be evaluated and financial position can be determined at regular intervals of time.

Full Disclosure: All material facts and information related to the economic activities of the entity should be properly disclosed in the financial statements and the accompanying notes to accounts**.**

Materiality Principle: Disclosure of all material transactions and information is necessary but it does not mean that even figures of big amount which are irrelevant are to be mandatorily disclosed in the financial statements.

Prudence/ Conservatism Principle: Prospective or anticipated future profit should not be recognised or recorded but all prospective future losses should immediately be recorded by making a provision for them.

Cost Principle: Fixed assets are recorded in the books of accounts at its original cost consisting of the cost of acquisition (purchase cost) and all the expenditure incurred for making the assets ready to use and bringing the asset to present location and condition.

Matching Principle: All expenses incurred by an enterprise during an accounting period are matched with the related incomes or revenues recognized during the same accounting period.

Dual Aspect Principle: Every business transaction has two aspects - a debit and a credit of equal amount. For every debit in an account there is a credit of equal amount in one or more accounts and vice-versa.

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1.20 GLOSSARY

Accounting: Process of identification, recording, classifying, summarising, interpreting and communicating financial information.

Account: refers to a summarized record of all relevant transactions relating to a particular item at one place.

Accounting Standard: written policy documents issued by professional accounting body for preparation and presentation of financial statements.

Asset: Asset is a resource controlled by the business entity from which probable future economic assets will flow to the entity by using it for generating future profits.

Business Transaction: It refers to a business activity which involves exchange of money or money's worth between parties.

Expenses: amount of expenditure incurred (the benefit of which has already been expired) by a business for earning revenue.

Profit: The excess of operating sales/revenues over its related revenue expenses during an accounting year.

Liability: It is the present obligation to be settled through outflow of economic resources.

Working capital is the excess of current assets over current liabilities

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IN-TEXT QUESTIONS

1. Select the correct answer for the following multiple choice questions: Accounting includes:
   (i) Identifying the transactions and events;
   (ii) Recording the transactions and events;
   (iii) Classifying and summarizing the transactions and events;
   (iv) All of the above
   (v) None of the above
2. Please indicate whether each of the following statements is true or false.
   a) Book Keeping and Accounting are one and the same thing.
   b) There is no scope for Window Dressing in Accounting.
   c) Accounting is subject to Personal bias and Judgements.
3. Financial Accounting recognises only transactions and events which can be expressed in terms of……...
4. As per ……..Concept Fixed assets in balance sheet are shown at their purchase cost less depreciation instead at current market value in the relevant which could be realised on their immediate sale.
5. …….shows the inflows and outflows of cash and cash equivalents from three activities operating, investing and financing

1.21 ANSWERS TO IN-TEXT QUESTIONS

1. All of the above
2. a) False
   b) False
   c) True
3. Money
4. Historical Cost Concept
5. Cash Flow Statement

1.22 SELF-ASSESSMENT QUESTIONS

1. Define the Concept of Accounting
2. What is the difference between Accounting and Book Keeping?

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3. What are the Objectives of Accounting and explain its significance.
4. Discuss the interested users of Accounting Information with their customised areas of interest?
5. What are the drawbacks of Accounting?
6. Discuss the different Branches of Accounting.
7. What essential characteristics Accounting Information must possess?
8. Write a short note on :
   a) Money Measurement Principle
   b) Accounting Period Principle
   c) Dual Aspect Principle
   d) Going Concern
   e) Historical Cost

1.23 SUGGESTED READINGS

Latest editions of the following text books to be used:

1. Narayanaswamy R. Financial Accounting: A Managerial Perspective. PHI Learning Pvt. Ltd., Delhi
2. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.
3. Garg CA Kamal, and Sehrawat Neeraj Kumar. Beginner`s Guide to Ind AS & IFRS. Bharat Law House Pvt. Ltd., New Delhi
4. Maheshwari S. N., Maheshwari Sunil K., and Maheshwari Sharad K, An Introduction to Accountancy, Vikas Publishing House Pvt. Ltd.

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LESSON 2

PREPARATION OF FINANCIAL STATEMENTS, CORPORATE BALANCE SHEET

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STRUCTURE

2.1 Learning Objectives
2.2 Introduction
  2.2.1. Maintenance of Book of Accounts
2.3 Meaning and Components of Financial Statements
  2.3.1 Provisions Applicable
2.4 Users of Financial Information
2.5 Preparation of Financial Statement
2.6 Statement of Profit and Loss Account
2.7 Balance Sheet
  2.7.1. Items necessarily required to be included the following items in Balance Sheet
  2.7.2. Current and Non-Current Assets and Liabilities distinction in Balance Sheet
  2.7.3. Detailed disclosure of Share Capital
2.8 Cash Flow Statements
  2.8.1 Classification of Cash Flow activities
  2.8.2. Calculation of Cash Flow Statements

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2.9 Summary
2.10 Answers to In-Text Questions
2.11 Abbreviations
2.12 Self-Assessment Questions
2.13 References
2.14 Suggested Readings

2.1 LEARNING OBJECTIVES

The objective of this lesson is to explain students with the mechanics and ways of preparing financial statements of a company. This lesson will familiarize students with the basic terminologies, methods, Accounting Standards, Indian Accounting Standards. After preparation of financial statement this lesson will help the students to analyse it under different conditions.

2.2 INTRODUCTION

A financial statement is collection of all the financial information of a Business. It provides information about financial position and performance of an organization. While analyzing and interpreting the financial statement of a company one can make important decisions and draw conclusion about financial health of an organization. Assets, liabilities and equity are the key components associated with the measurement of financial position. However, to assess the financial performance of the business Revenue and Expenses are taken as essential element.

2.2.1 Maintenance of Book of Account: Under section 128 of Companies Act 2013, every single company should prepare and place all financial statements and other relevant books/ papers of the company for financial year at its registered office and its branches (if any) on accrual basis and double entry system of accounting. These financial statements should present a true and fair picture of the financial position and financial performance of the company during the accounting period.

2.3 MEANING AND COMPONENTS OF FINANCIAL STATEMENTS

As per Section 129 of Companies Act 2013, the Directors of the Company should lay financial statements at the annual general meeting of the company. The financial statement under **Section 2(40)** of Indian Companies Act 2013 includes the followings:

i) Balance Sheet reports the financial position of a business at a certain point in time.

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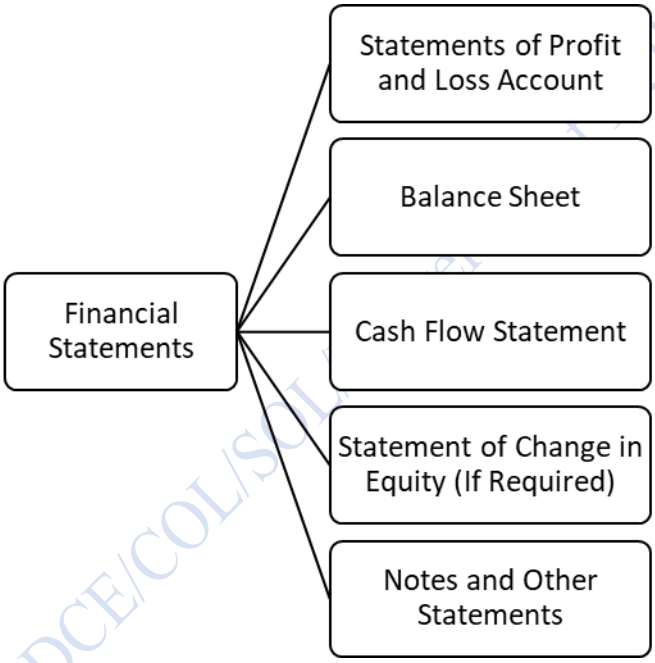
ii) Profit &Loss Account/ Income Expenditure Account shows the financial performance throughout the time frame.

iii) Cash Flow Statement encapsulates the total cash inflow and outflow for the period from operating, investing and financing activities.

iv) Statement of Changes in Equity summarizes how equity in the organization (if applicable).

Along with the statements mentioned above it is necessary to give explanatory notes in annexure for better understanding. There is an exception for mandatory requirement for making Cash flow Statement of One Person, Dormant and Small Companies.



2.3.1 Provisions Applicable: While preparing final account of the company the following point should be kept in mind:

a) As per Schedule III of Companies Act 2013 all necessary requirements,

b) Other statutory requirements

c) Accounting Standards by MCA from AS -1 to AS -29.

d) Statement and Guidance Notes issued by ICAI for understanding the rules related to accounting treatments, valuation, disclosure for the following companies:

1. If any specific act is applicable e.g. for an insurance company, banking company, company working in generation of electricity or any other company prescribed under

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Act for which a Form of Balance Sheet and Profit and Loss Account has been prescribed.

2. All other companies.

As per Section 2(41) of Companies Act 2012 the financial year for making financial statement should end on 31st March.

ACTIVITY 1

Go to the official website of the following companies and download the statement of profit& loss and balance sheet of the companies and check the format of each document downloaded.

i. Bharat Heavy Electricals Limited,
ii. Reliance ltd.,
iii. Infosys ltd. and
iv. HDFC Bank ltd.

2.4 USERS OF FINANCIAL STATEMENTS

The financial Statements provides financial position, performance and cash flows of the organization which is helpful for various stake holders such as: investors, employees, lenders, suppliers, creditors, customers, government and general public. The stake holders mentioned above uses these summarized as per their requirement.

There are various categories of stakeholder or users of financial information which are interested in determining the financial position and financial performance of the business.

Users	Category of User	Information need of the user
Internal	**Owners/Proprietor/ Shareholders**	Return on investment, Net profit, financial position of the company/business, growth rate.
	Management	Rate of return from different segments, products and investments.
	Employees	Profitability of the employer to bargain wages rates and bonus, dues (PF, ESI, etc.) are being deposited regularly.

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External	**Potential investors**	Business and financial risk, EPS, future prospects of the business.
	Creditors/Suppliers	Short term liquidity: creditors are interested in knowing financial capability and ability of the business to pay its debts on time.
	Lenders	Repaying capacity, credit worthiness, short term liquidity and long term solvency.
	Tax Authorities	Assessment of income and expenses, tax dues, true and fair disclosure of accounting information.
	Others	Customers, researchers seek different in-formation for different own customised interests and reasons.

2.5 PRESENTATION OF FINANCIAL STATEMENTS

MCA has laid down the roadmap for all companies (except banking companies, non-banking finance companies, and insurance companies) for option of Ind-AS on February 2015. Under presentation of financial statement Companies Act (Revised) 2016, IFRS conversed with Indian Accounting Ind-AS from financial year 2016-17 is mandatory where the Finance Ministry has taken various steps to simplify the implementation of Ind -AS. Ind -AS-1 provides appropriate guidelines related to presentation of Financial Statements. The basic purpose is to ensure the compatibility of the business entity with its previous year's performance and with other business entities.

Structure of the Ind AS Schedule III

A. General Instructions for preparation of Company's Financial Statements

B. Part I- Preparation of Balance Sheet and Statement Change in Equity (if any)

C. Part I Notes-Notes and general instruction related to point no B

D. Part II-Form of Statement of Profit and Loss account

E. Part II Notes- General Instructions for Point no D.

F. Part III-General Instruction for Preparation of Consolidated Financial Statements

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IN-TEXT QUESTIONS

1. Under section 128 of Companies Act 2013 the financial statements of the company should kept in_____.
2. Which of the following is not a part of financial statements under section 2(40) of companies act 2013:
   a) Statement of Profit and Loss A/c b) Balance Sheet
   c) Cash Book d) Cash Flow Statements
3. Government and regulators uses the financial statements of various companies to check its governance and tax related matters. (True/False)

2.6 STATEMENTS OF PROFIT AND LOSS ACCOUNT

The Statement of Profit and Loss account reports the financial performance of the business during a specific period taking revenue and expenses as a key variable usually a fiscal quarter or a year.

There are three major types of profits in an organization based on specific information: Gross Profit, Operating profit and Net Profit. Gross Profit determines the business efficiency and talks about the profit margin of the business, operating profit is net income of an organization derived from its core operating activities. Net profit is representation of the amount company takes for itself.

The main objective of profit and loss account are as follows:

i. Profit and Loss account is helpful in knowing the trading results i.e. gross profit/gross loss and net profit/ net loss.

ii. It is helpful in analyzing the relationship between profit and turnover of a business. Further, it is helpful in calculating and comparing profitability ratio of a company.

iii. It helps in identification and analysis of direct and indirect expense, and also helpful in reducing the indirect expenses of the business for better performance of the business.

As per Part II of Schedule III [u/s. 129(1)] of Companies Act 2013 Profit and loss account should follow the vertical format given as follows:

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(Statement of Profit and Loss without stating EBITDA)

Name of the Company

Statement of Profit and Loss

for the year ended 31 March, 20XX

Particulars		**Note No.**	**For the year ended 31 March, 20X2**	**For the year ended 31 March, 20X1**
			Rs.	**Rs.**
A	**CONTINUING OPERATIONS**			
1	Revenue from operations (gross)		XXX	XXX
	Less: Excise duty		XXX	XXX
	Revenue from operations (net)		XXX	XXX
2	Other income		XXX	XXX
3	**Total revenue (1+2)**		XXX	XXX
4	**Expenses**			
	(a) Cost of materials consumed		XXX	XXX
	(b) Purchases of stock-in-trade		XXX	XXX
	(c) Changes in inventories of finished goods, work-in-progress and stock-in-trade		XXX	XXX
	(d) Employee benefits expense		XXX	XXX
	(e) Finance costs		XXX	XXX
	(f) Depreciation and amortisation expense		XXX	XXX
	(g) Other expenses		XXX	XXX

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	Total expenses	XXX	XXX
5	**Profit / (Loss) before exceptional and extraordinary items and tax (3 - 4)**	XXX	XXX
6	Exceptional items	XXX	XXX
7	**Profit / (Loss) before extraordinary items and tax (5 + 6)**	XXX	XXX
8	Extraordinary items	XXX	XXX
9	**Profit / (Loss) before tax (7 + 8)**	XXX	XXX
10	**Tax expense:**		
	(a) Current tax expense for current year	XXX	XXX
	(b) (Less): MAT credit (where applicable)	XXX	XXX
	(c) Current tax expense relating to prior years	XXX	XXX
	(d) Net current tax expense	XXX	XXX
	(e) Deferred tax	XXX	XXX
11	**Profit / (Loss) from continuing operations (9 +10)**	XXX	XXX
B	**DISCONTINUING OPERATIONS**		
12.i	Profit / (Loss) from discontinuing operations (before tax)	XXX	XXX
12.ii	Gain / (Loss) on disposal of assets / settlement of liabilities attributable to the discontinuing operations	XXX	XXX
12.iii	Add / (Less): Tax expense of discontinuing operations		
	(a) on ordinary activities attributable to the discontinuing operations	XXX	XXX

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	(b) on gain / (loss) on disposal of assets / settlement of liabilities		XXX	XXX
13	**Profit / (Loss) from discontinuing operations (12.i + 12.ii + 12.iii)**		XXX	XXX
C	**TOTAL OPERATIONS**		XXX	XXX
14	**Profit / (Loss) for the year (11 + 13)**		XXX	XXX
			`	`
15.i	**Earnings per share (of ` ___/- each):**			
	(a) Basic			
	(i) Continuing operations		XXX	XXX
	(ii) Total operations		XXX	XXX
	(b) Diluted			
	(i) Continuing operations		XXX	XXX
	(ii) Total operations		XXX	XXX
15.ii	**Earnings per share (excluding extraordinary items) (of ` ___/- each):**			
	(a) Basic			
	(i) Continuing operations		XXX	XXX
	(ii) Total operations		XXX	XXX
	(b) Diluted			
	(i) Continuing operations		XXX	XXX
	(ii) Total operations		XXX	XXX
	See accompanying notes forming part of the financial statements			

Source: Guidance Note on Schedule VI to the Companies Act 2013

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IN-TEXT QUESTIONS

4. Under which main Head of Sub-Head of the balance sheet (Equity and Liabilities) following items are shown?
   a) Bills Payable b) Premium on Redemption of Debentures
   c) Sundry Creditors d) Public Deposits
5. Give major Heads and Subheads shown in balance sheet as per Schedule III of Companies Act 2013of the following:
   a) Bills Receivable
   b) Mortgage Loan
   c) Goodwill
   d) Patent Rights
   e) Surplus i.e. Balance of Statement of Profit and Loss Account

2.7 BALANCE SHEET

The balance sheet of the company is a summarized statement of its financial position. It represents assets, liabilities and other essential things of the company. The old format of balance sheet was a represented in horizontal form also known as T-Shaped balance sheet. However, the method of preparation of Balance Sheet and its format has been revised in Companies Act 2013 and the new format is in statement form also known as vertical format of balance sheet.

The balance sheet of the company has two sections i.e., the asset and liabilities where the former shows what a company owns and the later reports what the company owes. Financial statements report the information about entity's:

i) Assets

ii) Liabilities

iii) Equity

iv) Income and Expenses, including loss and gain:

v) Contribution made by the Owner (Contribution/Distributions made by owner and his/her capacity in the business as owner)

vi) Cash flow in the organization

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There is no separate format of Balance Sheet as per Ind-AS.

2.7.1 Items necessarily required to be included the following items in Balance Sheet: As per Ind-AS asset is defined as follows:

> *"An asset is a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity."*

	Assets
a)	Property, plant and equipment
b)	Capital Work in progress
c)	Investment Property
d)	Goodwill
e)	Other Intangible Assets
f)	Intangible assets under development
g)	biological assets other than Bearer Plants within the scope of Ind AS 41, Agriculture;
h)	Financial assets i. Investments ii. Trade Receivables iii. Loans iv. Others (to be specified)
i)	Deferred Tax Liabilities
g)	Other Non-Current Assets
	Current Assets
a)	Inventories
b)	Financial Assets (i) Investments (ii) Trade receivables (iii) Cash and cash equivalents (iv) Bank balances other than (iii) above (v) Loans (vi) Others (to be specified)

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c)	Current Tax Assets (net)
d)	Other current assets

As per Ind-As Equity and Liabilities are defined as follows:

"Equity is the residual interest in the assets of the entity after deducting all its liabilities."

"A liability is a present obligation of the entity arising from past events, the settlement of which is expected to result in an outflow from the entity of resources embodying economic benefits."

2.7.2 Current and Non-Current Assets and Liabilities distinction in Balance Sheet

Under Ind- AS 1 an entity should make clear distinction between current and non-current assets and liabilities side of Balance Sheet.

For classification of current items the Ind-AS focuses on the following factors:

a) The asset is expected to realize/ consume/ sell in its normal operating cycle.

b) It should be for the purpose of trading.

c) Expected to realized within 12 month of reporting period

d) The asset is cash or a cash equivalent (as defined in Ind AS 7) unless the asset is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting period.

For classification of current items the Ind-AS focuses on the following factors:

a) A liability which is expected to settle within its operating cycle

b) It is primarily held for the purpose of trading.

c) Liability which is due to be settled within 12 months after reporting period.

d) It does not have an unconditional right to defer settlement of the liability for at least twelve months after the reporting period. Terms of a liability that could, at the option of the counterparty, result in its settlement by the issue of equity instruments do not affect its classification.

2.7.3 Detailed disclosure of Share Capital: The entity should disclose the following details about share capital either in Balance Sheet or in the statement of change in equity or in the notes to accounts:

a) The number of authorized shares

b) Number of fully paid and not fully paid issued shares

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c) Par value per shares

d) Reconciliation of number of outstanding shares at the beginning and end.

e) Preference Shares, right shares and any restriction on distribution of dividend of such shares

f) shares in the entity held by the entity or by its subsidiaries or associates; and

g) shares reserved for issue under options and contracts for the sale of shares, including terms and amounts; and

The format of balance sheet as per Guidance Note on Schedule III to the Companies Act 2013 is as follows:

PART I – Form of BALANCE SHEET

Name of the Company…….

Balance Sheet as at ……

(Rupees in……)

	Particulars	**Note No.**	**As at 31 March, 20XX**	**As at 31 March, 20XX**
			(Current Year Fig) `	**(Prev. Year Fig) `**
A	**EQUITY AND LIABILITIES**			
1	**Shareholders' funds**			
	(a) Share capital		XXX	XXX
	(b) Reserves and surplus		XXX	XXX
	(c) Money received against share warrants		XXX	XXX
2	**Share application money pending allotment**		XXX	XXX
3	**Non-current liabilities**			
	(a) Long-term borrowings		XXX	XXX
	(b) Deferred tax liabilities (net)		XXX	XXX

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	(c) Other long-term liabilities		XXX	XXX
	(d) Long-term provisions		XXX	XXX
4	**Current liabilities**			
	(a) Short-term borrowings		XXX	XXX
	(b) Trade payables		XXX	XXX
	(c) Other current liabilities		XXX	XXX
	(d) Short-term provisions		XXX	XXX
	TOTAL		XXX	XXX
B	**ASSETS**			
1	**Non-current assets**			
	(a) Fixed assets			
	(i) Tangible assets			
	(ii) Intangible assets	XXX		
	(iii) Capital work-in-progress	XXX		
	(iv) Intangible assets under development	XXX		
	(v) Fixed assets held for sale	XXX		
			XXX	XXX
	(b) Non-current investments		XXX	XXX
	(c) Deferred tax assets (net)		XXX	XXX
	(d) Long-term loans and advances		XXX	XXX
	(e) Other non-current assets		XXX	XXX
2	**Current assets**			

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	(a) Current investments		XXX	XXX
	(b) Inventories		XXX	XXX
	(c) Trade receivables		XXX	XXX
	(d) Cash and cash equivalents		XXX	XXX
	(e) Short-term loans and advances		XXX	XXX
	(f) Other current assets		XXX	XXX
	TOTAL		XXX	XXX
	See accompanying notes forming part of the financial statements			

Source: Guidance Note on Schedule III to the Companies Act 2013.

Illustration 1. How will you explain the following items in the Balance Sheet of a Company?

i) 9% Debentures

ii) Proposed Dividend

iii) Loose Tools

iv) Capital Redemption Reserve

Answer1.

S No.	**Items**	**Definition**	**Main Head**	**Sub-Head**
1	9% Debentures	It is a long-term debt to the business usually not secured by any collateral. 9% is the coupon rate for the long-term loan.	Non-Current Liabilities	Long-Term Borrowings
2.	Proposed Dividend	The Board of Directors have approved the proposal of dividend to be distributed in future but not distributed yet.	Current Liabilities	Short Term Provisions

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3.	Loose Tools	These are the assets used in a company for various production activities, hence it is helpful in conversion of raw material to finished goods.	Current Assets	Inventories
4.	Capital Redemption Reserve	It is a reservation out of profit over the years kept in company for either redemption or purchase of companies own shares.	Shareholders' Funds	Reserve and surplus

2.8 CASH FLOW STATEMENT

Cash is the blood of business, proper circulation of blood is very important for human to survive and in the similar way proper cash circulation is very important for a business to sustain. Before we move further to understand cash flow lets understand what is cash and cash equivalent.

Cash includes cash in hand, cash at bank, demand deposits with banks and cash equivalent means liquid investments made by the company with a maturity period less than three months.

Cash= Cash in Hand+ Cash at Bank+ Demand deposit at Bank

Cash Equivalent= Short Term Highly Liquid Investment (less than three months)

Cash Flow Statement: it is the periodic statement showing the inflows and outflows of Cash and Cash equivalents from Operating, Investing and Financing activities during a particular period which is usually a financial year.

Cash Flow Statement of a company exhibits the flow of incoming and outgoing cash in the business during a specific period (usually a financial year). It helps in ascertaining the ability of the business to generate cash and its utilization.

It is also helpful in determining the solvency of a business. According to guidelines of Accounting Standard 3 issued by ICAI, a cash flow mandatory all companies with a turnover of Rs 50 crore. Companies Act 2013 directs all companies to prepare cash flow statement except One Person Company, dormant company and small company. However, Schedule III of Companies Act 2013 do not prescribe any format for a Cash Flow Statement and hence it should be prepared as per the AS-3 issued by ICAI under direct/indirect Method. The change in position of cash for a specific period is calculated by considering the 'source' and 'application' of cash and cash equivalent.

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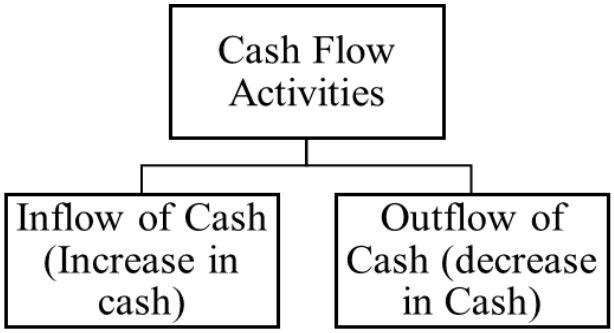

Sources of Cash: to identify the source of cash we check the inflow/increase in cash in the business.

a) Issue of Shares (equity or preference), debentures, bonds and long term loan.

b) Operating Cash Profit of the Business

c) Sale of fixed asset.

d) Sale of Investments.

Application of Cash: to identify the source of cash we check the outflow/decrease in cash in the business.

a) Repayment of Bank loan or redemption of Debentures

b) Payment of income tax, dividend, interest.

c) Operating Loss of the Business (Cash)

d) Purchase of any fixed asset.

Source of cash can be internal and external both. Internal sources usually cash from operations of the business. So, it is important to identify operating and non-operating activities in the business such.

Non-operating activities are one-time event in a business which may impact on revenue but falls outside of daily routine of the business and hence, excluded while calculating cash flow statements (loss/profit on sale of fixed asset, amortization of intangible asset).

The net profit calculated by the profit and loss account will have to be adjusted for non-operating items. Also, all non-cash items (depreciation, creation of reserve, provision of bad debts) already considered during computation of profit and loss account will have to be adjusted for calculation of cash flow statements.

2.8.1 Classification of Cash Flow activities: As per As-3, the cash flow can be classified into three broad categories: Cash Flow from Operating, Investing and Financing activities. The Operating activity is principal revenue generating activity of the business, the Investing

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Activity is summary of acquisition and disposal of investments and fixed assets in the business and financing activity summarizes change in the size of composition of owner's capital and borrowings in the business.

A. **Operating Activity:** Operating activities are daily activities related to producing and selling of product for generation of revenue to the business (sales, direct expenses, marketing expenses etc.) and it should be considered while calculating cash inflow and outflow of the business. It records both inflow and outflow of cash. The Net cash flow is reported as 'Cash Flow from operating activities'. Examples:

a) Cash payment made to suppliers for goods and services.

b) Cash receipts from sales of goods/ services.

c) Cash received from royalties, fees and other revenue.

B. **Investing Activities:** Investing Activity is summary of acquisition and disposal of investments and fixed assets in the business. Examples:

a) Cash paid for acquisition of fixed asset, investments, bonds, research and development.

b) Cash received from sale of property.

c) Purchase of government securities

d) Interest/ dividend received from investment made.

e) Cash advances or loans given to other parties.

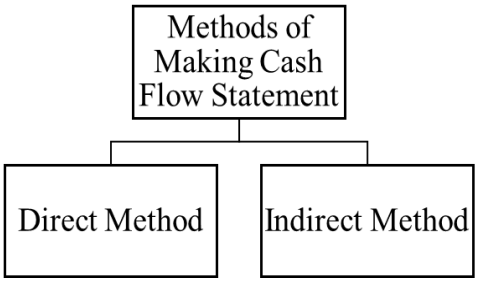
C. **Financing Activity:** financing activity summarizes change in the size of composition of owner's capital and borrowings in the business. Example:

a. Bank loan repayment

b. Cash proceeds from issue of shares/ debentures

c. Cash payment by lessee for outstanding liabilities related to finance lease.

2.8.2 Calculation of Cash Flow Statement: A businessmen can be calculated the cash flow using direct/ indirect method.



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1. **Direct Method:** In the direct method of cash flow statement, we calculate operating cash profit by taking all cash gross receipts and payment which are operating in nature. All non- operating and non-cash items are ignored under direct method of cash flow statement.

   Format for assessment of 'Cash Flow from Operating Activities' using Direct Method

Particulars	**Amount**
Cash Receipts from:	xxx
Cash sales	
Recovery of cash from debtors for credit sales	
Recovery of cash on account of Bills Receivables for credit sales	
Sale of scrap	
Less : Cash Payments for:	
Salaries and Wages	
Rent	
Electricity expense	
Suppliers	
Cash Purchases	(xxx)
Payment to Suppliers	
Cash generated from Operations	xxx
Less: Income Tax Paid during the current year	(xxx)
Cash Flow before adjustment for Extra-ordinary Items	xxx
Adjustments for Extra-ordinary items	xxx
Net Cash utilised in/ generated from Operating Activities	xxx

   Source: ICAI Study Material

2. **Indirect Method:** Under indirect method of calculation of cash flows, the net profit is taken as the base and starting point and exclude all non-operating and non-cash item. The main motive remains same using both the method i.e. calculation of operating cash profit from the business. Hence, non-operating items such as profit/loss on sale

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of fixed asset and investments, amortization of intangible asset and all non-cash items such as deprecation, provision for tax, provision for Bad-debts, transfer to general reserve is adjusted to net profit of the business.

Format for calculation of 'Cash Flow from Operating Activities' as per Indirect Method

Particulars	**Amount**
Net Profit before Adjustments for Non-Cash items, Non-Operating items, Tax and Extra-ordinary items	xxx
Adjustments for Non Cash and Non-Operating Activities	
Add: Depreciation provided during the year	xxx
Add: Loss due to Foreign Exchange rate fluctuations	xxx
Add: Loss on sale Investments	xxx
Less: Gain due to Foreign Exchange rate fluctuations	xxx
Less: Gain on sale Investments	xxx
Less: Dividend Received	xxx
Less: Interest Received	xxx
Operating Profit before Working Capital Adjustments	xxx
Adjustments for Working Capital Changes	
Add: Decrease in the amount of Current Assets during the year	xxx
Add: Increase in the amount of Current Liabilities during the year	xxx
Less: Increase in the amount of Current Assets during the year	xxx
Less: Decrease in the amount of Current Liabilities during the year	
Cash generated from Operations	xxx
Less: Interest Paid	(xxx)
Less: Income Taxes paid	(xxx)
Cash before Extra-Ordinary Items	xxx
Adjustment for Extra-ordinary items	xxx
Net Cash Flow from Operating Activities	xxx

Source: ICAI Study Material

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2.9 SUMMARY

The Main objective of the financial statement is to evaluate the position and performance of the business. As we know that a company has numerous stake holders and it is very important to protect the interest of the stakeholders. The publication of such relevant financial statement as per guidelines of Companies Act, MCA, and ICAI gives the power to these stakeholders to interpret and take decisions accordingly.

A financial statement is collection of all the financial information about financial position and performance of an organization.

The financial statement under **Section 2(40)** of Indian Companies Act 2013 includes the followings:

v) Balance Sheet reports the financial position of a business at a certain point in time.

vi) Profit &Loss Account/ Income Expenditure Account shows the financial performance throughout the time frame.

vii) Cash Flow Statement encapsulates the total cash inflow and outflow for the period from operating, investing and financing activities.

viii) Statement of Changes in Equity summarizes how equity in the organization (if applicable).

Users of Financial Statements

Users	Category of User	Information need of the user
Internal	**Owners/Proprietor/ Shareholders**	Return on investment, Net profit, financial position of the company/business, growth rate.
	Management	Rate of return from different segments, products and investments.
	Employees	Profitability of the employer to bargain wages rates and bonus, dues (PF, ESI, etc.) are being deposited regularly.
External	**Potential investors**	Business and financial risk, EPS, future prospects of the business.
	Creditors/Suppliers	Short term liquidity: creditors are interested in knowing financial capability and ability of the business to pay its debts on time.
	Lenders	Repaying capacity, credit worthiness, short term liquidity and

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		long term solvency.
	Tax Authorities	Assessment of income and expenses, tax dues, true and fair disclosure of accounting information.
	Others	Customers, researchers seek different in-formation for different own customised interests and reasons.

Financial Statements of companies are to be prepared as per the Schedule III of the Companies Act 2013. Financial statements report the information about entity's:

i) Assets

ii) Liabilities

iii) Equity

iv) Income and Expenses, including loss and gain:

v) Contribution made by the Owner (Contribution/Distributions made by owner and his/her capacity in the business as owner)

vi) Cash flow in the organization

Statement of Profit and Loss account: The Statement of Profit and Loss account reports the financial performance of the business during a specific period taking revenue and expenses as a key variable usually a fiscal quarter or a year.

Balance Sheet: The balance sheet of the company is a summarized statement of its financial position. It represents assets, liabilities and other essential things of the company. The old format of balance sheet was a represented in horizontal form also known as T-Shaped balance sheet. However, the method of preparation of Balance Sheet and its format has been revised in Companies Act 2013 and the new format is in statement form also known as vertical format of balance sheet.

The balance sheet of the company has two sections i.e., the asset and liabilities where the former shows what a company owns and the later reports what the company owes.

Cash Flow Statement: it is the periodic statement showing the inflows and outflows of Cash and Cash equivalents from Operating, Investing and Financing activities during a particular period which is usually a financial year.

Sources of Cash: to identify the source of cash we check the inflow/increase in cash in the business.

e) Issue of Shares (equity or preference), debentures, bonds and long term loan.

f) Operating Cash Profit of the Business

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g) Sale of fixed asset.

h) Sale of Investments.

Application of Cash: to identify the source of cash we check the outflow/decrease in cash in the business.

e) Repayment of Bank loan or redemption of Debentures

f) Payment of income tax, dividend, interest.

g) Operating Loss of the Business (Cash)

Classification of Cash Flow activities: As per As-3, the cash flow can be classified into three broad categories: Cash Flow from Operating, Investing and Financing activities.

Operating Activity: Operating activities are daily activities related to producing and selling of product for generation of revenue to the business (sales, direct expenses, marketing expenses etc.)

Investing Activities: Investing Activity is summary of acquisition and disposal of investments and fixed assets in the business.

Financing Activity: financing activity summarizes change in the size of composition of owner's capital and borrowings in the business.

2.10 ANSWERS TO IN-TEXT QUESTIONS

1. Registered Head Office and its Branches (if any)

2. Cash Book

3. True

4. Heads and Subheads under Equity and Liabilities:

   a) Bills Payable-Current Liabilities-Trade Payables

   b) Premium on Redemption of Debentures-Non-Current Liabilities- Long Term Borrowings

   c) Sundry creditors- Current Liabilities- Trade Payables

   d) public Deposits-Non-Current Liabilities- Long term Borrowings

5. a)Bills Receivable-Current Assets-Trade Receivables

   b)Mortgage Loan-Non-Current Liabilities – Long Term Borrowings

   c) Goodwill- Non-Current Assets-Fixed Assets Intangible Assets

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d)Patent Rights-Non-Current Assets-Fixed Assets Intangible Assets

e)Surplus i.e. Balance of Statement of Profit and Loss Account- Shareholders Funds-Reserves and Surplus

2.11 ABBREVIATIONS

- AS- Accounting Standards
- ICAI-Institute of Chartered Accountants of India.
- MCA- Ministry of Corporate Affairs
- Ind-AS-Indian Accounting Standards

2.12 SELF-ASSESSMENT QUESTIONS

1. What do you understand by the term Financial Statements and the method of preparing the financial statements under Companies Act 2013?
2. What do you mean by statement of profit and loss account? How is it helpful in ascertaining financial performance of the business, also explain the advantages of profit and loss accounts to the business.
3. Explain the purpose of making cash flow statements. Also give details about direct and indirect method of making Cash Flow Statement.

2.13 REFERENCES

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2.14 SUGGESTED READINGS

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LESSON 3

DEPRECIATION

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STRUCTURE

3.1 Learning Objectives
3.2 Introduction
3.3 Meaning of Depreciation
3.4 Objectives for Providing Depreciation
3.5 Factors Influencing Depreciation
3.6 Methods of Depreciation
3.7 Fixed Instalment/Original Cost or Straight line Method
3.8 Reducing/Diminishing Balance/Written Down
3.9 Sum of Digits of Years Method
3.10 Machine Hour Method
3.11 Production Units Method
3.12 Depletion Method
3.13 Accounting Entries for Depreciation
3.14 Change in Cost and Residual Value/Life of Asset
3.15 Change in Method of Depreciation
3.16 Revaluation of Depreciable Assets
3.17 Cessation of Depreciation
3.18 Retirement
3.19 Sale / Disposal of Depreciable Assets

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3.20 Summary

3.21 Self-Assessment Questions

3.22 Suggested Readings

3.1 LEARNING OBJECTIVES

After reading this lesson, readers will be able to understand:

- Concept of Depreciation
- Objectives for Providing Depreciation
- Factors influencing Depreciation
- Methods of Depreciation
- Accounting Entries for Depreciation
- How to treat Change in Cost and Residual Value/Life of Asset
- Accounting Treatment for Change in Method of Depreciation
- Accounting Treatment for Revaluation of Depreciable Assets
- Accounting Treatment for Cessation of Depreciation
- Accounting Treatment for Retirement
- Accounting Treatment for Sale / Disposal of Depreciable Assets

3.2 INTRODUCTION

The Assets which are expected to give benefit over a long period of time are not charged to expense at the time of their acquisition rather they are capitalised in the balance sheet as Fixed Assets or Property Plant and Equipment and are charged to profit and loss account through the medium of depreciation or amortisation.

As per IND AS 16 **Property, plant and equipment** are tangible assets that:

(a) are held for:

- ✓ use in the production or
- ✓ supply of goods or services,
- ✓ rental to others, or
- ✓ administrative purposes;

And

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(b) are expected to be used for at least 12 months.

Part of the acquisition cost of the fixed assets allocated as an expense in each of the accounting period in which the asset is utilized. The amount of fixed assets allocated in such manner to respective accounting period is called depreciation.

3.3 MEANING OF DEPRECIATION

Depreciation is the **systematic allocation** of the **depreciable amount** of an asset over its **useful life.** It is the reduction in the value of fixed tangible assets due to wear and tear, up gradation of technology and afflux of time

Depreciation commences from the day asset is available for use even if it is not put to use.

3.4 OBJECTIVES FOR PROVIDING DEPRECIATION

Depreciation is charged on property plant and equipment to serve the following objectives:

1. To calculate true cost of production of goods or services rendered which involve usage of Fixed assets in their production
2. To correctly measure the income as per matching concept.
3. To depict true financial position by valuing the assets after deducting depreciation
4. To provide internal funds for replacement of fixed assets by charging depreciation from profit and loss.

3.5 FACTORS INFLUENCING DEPRECIATION

Calculation of depreciation is based on the following three factors:

1. **Historical Cost** or other amount substituted for the Historical Cost of the Asset when revalued. Historical cost is the amount which is paid by the entity
2. **Estimated Useful Life**
3. **Estimated Residual Value**

These factors are explained as follows -

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1. Historical Cost:

Purchase price	XX
Add : Other Non-refundable taxes & duties	XX
Add: Any directly attributable cost of bringing the asset to its working condition for its intended use	XX
Less: Trade discount & rebates	(XX)
Cost of Asset	**XX**

2. 'Useful Life' is either -

(a) The period over which a depreciable asset is expected to be used by the enterprise, or

(b) The number of production or similar units expected to be obtained from the use of theasset by the enterprise.

3. Residual/Scrap Value is the amount likely to be obtained by the disposal of the Fixed Asset at the end of its Useful Life.

DEPRECIABLE AMOUNT

'Depreciable Amount' of a Depreciable Asset is determined as under:

Particulars	**Amount**
Historical Cost, or other amount substituted for it in the Financial Statements Less: Estimated Residual Value	XX (XX)
Depreciable Amount	**XX**

3.6 METHODS OF DEPRECIATION

The following methods are available for computing and allocating the depreciable amount of an asset over its useful life -

- Fixed Instalment or Straight Line Method
- Reducing Balance or Written Down Value (WDV) Method
- Sum of Digits of Years Method

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- Machine Hour Method
- Production Units Method
- Depletion Method

3.7 FIXED INSTALMENT/ORIGINAL COST OR STRAIGHT LINE METHOD (SLM)

- Under this method, an equal or constant amount of depreciation is written off from Depreciable Asset every year.
- Suitable for assets which generates equal utility during every year of its useful life.
- At the end of the useful life of the asset, the cost of the asset will be NIL or equal to its Residual Value / Scrap Value.

$$\text{Straight Line Depreciation} = \frac{\text{Cost of Asset Less Residual Value}}{\text{Useful Life}}$$

$$\text{SLM Depreciation Rate} = \frac{\text{SLM Depreciation} \times 100}{\text{Cost of Asset}}$$

Example: X Ltd purchased a Machine costing Rs 10 Lakhs, having a useful life of 5 years. Its estimated Residual Value is Rs 1 Lakh.

$$\text{Straight Line Depreciation} = \frac{10{,}00{,}000-1{,}00{,}000}{5}$$

= Rs. 1,80,000 p.a

$$\text{SLM Depreciation Rate} = \frac{1{,}80{,}000 \times 100}{10{,}00{,}000} = 18\% \text{ p.a}$$

3.8 REDUCING/DIMINISHING BALANCE/WRITTEN DOWN VALUE (WDV) METHOD

- Depreciation Amount for each year is computed by applying a fixed % on the Opening Balance of the Asset (i.e. Diminishing Balance of the Asset.)
- Reducing Balance refers to the Written down Value of the Asset, i.e. value of the asset as reduced by the depreciation up to the previous year.
- The value of the asset will never be extinguished, as it happens in SLM Method.
- Depreciation Rate is computed such that at the end of the useful life of the asset, the cost

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of asset will be equal to its Residual Value / Scrap Value.

$$\text{WDV Depreciation Rate} = \frac{1 - \sqrt[n]{\text{Residual Value}}}{\text{Cost of Asset}}$$

Where n = Useful Life.

X Ltd purchased a machine costing Rs 10 Lakhs with scrap value of Rs. 2,50,000 and useful life of 10 years, and has ascertained its WDV rate as 10% p.a. Depreciation rate will be calculated as follows:

WDV Depreciation Rate = $1 - [2,50,000/10,00,000]^{1/10}$ = 12.95% p.a (approx.)

3.9 SUM OF DIGITS OF YEARS METHOD

It is a variation of the WDV Method. Under this method, Depreciation amount for each year is computed by applying the following formula –

$$\text{Dep.} = \text{Depreciable Amount} \times \frac{\text{No. of years of balance useful life (including current year)}}{\text{Total of Digits of the Useful Life of the Asset (in years)}}$$

X Ltd purchased a machine costing Rs 78 Lakhs, having a useful life of 5 years, and estimated Scrap Value Rs 3 Lakhs. Depreciation amounts for the five years will be –

Sum of digits of the year = 1+2+3+4+5 = 15

Depreciable amount = 78,00,000 – 3,00,000 = 75,00,000

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5
Depreciation Amount for the year	75,00,000 x 1/15 = 5,00,000	75,00,000 x 2/15 = 10,00,000	75,00,000 x 3/15 = 15,00,000	75,00,000 x 4/15 = 20,00,000	75,00,000 x 5/15 = 25,00,000

Note: Depreciation is calculated on the Depreciable Amount, i.e. Cost less Residual Value

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3.10 MACHINE HOUR METHOD

In this method, Depreciation is computed based on the number of Machine Hours (rather than years).

Where it is practicable to keep a record of the actual running hours of each machine, depreciation may be calculated on the basis of hours that the concerned machinery worked for. Under machine hour rate method of calculating depreciation, the life of a machine is not estimated in years but in hours. Thus depreciation is calculated after estimating the total number of hours that machine would work during its whole life.

$$\text{Depreciation} = \text{Depreciable Amount} \times \frac{\text{No.of Machine Hours during the year}}{\text{Total Machine Hours during the entire useful life}}$$

Example: X Ltd purchased a machine costing Rs 22,00,000, having a Scrap Value of Rs 1,30,000.

The machine has a useful life of 20,700 machine hours distributed as under –

- Years 1 to 3: 2,500 machine hours each,
- Years 4 to 6: 2,000 machine hours each, and
- Years 7 to 10: 1,800 machine hours each.

In this case, Depreciation Amounts will be computed as under –

Depreciable Amount = 22,00,000- 1,30,000 = 20,70,000

Depreciation per hour = 20,70,000/20,700 = 100 per hour

Year	Machine Hours	Depreciation amount
1	2500	2500 x100 = 2,50,000
2	2500	2500 x100 = 2,50,000
3	2500	2500 x100 = 2,50,000
4	2000	2000 x100 = 2,00,000
5	2000	2000 x100 = 2,00,000
6	2000	2000 x100 = 2,00,000
7	1800	1800 x100 = 1,80,000
8	1800	1800 x100 = 1,80,000

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9	1800	1800 x100 = 1,80,000
10	1800	1800 x100 = 1,80,000
Total	20700	

3.11 PRODUCTION UNITS METHOD

In this method, Depreciation is computed based on the production / output quantity.

Depreciation = Depreciable Amount x Production Quantity for the current year

Total Estimated Production Quantity from the Machine

Question: X Ltd purchased a machine costing Rs 25,00,000, having a Scrap Value of Rs 5,00,000. The machine is expected to produce 10,00,000 units of output in the following manner –

Years 1 & 2: 1,15,000 units each,

Years 3 to 7: 1,00,000 units each, and

Years 8 to 10: 90,000 units each.

Depreciation will be calculated as follows:

Depreciable Amount = 25,00,000- 5,00,000 = 20,00,000

Depreciation per unit = 20,00,000/10,00,000 = 2 per unit

Year	**Units of output**	**Depreciation amount**
1	1,15,000	1,15,000 x 2 = 3,30,000
2	1,15,000	1,15,000 x 2 = 3,30,000
3	1,00,000	1,00,000 x 2 = 2,00,000
4	1,00,000	1,00,000 x 2 = 2,00,000
5	1,00,000	1,00,000 x 2 = 2,00,000
6	1,00,000	1,00,000 x 2 = 2,00,000
7	1,00,000	1,00,000 x 2 = 2,00,000
8	90,000	90,000 x 2 = 1,80,0000
9	90,000	90,000 x 2 = 1,80,0000

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10	90,000	90,000 x 2 = 1,80,0000
Total	10,00,000	

3.12 DEPLETION METHOD

- Depletion means reduction or exhaustion.
- This method is used in the case of Mines, Quarries, Oil Well, etc. containing only a certain estimated quantity of resources / products.

$$\text{Depreciation} = \text{Depreciable Amount} \times \frac{\text{Quantity of Mineral / Oil extracted during current year}}{\text{Total Estimated Quantity from the Mine / Quarry / Well}}$$

Question: X Ltd took a quarry on lease by paying Rs. 75,00,000. As per technical estimate, the total quantity mineral deposit is 1,00,000 tonnes. The extraction pattern is given below –

- Year 1: 6,000 tonnes,
- Years 2 to 5: 15,000 tonnes each, and
- Years 6 & 7: 17,000 tonnes each.

Depreciation will be calculated as follows:

Depreciable Amount = 75,00,000

Depreciation per tonne = 75,00,000/1,00,000 = 75 per tonne

Year	**mineral deposit in tonnes**	**Depreciation amount**
1	6,000	6,000 x 75 = 4,50,000
2	15,000	15,000 x 75 = 11,25,000
3	15,000	15,000 x 75 = 11,25,000
4	15,000	15,000 x 75 = 11,25,000
5	15,000	15,000 x 75 = 11,25,000
6	17,000	17,000 x 75 = 12,75,000
7	17,000	17,000 x 75 = 12,75,000
Total	1,00,000	

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3.13 ACCOUNTING ENTRIES FOR DEPRECIATION

Depreciation can be recorded in the books of account, under 2 approaches, which are described below:

Method	**Method 1** **Asset Credit Method**	**Method 2** **Provision for Depreciation Method**
Journal Entry	Depreciation A/c Dr. To Fixed Asset A/c Profit and Loss A/cDr. To Depreciation A/c	Depreciation A/c Dr. To Provision for Depreciation A/c Profit and Loss A/c Dr. To Depreciation A/c
Provision for Depreciation A/c	There is no Provision for Depreciation Account at all.	Depreciation for each year is credited to Provision for Depreciation A/c, which shows the Accumulated Depreciation on the Asset.
Effect on Asset A/c	Asset A/c is shown at Historical Cost less Depreciation. So, balance in Asset A/c is reduced year after year.	Asset is shown in the books at Original Cost. Net Book Value = Original Cost less Accumulated Depreciation thereon.

Note: The above schemes are applicable to SLM and WDV Methods. The same treatment is applicable under - (a) Sum of Digits, (b) Machine Hours, (c) Production Units, and (d) Depletion Methods

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3.14 CHANGE IN COST AND RESIDUAL VALUE/LIFE OF ASSET

CHANGE IN HISTORICAL COST.

The Historical Cost of a depreciable asset may undergo subsequent changes arising as a result of increase or decrease in long term liability on account of —

(a) Exchange Rate Fluctuations,

(b) Price Adjustments,

(c) Changes in duties, or

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(d) Other similar factors.

When the Historical Cost of an asset has undergone a change due to the above circumstances the depreciation on the revised unamortised depreciable amount is provided prospectively over the residual useful life of the Asset.

CHANGE IN ESTIMATED USEFUL LIFE & SCRAP VALUE

The useful lives & scrap values of major depreciable assets or classes of depreciable assets may be reviewed periodically. The change should be accounted for as a change in an accounting estimate. Where there is a revision of the estimated useful life or scrap value of an asset, the unamortised depreciable amount should be charged over the revised estimate.

Example: B Ltd. owns an asset with an original cost of Rs. 2,00,000. On acquisition, management determined that the useful life was 10 years and the residual value would be Rs. 20,000. The asset is now 8 years old, and during this time there have been no revisions to the assessed residual value. At the end of year 8, management has reviewed the useful life and residual value and has determined that the useful life can be extended to 12 years in view of the maintenance program adopted by the company. As a result, the residual value will reduce to Rs. 10,000. How would the above changes in estimates be made by B Ltd.?

Solution

The changes in estimates would be effected in the following manner:

The asset has a carrying amount of Rs. 56,000 at the end of year 8 [Rs. 2,00,000 – Rs. 1,44,000] i.e. Accumulated Depreciation.

Accumulated depreciation is calculated as below:

Depreciable amount {Cost less residual value} = Rs. 2,00,000 – Rs. 20,000 = Rs. 1,80,000.

Annual depreciation = Depreciable amount / Useful life = 1,80,000 / 10 = Rs. 18,000.

Accumulated depreciation = 18,000 × No. of years (8) = Rs. 1,44,000.

Revision of the useful life to 12 years results in a remaining useful life of 4 years (12 – 8).

The revised depreciable amount is Rs. 46,000. (56,000 – 10,000)

Thus, depreciation should be charged in future at Rs. 11,500 per annum (Rs. 46,000/4 years).

3.15 CHANGE IN METHOD OF DEPRECIATION

The depreciation method applied to an asset should be reviewed at least at each financial year-end and, if there has been a significant change in the expected pattern of consumption of

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the future economic benefits embodied in the asset, the method should be changed to reflect the changed pattern.

Whenever any change in depreciation method is made such change in method is treated as change in accounting estimate as per Accounting Standards.

Change in method of depreciation is applied with prospective effect. Hence, depreciation is recalculated in accordance with the new method from the date method is changed.

3.16 REVALUATION OF DEPRECIABLE ASSETS

First Revaluation	Upward	Use Revaluation Surplus (R/S)
Subsequent Revaluation	Downward	Use P & L A/c

Subsequent Revaluation:

Case	1st	2nd	Ist	2nd
1	↑	↑	R/S	R/S
2	↓	↓	P & L	P & L
3	↑	↓	R/S	Use R/S 1st
4	↓	↑	P & L	Use P&L 1st

Example: A Plant & Machinery costing Rs. 10,00,000 is depreciated on straight line assuming 10 year working life and zero residual value, for four years. At the end of fourth year, the machinery was revalued upwards by Rs. 40,000. The remaining useful life was reassessed at 8 years. Calculate depreciation for the fifth year.

Solution:

Depreciable amount {Cost less residual value} = Rs. 10,00,000 – Nil = Rs. 10,00,000.

Annual depreciation = Depreciable amount / Useful life = 10,00,000 / 10 = Rs. 1,00,000.

Accumulated depreciation = 1,00,000 × No. of years (4) = Rs. 4,00,000.

Carrying amount at the end of year 4 = Rs. 6,00,000 [Rs. 10,00,000 – Rs. 4,00,000]

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Revised carrying amount after revaluation = 6,00,000 + 40,000 = 6,40,000

Now remaining useful life 8 years.

The revised depreciable amount is Rs. 6,40,000.

Thus, depreciation for 5th year = Rs. 80,000 (Rs. 6,40,000/8 years).

3.17 CESSATION OF DEPRECIATION

Depreciation ceases to be charged:

A) When asset's residual value exceeds its carrying amount

The residual value of an asset may increase to an amount equal to or greater than its carrying amount. If it does, depreciation charge of the asset is zero unless and until its residual value subsequently decreases to an amount below its carrying amount.

B) At the earlier of:

- The date that the asset is retired from active use and is held for disposal, or
- The date that the asset is derecognised

3.18 RETIREMENT

Asset is retired from active use & held for disposal

- It is to be recorded in the books at carrying amount or NRV, whichever is lower.
- Any expected loss is recognized immediately in the P&L statement.

3.19 SALE / DISPOSAL OF DEPRECIABLE ASSETS

Sale/Disposal of Depreciable Assets in dealt with in the following manner —

1. Ascertain Depreciation for the year (upto the date of disposal), and charge the same for that year.
2. Determine Net Book Value" (or) Written Down Value of the Asset = Historical Cost less Depreciation till date, including depreciation upto the date of disposal.
3. Compare Net Book Value of Asset with its Disposal Value and ascertain Profit / (Loss) on disposal & thereafter transfer the Profit / (Loss) on disposal to the Profit and Loss Account.

Example: The M/s LG Transport purchased 10 trucks at Rs. 45,00,000 each on 1st April 2018. On October 1st, 2020, one of the trucks is involved in an accident and is completely

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destroyed and Rs. 27,00,000 is received from the insurance in full settlement. On the same date, another truck is purchased by the company for the sum of Rs. 50,00,000. The company writes off 20% on the original cost per annum. The company observe the calendar year as its financial year.

You are required to prepare the motor truck account for two year ending 31 Dec, 2021

Solution:

Machine A/c

Date	Particulars	Amount	Date	Particulars	Amount
2020			2020		
1/1	To Balance b/d	2,92,50,000	1/10	By Bank A/c	27,00,000
1/10	To P&L A/c (Profit on Settlement of Truck)	4,50,000	1/10	By Depreciation on lost assets	6,75,000
1/10	To Bank A/c	50,00,000	31/12	By Depreciation A/c	83,50,000
			31/12	By Balance c/d	2,29,75,000
		3,47,00,000			3,47,00,000
2021			2021		
1/1	To Balance b/d	2,29,75,000	31/12	By Depreciation A/c	91,00,000
			31/12	By Balance c/d	1,38,75,000
		2,29,75,000			2,29,75,000

Working Note:

Opening balance on 01.01.2020

Original cost as on 1.4.2018	4,50,00,000
Less: Depreciation for 2018	(67,50,000)
	3,82,50,000
Less: Depreciation for 2019	(90,00,000)
	2,92,50,000

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To find out Profit/Loss on settlement of truck

Original cost as on 1.4.2018	45,00,000
Less: Depreciation for 2018	(6,75,000)
	38,25,000
Less: Depreciation for 2019	(9,00,000)
	29,25,000
Less: Depreciation for 2020 (9 Months)	(6,75,000)
	22,50,000
Less: Amount received from Insurance company	(27,00,000)
Profit	4,50,000

Example: A Firm purchased an old Machinery for Rs. 37,000 on 1st January, 2018 and spent Rs. 3,000 on its overhauling. On 1st July 2019, another machine was purchased for Rs. 10,000. On 1st July 2020, the machinery which was purchased on 1st January 2018, was sold for Rs. 28,000 and the same day a new machinery costing Rs. 25,000 was purchased. On 1st July, 2021, the machine which was purchased on 1st July, 2019 was sold for Rs. 2,000.

Depreciation is charged @ 10% per annum on straight line method. The firm changed the method and adopted diminishing balance method with effect from 1st January, 2019 and the rate was increased to 15% per annum. The books are closed on 31st December every year.

Prepare Machinery account for four years from 1st January, 2018.

Solution

Machine A/c

Date	Particulars	Amount	Date	Particulars	Amount
2018			2018		
1/1	To Bank A/c (37,000+3,000)	40,000	31/12	By Depreciation A/c	4,000
			31/12	By Balance c/d	36,000
		40,000			40,000
2019			2019		

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1/1	To Balance b/d	36,000	31/12	By Depreciation A/c (5,400+750)	6,150
1/7	To Bank A/c	10,000	31/12	By Balance c/d (30,600+9,250)	39,850
		46,000			46,000
2020			2020		
1/1	To Balance b/d	39,850	1/7	By Bank A/c	28,000
1/7	To Bank A/c	25,000	1/7	By Depreciation A/c	2,295
			1/7	By Profit & Loss A/c (Loss on sale)	305
			31/12	By Depreciation A/c (1,388+1,875)	3,263
			31/12	By Balance c/d (7,862+23,125)	30,987
		64,850			64,850
2021			2021		
1/1	To Balance b/d	30,987	1/7	By Bank A/c	2,000
			1/7	By Depreciation A/c	590
			1/7	By Profit & Loss A/c (Loss on sale)	5,272
			31/12	By Depreciation A/c	3,469
			31/12	By Balance c/d	19,656
		30,987			30,987

Working Note:

Book Value of machines (Straight line method)

	Machine 1	Machine 2	Machine 3
Cost of Machinery	40,000	10,000	25,000
Less: Depreciation for 2018	(4,000)		
Written down value as on 31.12.2018	36,000		

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Less: Depreciation for 2019	(5,400)	(750) [6 months]	
Written down value as on 31.12.2019	30,600	9,250	
Less: Depreciation for 2020	(2,295) [6 months]	(1,388)	(1,875) [6 months]
Written down value as on 1.7.2020	28,305		
Less: Sale Proceeds	(28,000)		
Loss on Sale	305		
Written down value as on 31.12.2020		7,862	23,125
Depreciation for 6 months in 2021		(590)	
Written down value as on 1.7.2021		7,272	
Sale proceeds		(2,000)	
Loss on sale		5,272	
Depreciation for 2021			(3,469)
Written down value as on 31.12.2021			19,656

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3.20 SUMMARY

Property, plant and equipment are tangible assets that:

(c) are held for:

- ✓ use in the production or
- ✓ supply of goods or services,
- ✓ rental to others, or
- ✓ administrative purposes;

and

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(d) are expected to be used for at least 12 months.

Depreciation is the **systematic allocation** of the **depreciable amount** of an asset over its **useful life**. It is the reduction in the value of fixed tangible assets due to wear and tear, up gradation of technology and afflux of time.

Objectives for providing Depreciation:

5. To calculate True cost of production of goods or services rendered which involve usage of Fixed assets in their production
6. To correctly measure the Income as per matching concept.
7. To depict True Financial Position by valuing the assets after deducting depreciation
8. To provide internal funds for replacement of fixed assets by charging depreciation from profit and loss.

Factors influencing Depreciation:

1. Historical Cost
2. Estimated Useful Life
3. Estimated Residual Value

Methods of Depreciation:

- Fixed Instalment or Straight Line Method
- Reducing Balance or Written Down Value (WDV) Method
- Sum of Digits of Years Method
- Machine Hour Method
- Production Units Method
- Depletion Method

Straight Line Method: an equal or constant amount of depreciation is written off from Depreciable Asset every year.

Written down Value Method: Depreciation amount for each year is computed by applying a fixed % on the Opening Balance of the Asset.

Sum of Digits of Years Method: Depreciation Amount for each year is computed by applying the following formula –

$$\text{Dep.} = \text{Depreciable Amount} \times \frac{\text{No. of years of balance useful life (including current year)}}{\text{Total of Digits of the Useful Life of the Asset (in years)}}$$

Machine Hour Method: Depreciation is computed based on the number of Machine Hours (rather than years)

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$$\text{Dep.} = \text{Depreciable Amount} \times \frac{\text{No. of Machine Hours during the year}}{\text{Total Machine Hours during the entire useful life}}$$

Production Units Methods: Depreciation is computed based on the production / output quantity.

$$\text{Dep.} = \text{Depreciable Amount} \times \frac{\text{Production Quantity for the current year}}{\text{Total Estimated Production Quantity from the Machine}}$$

Depletion Method: Depletion means reduction or exhaustion. This method is used in the case of Mines, Quarries, Oil Well, etc. containing only a certain estimated quantity of resources / products.

$$\text{Dep.} = \text{Depreciable Amount} \times \frac{\text{Quantity of Mineral / Oil extracted during current year}}{\text{Total Estimated Quantity from the Mine / Quarry / Well}}$$

3.21 SELF ASSESSMENT QUESTIONS

1. Explain the meaning of Depreciation and why depreciation is charged.
2. What are the factors influencing amount of depreciation.
3. Explain the Sum of digits of years and Machine hour method of depreciation.
4. Differentiate between Straight line method and Written down value method of depreciation.
5. How change in estimated useful life, historical cost & scrap value is accounted.

3.22 SUGGESTED READINGS

Latest editions of the following text books to be used:

5. Narayanaswamy R. Financial Accounting: A Managerial Perspective. PHI Learning Pvt. Ltd., Delhi
6. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.
7. Garg CA Kamal, and Sehrawat Neeraj Kumar. Beginner`s Guide to Ind AS & IFRS. Bharat Law House Pvt. Ltd., New Delhi
8. Maheshwari S. N., Maheshwari Sunil K., and Maheshwari Sharad K, An Introduction to Accountancy, Vikas Publishing House Pvt. Ltd.

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LESSON 4

INVENTORY VALUATION

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STRUCTURE

4.1 Learning Objectives
4.2 Introduction to Inventory
4.3 Objective of IND AS 2
4.4 Scope of IND AS 2
4.5 Some important definitions as per IND AS 2
4.6 Measurement of Inventories
4.7 Measurement of Net Realisable Value
4.8 Writing inventories down to net realisable value
4.9 Reversals of write-downs
4.10 Recognition as an Expense
4.11 Disclosures
4.12 Summary
4.13 Self-Assessment Questions
4.14 Suggested Readings

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4.1 LEARNING OBJECTIVES

After reading this lesson, students will be able to understand:

- The concept of Inventory
- Scope of Ind AS-2

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- Concept of net realisable value and fair value
- Calculate the inventory cost
- Cost formula for valuation of inventory
- When and How to write-down inventory to net realisable value
- How to write down value as an expense

4.2 INTRODUCTION TO INVENTORY

Inventory refers to the goods which are acquired and held for the purpose of resale in the ordinary course of business, or for further processing to make goods for sale. These are not held for administrative purposes. These also includes the consumable supplies such as lubricants, indirect material used in the production or manufacturing of goods for sale in the ordinary course of business. For Companies following IND AS based Financial Reporting Framework, IND AS 2 prescribes the accounting treatment for Inventory and related matters.

4.3 OBJECTIVE OF IND AS 2

The objective of IND AS 2 is as follows:

- To give the accounting treatment and definition of inventories.
- To provide the guidance on calculating the cost of inventories
- To provide guidance on both initial recognition and subsequent recognition as an expense,
- To provide guidance on write-down of value of inventory to net realisable value.
- To provide guidance on the methods of valuation of inventory, such as
  - ✓ Standard cost method
  - ✓ Retail method.
- To provide acceptable methods of determining cost of inventory such as
  - ✓ Specific identification method
  - ✓ First-in-first-out method
  - ✓ Weighted average cost method.

4.4 SCOPE OF IND AS-2

IND AS-2 prescribe accounting treatment for all inventories, except for:

1. Financial instruments (Ind AS 32 and 109 prescribe the accounting treatment)

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2. Biological assets (such as living animals and plants) related to operations of agriculture including agricultural produce at the time of harvest (for these, Ind AS 41, Agriculture prescribes the accounting treatment). As per Ind AS 41 inventories which are in the form of agricultural produce that is harvested from biological assets is to be valued at fair value minus costs to sell on initial recognition.

Further IND AS-2 is not applicable to the valuation of following inventories:

1. Inventories of agriculturists and forest products, agricultural produce after harvest, Minerals and products based on minerals, because they are valued at net realisable value as per their own well-established industry practices. Any changes in their net realisable value in recorded in statement of profit or loss in the period of the change.
2. Inventories of Commodity broker-traders because they value their inventories at fair value less costs to sell the commodities such as exchange commission, taxes and other charges. Broker-traders are person or entities who buy or sell commodities on behalf of their clients against commission or on their own account or both. Any changes in the value of such commodities is recorded in statement of profit or loss in the period of the change.

4.5 SOME IMPORTANT DEFINITIONS AS PER IND AS 2

Let us understand some of the important terms used in understanding the guidance provided by the Ind AS 2 which are as follows:

Inventories are tangible assets or items:

- **i.** held for the purpose of resale in the ordinary course of business; (complete goods-Finished Goods in case of manufacturer/ Stock in trade in case of trader)
- **ii.** held in the process of further production for selling in the ordinary course of business (incomplete goods-Work in progress)
- **iii.** held as materials or supplies to be consumed in the further production process or in the rendering of services. (Raw material or Consumable Supplies)

Note: Costs incurred to fulfill a contractual obligation under a contract with a customer is not treated as inventories, Ind AS 115 Revenue from Contracts with Customers prescribe the accounting for such costs.

Net realisable value (NRV): NRV can be expressed in the form of equation given below:

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Estimated selling price in the ordinary course of business - Estimated costs of completion of work in progress or raw material- Estimated selling costs such as commission, transportation, etc.

Therefore, NRV is the net proceeds that a business enterprise expects to receive from the customer through sale of inventory in the ordinary course of business after recovering the cost of completion and incidental selling expenses (if any).

Fair value is the selling price of inventory in an orderly transaction in the principal (or most advantageous) market for the same or identical inventory on the date at which value of inventory is measured.

Net Realisable Value differs from business to business as different business sell the same item at different prices therefore NRV is entity-specific value while Fair Value is same for all as it is determined by the free market forces of demand and supply for all the market participants.
Note: NRV of inventories might not be equal fair value less costs to sell.

Fair value: As per Ind AS 113, fair value is the price in an orderly transaction between market participants that would be either received on sale of an asset or paid to transfer/discharge a liability at the date of valuation.

Example

X ltd holds inventories of 2,00,000 units and it could sell it in the market at Rs. 25 each. It has received an order to sell the inventories at Rs. 28 each. The incidental selling cost per unit is estimated to be Rs. 1 per unit.

Here, the Fair value is Rs 25 per unit, However, net realisable value is Rs. 27 (Expected selling price (28) - expected selling expenses (1)) per unit

Difference between Net Realisable Value and Fair Value

Basis of distinction	**Net Realisable Value**	**Fair Value**
Meaning	It is the net amount that a business enterprise expects to receive from the sale of inventory in the ordinary course of business.	It refers to selling price of the same or identical inventory in the principal (or most advantageous) market in an orderly transaction between market participants at the date at which inventory is valued.

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Base of measurement	differs from business to business as different business sell the same item at different prices therefore NRV is entity-specific value	Is same for all as it is determined by the free market forces of demand and supply for all the market participants.

4.6 MEASUREMENT OF INVENTORIES

Inventories shall be measured at the lower of:

- ✓ cost of such inventory to the entity and
- ✓ net realisable value of such inventory.

Cost of Inventories- includes:

i. all costs of purchase;

ii. costs of conversion (direct wages, manufacturing expenses and other direct expenses such as royalty per unit); and

iii. other costs incurred to bring the inventories to their present location and condition such as transportation costs.

Cost of purchase- includes:

i. the purchase price,

ii. import duties and other indirect taxes such as GST (other than which are recoverable subsequently from the taxing authorities such as input tax credit in GST and duty drawbacks),

iii. transport, handling charges and

iv. other costs directly related to the purchase or acquisition of such inventory.

Note: trade discounts, rebates, subsidies if any are to be deducted from the costs of purchase. Cash discount is not to be considered at all.

Example: ABC Ltd. buys goods from an overseas supplier. It has just purchased 2,000 units of component X from the supplier. The quoted price of component X was Rs 1,600 per unit but a trade discount of 10% was given. The supplier a cash discount of 2% for payment within 45 days.

Import duties (basic custom duties) of Rs. 80 per unit to be paid at time of clearance from customs department. Transportation cost of Rs. 25,000 to be paid to take the components to the warehouse. Calculate the cost of Inventory.

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Solution

Particulars	Amount in Rs
Purchase price (1,600x 2,000 x 90%)	28,80,000
Import duties (2,000 x 80)	1.60,000
Delivery cost	25,000
Cost of inventory	30,65,000

Cost of conversion: include costs which are directly related to the production of finished goods, such as:

a) direct material,

b) direct labour

c) other direct costs; and

d) allocation of fixed and variable manufacturing overheads.

Fixed production overheads are indirect costs of production that remain constant in amount in the short run regardless of the volume of production, such as

- ✓ Depreciation on Property Plant and Equipment
- ✓ Maintenance charges of factory buildings, Office equipment, Laptops, Computers, etc.
- ✓ Cost of factory management and administration.
- ✓ Rent of the factory

- Allocation of fixed production overheads to the costs of conversion is to be done on the basis of normal production capacity which is the average and expected production over a number of past periods under normal circumstances after adjusting the loss of capacity due to planned maintenance if any. The actual level of production can also be used if it approximately equal to the normal capacity.
- If production levels are abnormally low, unallocated overheads are recognized as an expense in the statement of profit or loss of the period in which they are incurred.
- If there is abnormally high production, then we will take the actual production levels so that the amount of fixed overhead allocated to each unit of production is decreased so that inventories are not measured above the actual cost of production to maintain the principle of prudence.

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- Variable production overheads are indirect costs of manufacturing the finished goods varying directly, or nearly directly, with the volume of production, such as
  - ✓ indirect materials such as lubricants
  - ✓ indirect labour.

Variable production overheads are allocated to each unit of output on the basis of the actual use of the inputs, production resources and facilities.

Note: Production overheads must be absorbed based on normal production capacity.

Note: The process of allocating costs to units of production is usually called absorption to link the total production overhead to some production variable, for example, time, wages, materials or simply the number of units expected to be manufactured.

Other costs: These are the costs which are incurred in bringing the inventories to their present location and condition, so these are also included in the cost of inventory.

Following costs to be excluded from the cost of inventories and recognised as expense in the Statement of Profit and Loss of the period in which they are incurred:

a) Abnormal wastage of materials, labour or other production resources and facilities;

b) Storage costs such as warehousing charges, cold storage charges,

c) Administrative overheads such as salary of permanent office staff, electricity and other utility bill of office.

d) Selling costs such as carriage outward, sales commission, etc.

Ind AS 23 "requires that the borrowing costs shall be capitalised on qualifying assets but excludes inventories manufactured in large quantities on a repetitive basis.

Inventories manufactured over a short period of time are not qualifying assets. However, in case of producing small quantities over a long period of time, borrowing costs (interest on borrowings for financing the purchase or acquisition of such inventories) are to be added into cost of inventories.

An entity may acquire inventories on deferred payment terms (payment to be made to suppliers in future in lump sum or in installments). If the price of inventory under such terms is more than the price under cash payment mode, then such financing element is to be accounted as interest expense over the period of the financing.

4.7 MEASUREMENT OF NET REALISABLE VALUE

Let us first understand the meaning of Net Realisable Value. **Net Realisable Value (NRV)** refers to the estimated selling price of goods in the ordinary course of business minus the

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estimated costs of completion of work in progress minus the estimated selling expenses.

Net realisable value = estimated selling price of goods - estimated costs of completion - estimated selling expenses.

If inventories are

1. Damaged
2. Become wholly or partially obsolete
3. Selling prices have declined due to fall in the demand

Then cost of such inventories may not be recoverable fully. In such cases, Estimates of net realisable value on the basis of most reliable information available with respect to amount expected to be realized from inventories. These estimates should be made after considering price or cost fluctuations with respect to events occurring after reporting date or after the end of the accounting period on the basis of conditions that exists on the reporting date.

Estimates should be made after considering the main purpose and objective of holding the inventory. For example, the net realisable value of inventory which is held to supply against firm sales or service contracts is to be determined on the basis of individual contract price agreed with the customers. If the contracts for sale of inventory are for the quantity which is lesser than the quantity of inventory held by the entity, then net realisable value of such excess inventory to be supplied is determined on the basis of general selling prices prevailing in the market or as per the recent sales contracts or transactions.

Inventories are usually written down to net realisable value item by item and not on the basis of a classification of inventory into raw material, work in progress, finished goods.

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IN-TEXT QUESTIONS

6. Cost of Inventories- includes: all costs of purchase; costs of conversion (direct wages, manufacturing expenses and other direct expenses such as royalty per unit); and other costs incurred to bring the inventories to their present location and condition such as transportation costs.

   All of the above

7. Cost of purchase- includes: the purchase price, import duties and other indirect taxes such as GST (other than which are recoverable subsequently from the taxing authorities such as input tax credit in GST and duty drawbacks), transport, handling charges and

   All of the above

8. If production levels are abnormally low, unallocated overheads are recognized as _____.

9. If there is abnormally high production, then _____is taken to allocate fixed overhead allocated to each unit of production.

10. Variable production overheads are allocated to each unit of output on the basis of the _____.

11. Following costs to be excluded from the cost of inventories and recognised as expense in the Statement of Profit and Loss of the period in which they are incurred:

    a) Abnormal wastage of materials, labour or other production resources and facilities

    b) Storage costs such as warehousing charges, cold storage charges

    c) Administrative and selling overheads

    d) All of the above.

    e) None of the above

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4.8 WRITING INVENTORIES DOWN TO NET REALISABLE VALUE

Only Work in Progress and Finished Goods are to be written down below the cost to their Net Realisable Value.

Generally Raw Materials and Consumable Supplies held for use in the production of finished goods are not to be written down below cost till the time the finished products in which they will be used are expected to be sold at or above cost.

However, if due to fall in selling price below the net realizable value of the finished products in which raw material or consumable supplies are to used, then materials and consumable supplies are to be written down to net realisable value by taking replacement cost of such materials as their NRV as these are considered the most reliable and best available measure of their net realisable value.

4.9 REVERSALS OF WRITE-DOWNS

For instance, when an inventory is carried at net realisable value, because due to fall in demand its selling price in the market has declined, but in the subsequent accounting period and its selling price has increased. In such cases IND AS 2 provides the following guidance which is as follows:

Net realisable value is determined in each subsequent accounting period.

If the earlier circumstances causing inventories to be valued at below cost does not exists or there are changes in economic circumstances evidencing increase in net realisable value of inventories, then the write-down amount is to be reversed upto the amount of the original write-down so that the new carrying value is the lower of the cost and the net realisable value (revised).

Question: Whether the following costs should be considered while determining the Net Realisable Value (NRV) of the inventories?

(a) Costs of completion of work-in-progress;

(b) Trade discounts expected to be allowed on sale; and

(c) Cash discounts expected to be allowed for prompt payment

Question: ABC Ltd. manufactures and sells paper envelopes. The stock of envelopes was included in the closing inventory as of 31st March, 20X1, at a cost of Rs. 50 per pack. During the final audit, the auditors noted that the subsequent sale price for the inventory at

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15th April, 20X1, was Rs. 40 per pack. Furthermore, enquiry reveals that during the physical stock take, a water leakage has created damages to the paper and the glue. Accordingly, in the following week, ABC Ltd. has spent a total of Rs. 15 per pack for repairing and reapplying glue to the envelopes.

Calculate the net realizable value and inventory write-down (loss) amount.

Question: At the end of its financial year, Company P has 100 units of inventory on hand recorded at a carrying amount of Rs. 10 per unit. The current market price is Rs. 8 per unit at which these units can be sold. Company P has a firm sales contract with Company Q to sell 60 units at Rs. 11 per unit, which cannot be settled net. Estimated incremental selling cost is Rs. 1 per unit.

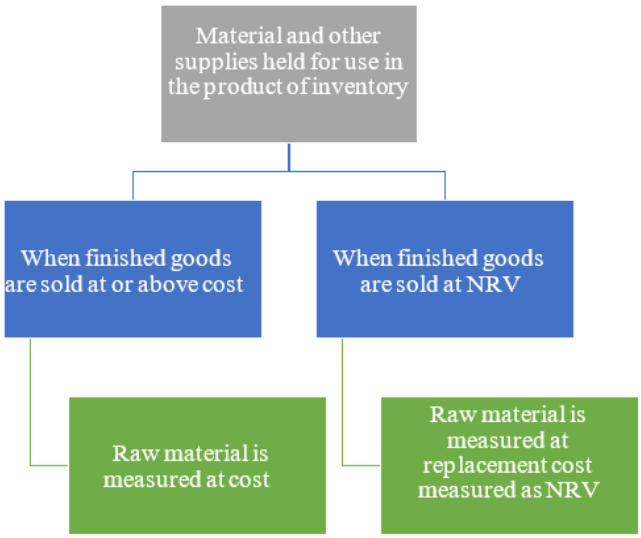
Determine Net Realisable Value (NRV) of the inventory of Company P.

Question: A business has four items of inventory. A count of the inventory has established that the amounts of inventory currently held, at cost, are as follows:

	Cost	Estimated Sales price	Selling costs
Inventory item A1	8,000	7,800	500
Inventory item A2	14,000	18,000	200
Inventory item B1	16,000	17,000	200
Inventory item C1	6,000	7,500	150

Determine the value of closing inventory in the financial statements of a business.

Net realisable value for raw material



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Particulars		Kg.	Rs.
Opening Inventory:	Finished Goods	1,000	25,000
	Raw Materials	1,100	11,000
Purchases		10,000	1,00,000
Labour			76,500
Overheads (Fixed)			75,000
Sales		10,000	2,80,000
Closing Inventory:	Raw Materials	900	
	Finished Goods	1200	

The expected production for the year was 15,000 kg of the finished product. Due to fall in market demand the sales price for the finished goods was Rs. 20 per kg and the replacement cost for the raw material was Rs. 9.50 per kg on the closing day. You are required to calculate the closing inventory as on that date.

Sun Pharma Limited, a renowned company in the field of pharmaceuticals has the following four items in inventory: The Cost and Net realizable value is given as follows:

Item	Cost	Net Realisable Value
A	2,000	1,900
B	5,000	5,100
C	4,400	4,550
D	3,200	2,990
Total	14,600	14,540

Determine the value of Inventories:

a. On an item by item basis

b. On a group basis

4.10 RECOGNITION AS AN EXPENSE

The amount of inventories to be recorded or written off as an expense in the accounting period will usually be:

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1) carrying amount of the inventories sold in the accounting period in which related revenue is recognized in the statement of profit and loss or income statement; and

2) the amount of any write-down of inventories to their net realisable value and all losses of inventories thereof shall be recorded as an expense in the accounting period in which the write-down or loss occurs reduced by the amount of any reversal in the same accounting period of any write-down of inventories due to increase in net realisable value shall be recorded as a reduction in the amount of inventories recognised as an expense in the period in which the reversal occurs.

Some inventories may be allocated to other asset accounts, for example, inventory used as a component of self-constructed property, plant or equipment. Inventories allocated to another asset in this way are recognised as an expense during the useful life of that asset through charging of depreciation on that asset.

Example:

An item of inventory costing Rs.20,000 as covered under Ind AS 2 is consumed in the construction of self-constructed property to be accounted as Property, plant and equipment under Ind AS 16. The cost of such property, plant and equipment other than inventories is Rs.80,000. Such Inventory needs to be capitalized in the cost of Property, plant and equipment. The useful life of the property is 5 years. The depreciation on such property charged to profit and loss account is Rs.20,000 per annum (i.e. 1,00,000/ 5)

4.11 DISCLOSURES

The financial statements shall make the following disclosures with respect to inventories:

1. Accounting Policies with respect to valuation of Inventory
2. Inventories pledged as security for raising funds
3. Detailed analysis of carrying amount of inventory, classified into its components or categories
4. Amounts recognized in the Statement of profit or loss as expense during the current year
5. Inventory carried at fair value less costs to sell

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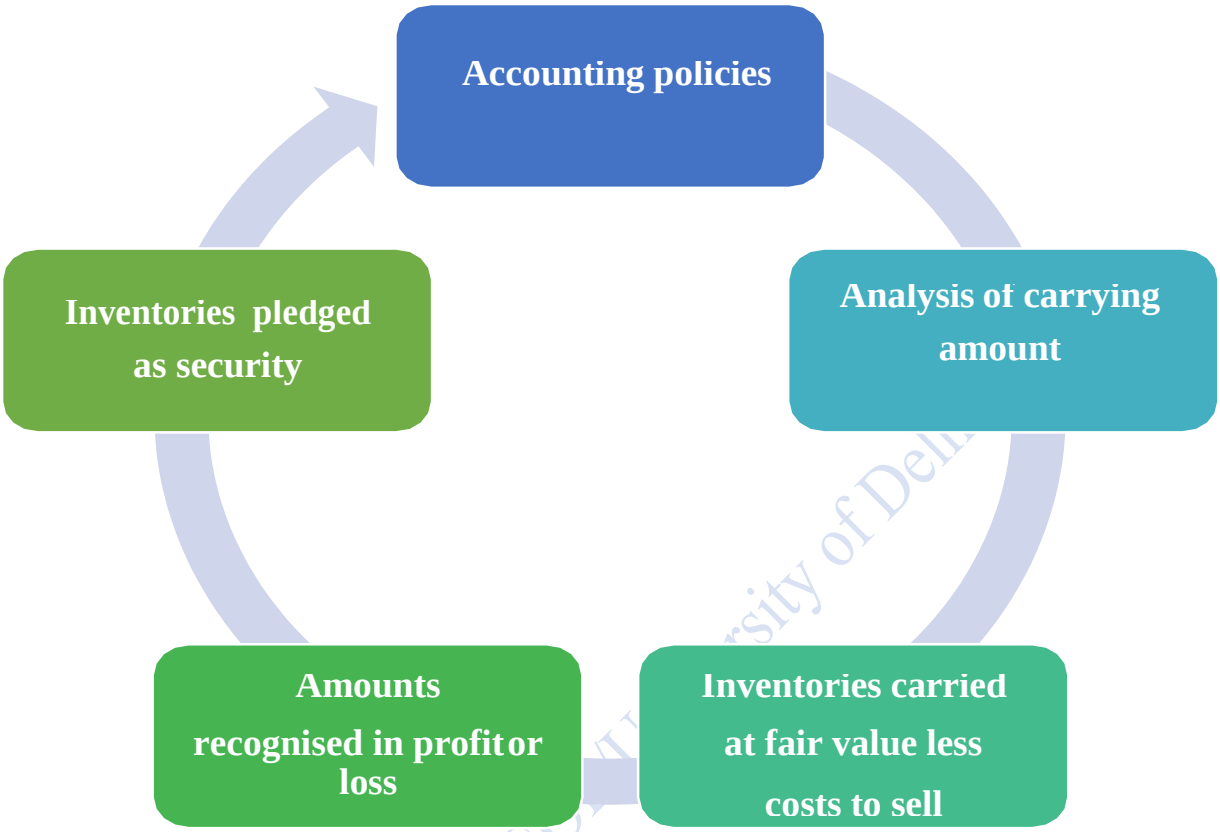

4.12 SUMMARY

Inventories are tangible items which are:

a) held for sale in the ordinary course of business (Finished Goods)

b) held in the process of production for further processing so that they can be sold as finished goods (Work in progress)

c) in the form of raw materials or consumable supplies to be consumed or utilized in the production process or rendering of services to customers.

Net realisable value is the estimated selling price of the goods in the ordinary course of business - Estimated costs of completion (if the goods are not ready for sale as such) - Estimated selling costs (such as distribution expenses, selling commission or transportation expenses).

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Fair value is the selling price of same or identical inventory in the principal (or most advantageous) market place between market participants (in an orderly transaction) at the date of measurement.

Inventories or closing stock shall be valued (at the end of each accounting period) at the lower of:

1. cost of inventory
2. Net realizable value

Disclosures to be made in financial statements with respect to Inventory:

1. Accounting Policies
2. Inventories pledged as Security
3. Detailed analysis of carrying amount into its components
4. Amounts recognized in the Statement of profit or loss

4.13 SELF-ASSESSMENT QUESTIONS

1. Explain the meaning of Inventory.
2. What are the objectives and Scope of IND AS 2?
3. What are the different classification of Inventory?
4. Differentiate between Net Realisable Value and Fair value.
5. Explain the following term:
   i. Net Realisable Value
   ii. Fair Value.
6. Explain the situations when the Inventories are required to be written down to their Net Realisable Value.
7. State the circumstances when the written down to Net Realisable Value is to be reversed.
8. What are the disclosures to be made in the Financial Statements with respect to Inventory?

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4.14 SUGGESTED READINGS

Latest editions of the following text books to be used:

9. Narayanaswamy R. Financial Accounting: A Managerial Perspective. PHI Learning Pvt. Ltd., Delhi

10. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.

11. Garg CA Kamal, and Sehrawat Neeraj Kumar. Beginner`s Guide to Ind AS & IFRS. Bharat Law House Pvt. Ltd., New Delhi

12. Maheshwari S. N., Maheshwari Sunil K., and Maheshwari Sharad K, An Introduction to Accountancy, Vikas Publishing House Pvt. Ltd.

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LESSON 5

ANALYSIS OF ACCOUNTING INFORMATION

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STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 Understanding Accounting Ratio and Analysis of Accounting Ratios
5.4 Expressing Accounting Ratios in different Forms
5.5 Objectives of Ratio Analysis
5.6 Significance of Ratio Analysis
5.7 Limitations of Ratio Analysis
5.8 Types of Ratios
5.9 Liquidity (Short-term Solvency) Ratios
5.10 Solvency Ratios
5.11 Activity Ratios
5.12 Profitability Ratios
5.13 Summary
5.14 Glossary
5.15 Self-Assessment Questions
5.16 Suggested Readings

5.1 LEARNING OBJECTIVES

After reading this lesson, students will be able to understand:

- The concept of Ratio and Ratio Analysis

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- Forms of expressing ratios
- Significance of Ratio Analysis
- Liquidity Ratios
- Long term Solvency Ratios
- Profitability ratios
- Activity ratios

5.2 INTRODUCTION

The users of financial statements (shareholders/owners/investors, management, employees, lenders, competitors, government and regulatory agencies, auditors, etc.) are always interested in understanding and interpreting the meaning of financial information contained in the financial statements, which is possible only by understanding the relationships between various financial variables contained in balance sheet and statement of profit and loss. Such analysis is known as the **Accounting Ratio Analysis**.

Ratios analysis helps in identifying the patterns and trends in income, expenses, sales growth and helps to predict the future financial position and results (profit or loss).

5.3 UNDERSTANDING ACCOUNTING RATIO AND ANALYSIS OF ACCOUNTING RATIOS

Ratio: It is a mathematical expression of indicating relationship between two interdependent quantities which can be financial items or variables in the financial statements or two accounting figures.

Accounting Ratio: when ratio is calculated between two financial or accounting variables on the basis of information given in the financial statements, balance sheet, profit and loss account such as profit, sales, assets, liabilities, debtors, creditors, etc.

Accounting Ratio Analysis: it the mechanism of studying relationship among various financial variables (such as profit, sales, assets, liabilities, debtors, creditors) with the help of accounting ratios. It is a process of determining and interpreting relationships between financial variables given in the financial statements to obtain an understanding of trends and making future predictions of the financial performance and position of a business enterprise.

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5.4 EXPRESSING ACCOUNTING RATIOS IN DIFFERENT FORMS

Accounting ratios can be expressed in the following forms:

1. **Pure:** ratio is expressed as a quotient such as current ratio, quick ratio, etc.
2. **Percentage:** ratio is expressed in the form of percentage such as net profit ratio, gross profit ratio, return on investment, etc.
3. **Times:** ratio is expressed in number of times a financial variable in terms of another financial variable such as debtors turnover ratio, creditors turnover ratio, inventory turnover ratio etc.

5.5 OBJECTIVES OF RATIO ANALYSIS

Ratio analysis is done with the following objectives:

1. Making understanding of financial information presented in the financial statement very simple and precise.
2. Facilitating determination of both liquidity and long-term solvency of the business enterprise.
3. Assists in determining the operating efficiency.
4. Facilitating analysis of profitability.
5. Comparative study which can be either intra-firm (of the same entity over different periods) or inter firm (from one entity to another) comparisons.

5.6 SIGNIFICANCE OF RATIO ANALYSIS

Ratio Analysis offers the following advantages:

1. **Determining Operating Efficiency:** ratio analysis helps in assessing and evaluating liquidity (short term solvency), solvency and profitability of a business enterprise.
2. **Inter-firm comparison and Intra-firm comparison of performance:** When performance is compared with performance other business organisations in the same industry, it is called Inter-firm Comparison. While, if the performance of same organisation over different years is compared or performance of different divisions or segments within the same organisation is compared, it is called Intra-firm Comparison. Accounting ratios facilitates both inter firm and intra-firm comparisons.
3. **Helps in Analysis of Financial position and performance:** Through ratios users of financial information can analyse the financial statements to know financial position and performance of a business enterprises. There are many stakeholders such as

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bankers, regulators, investors, tax authorities, creditors, owners, management, etc. who are interested in knowing the financial performance and position of the business enterprise.

4. **Helps in making Forecasts:** Accounting ratios helps to identify the trends in financial performance or activities of the organisation which helps in future planning and forecasting.

5. **Simplifies Accounting Information:** Ratios summarises the results of detailed and complicated information in a very precise manner.

6. **Spotting/locate Weak Areas:** Accounting ratios can be used to locate the weak areas where the business is not performing well as compared to past years or others in the industry. Therefore management can take prompt corrective actions to improve the performance in those areas.

5.7 LIMITATIONS OF RATIO ANALYSIS

Besides many advantages, ratio analysis suffers from the following disadvantages

1. **No Standard Ratio:** There is no benchmark against which actual ratios can be compared determine whether a ratio is favourable or adverse.

2. **Reliability issues:** Ratios are calculated on the basis of information given in the financial statement which is not futuristic but relates to past only, further if the information available is not then ratios will be incorrectly calculated. Therefore, one cannot completely rely on ratios to make any future economic decisions.

3. **Qualitative Aspects are ignored:** Ratios considers only quantitative factors and all the qualitative factors such as efficiency of management, customer satisfaction level, etc. are ignored, which are also to be considered future decision making.

4. **Incomparable in case of different Financial Reporting Framework:** Different entities within the same industry may follow different Financial Reporting Framework having different policies and procedures for preparing and presenting financial statements. Due to which amount of financial items such as sale, profit, current assets, etc. would also differ. Thus, accounting ratios of different business organisation cannot be compared as they based on information derived from different accounting policies and methods.

5. **Ignores changes in Price Level:** Since accounting is based on the historical cost concept, the assets are carried at historical cost minus accumulated depreciation and not on their current market value prevailing in the relevant market.

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6. **Scope for Manipulations and Window Dressing:** Accounting cannot prevent the inherent risk of window dressing by the internal management to modify the financial performance and position to gain undue advantage at the cost of users, thus manipulative information will make ratios inaccurate leading to incorrect calculation of ratios affecting the economic decisions taken on the basis such incorrect ratios.

7. **Personal Judgement:** Since, recording of transactions and events, preparation of financial statements is largely influenced by personal judgments of management. Therefore, accounting ratios calculated on the basis of such information on comparable and are biased.

5.8 TYPES OF RATIOS

Ratios are classified into the following types:

1. **Liquidity or Short-term solvency ratios:** These are the ratios which are concerned with evaluating the ability of a business organisation to meet its short-term financial obligations or current liabilities (which are to be settled within normal operating cycle or 12 months from the reporting date) on time. It includes the following ratios:

    1. Current Ratio (which relationship between Current Assets and Current Liabilities)
    2. Liquid Asset/ Acid Test/ Quick Ratio (relationship between liquid or Quick Assets and Current Liabilities)

2. **Solvency or long-term solvency ratios:** These are the ratios which are concerned with evaluating the long-term financial leverage and solvency of the business organisation. They depict the ability of business to repay the long-term financial obligations such as debentures, long term bank loan, public deposits. It includes the following ratios:

    1. Debt to Equity or Debt Equity Ratio (DE) (relationship between shareholders' funds and debt)
    2. Total Assets to Debt Ratio (relationship between total assets and debt)
    3. Proprietary Ratio (relationship between shareholders fund and total assets)
    4. Interest Coverage Ratio (relationship between interest and earnings before interest)

These ratios are concerned with assessment of capital structure, sources and application of funds.

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3. **Activity/Turnover ratios:** These are the ratios which are concerned with evaluating how efficiently the entity has utilised the resources in the business operations. It includes the following ratios:

   1. Inventory Turnover Ratio (relationship between cost of revenue from operation and average inventory)
   2. Debtor/Trade Receivables Turnover Ratio (relationship between net credit sales or credit revenue from operations and Average Trade Receivables)
   3. Creditor/Trade Payables Turnover Ratio (relationship between net credit purchases and Average Trade Payables including creditors and bills payable)
   4. Working Capital Turnover Ratio (relationship between net sales and working capital)

4. **Profitability:** These are the ratios which are concerned with evaluating the earning capacity of the business organisation as a return on the resources used. It includes the following ratios:

   1. Gross Profit Ratio (relationship between Gross profit and sales)
   2. Operating Ratio (relationship between operating cost and sales)
   3. Operating Profit Ratio (relationship between operating profit and sales)
   4. Net Profit Ratio (relationship between net profit and sales)
   5. Return on Investment (relationship between profit and capital employed)

5.9 LIQUIDITY (SHORT-TERM SOLVENCY) RATIOS

Liquidity ratios are concerned with determining the ability to meet its short-term financial obligations or current liabilities (which are to be settled within normal operating cycle or 12 months from the reporting date) on time. It includes the following ratios:

1. **Current Ratio:** It is a ratio which is concerned with explaining the relationship between the current assets and current liabilities.

It evaluates the ability of a business organisation to meet or settle its short-term financial obligations or current liabilities on time from the realisation of current assets. It is expressed in the form of pure ratio.

Current ratio can be expressed as follows:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

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Ideal or acceptable Current Ratio is 2: 1, current assets must be at least double the amount of current liabilities so as to provide a sufficient cover for current liabilities.

High Current Ratio indicates better liquidity however very high current ratio indicates poor credit worthiness among the suppliers and creditors and poor operational efficiency.

Current Assets: these are the assets which are expected to be utilised, realised or converted into Cash and Cash Equivalents within normal operating cycle or within 12 months from the reporting date whichever is higher. It includes:

1. Short-term loans and advances
2. Current Investments (shares and securities of other entities)
3. Inventories (excluding Loose Tools and Stores and Spares) in the form of raw material, work in progress, finished goods, stock in trade
4. Trade Receivables (sum of bill receivables and sundry debtors)
5. Cash and Cash Equivalents (credit balance in current account with bank, cash in hand, time deposits of upto three months, cheques/drafts in hand and other marketable securities)
6. Other Current Assets (advance given to suppliers of raw material, prepaid expenses, accrued interest, etc.)

Current Liabilities: these are the liabilities which are expected to be settled or repayable through outflow of economic resources within 12 months from the reporting date or within the period of normal operating cycle. It includes:

1. Short-term borrowings (short term bank loans, cash credit, bank overdraft)
2. Short-term provisions (provision for discount on debtors, provision for income taxation, provision for doubtful debts, etc.)
3. Trade Payables (sum of bills payable and sundry creditors)
4. Other Current Liabilities (not included in the above categories)

Other Current Liabilities includes the following:

- Current maturities of long term loans or borrowings
- Accrued interest (earned) but not due and not received
- Interest accrued and due (earned but not received)
- Outstanding expenses (outstanding salary, outstanding rent, etc.)
- Unpaid dividend
- Calls-in- advance (advance received for call money on shares), etc.

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Operating Cycle: It is the time span between the acquisition of resources (raw material, stock in trade, labour) for processing or production of goods and their conversion into Cash and Cash Equivalents after sale and receipt of cash from debtors.

Note: If the normal operating cycle cannot be determined or not given in the question, then take it as 12 months for classifying assets and liabilities as current and non-current.

Working Capital: The amount of capita which is used in meeting day to day expenses and payment to suppliers. It refers to amount by which Current Assets exceeds Current Liabilities.

Formula for Working Capital is given as:

Working Capital = Current Assets - Current Liabilities

Example: From the following information calculate Current Ratio:

Particulars	**Amount**	**Particulars**	**Amount**
Debtors	3,60,000	Bills Payable	40,000
Insurance (prepaid)	80,000	Creditors	2,00,000
Cash at bank	1,00,000	Long term bank loan	8,00,000
Treasury bills	1,00,000	Raw material	1,60,000
Plant and machinery	10,00,000	Outstanding salary	1,60,000

Solution:

Current Assets = Debtors + Insurance (prepaid) + Cash at bank + Treasury bills + Raw material

= 3,60,000 + 80,000 + 1,00,000 + 1,00,000 + 1,60,000

= 8, 00,000

Current Liabilities = Bills Payable + Creditors + Outstanding salary

= 40,000 + 2,00,000 + 1,60,000

= 4,00,000

Current ratio = Current assets/Current liabilities

=8,00,000/4,00,000

=2:1

Here current ratio is equal to the ideal current ratio

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2. **Quick or Liquid ratio or Acid Test Ratio:** This ratio is concerned with evaluating the current ability of the business organisation to meet its short-term financial obligations or current liabilities which arises within normal operating cycle or 12 months from the reporting date. It studies the relationship between liquid assets and current liabilities. It a better, more prudent and strict indicator of liquidity or short term solvency as compared to the current ratio because it does not takes into account blocked assets such as prepaid expenses and inventory which cannot be used to pay the current liabilities. It is expressed in the form of a pure ratio.

   Liquid or Quick Ratio or Acid test Ratio

   $$= \frac{\text{Liquid or Quick Assets (Current Assets- Prepaid expenses- Inventory)}}{\text{Current Liabilities}}$$

   Idle Ratio: 1: 1, liquid assets must be at least equal to amount of current liabilities to make their payment on time.

Liquid Assets: These assets are more liquid as compared to current assets and constitutes mainly Cash and Cash Equivalents or assets which can be converted into Cash and Cash Equivalent within the normal operating cycle or 12 months whichever is higher.

Liquid Assets or Quick Assets = Current Assets- Prepaid expenses- Inventory.

Prepaid expenses and inventory are deducted from current assets to obtain the amount of liquid assets because inventories takes time in production and sale to convert in cash and cash equivalents after recovery from trade receivables and prepaid expenses are already been paid to outsiders and cannot be used to pay the outsiders and cannot be readily converted into cash.

Liquid Assets includes the following assets:

- Short-term Loans and Advances,
- Current Investment (into the shares and securities of other entities),
- Trade Receivables (sum of sundry debtors and trade receivables),
- Cash and Cash Equivalents (cash in hand, credit balance in current account at bank, time deposits of up to three months, cheques/drafts in hand and other marketable securities),
- Other Current Assets other than Prepaid Expenses.

Example:

Consider the following information:

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Current Assets 12,00,000; Inventories 2,40,000; Working Capital 10,08,000. Determine Quick Ratio.

Solution:

We know that, Quick Assets = Current Assets- – Inventories (other than loose tools and spares) - prepaid expenses

= 12,00,000 - 2,40,000- 0

= 9,60,000

Current Liabilities = Current Assets- Working Capital

= 12,00,000-10,08,000 = 1,92,000

Quick Ratio = Quick Assets or Liquid Assets / Current Liabilities

=9,60,000/1,92,000 = 5:1

Current Ratio vs. Quick Ratio:

Basis of Distinction	**Current Ratio**	**Quick Ratio/Liquid Ratio/Acid test Ratio**
Relationship	Between Current Assets and Current Liabilities.	Between the Liquid Assets/Quick Assets and Current Liabilities.
Evaluation	Shows ability to pay current liabilities out of current assets which are to be settled within a period of 12 months from the reporting date 931st March) or within the period of normal Operating Cycle whichever is higher.	Ability to meet Current liabilities immediately out of liquid assets.
Ideal Ratio	Ideal Ratio is 2:1.	Ideal Ratio is 1:1.
Measure	The short-term financial position or liquidity.	Better and more prudent than Current Ratio as it excludes blocked current assets such as inventory and prepaid expenses.

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5.10 SOLVENCY RATIOS

Solvency Ratios are also known as Long term liquidity ratios as these are concerned with assessment of capital structure, sources and application of funds.

These are the ratios which are concerned with evaluating the long-term financial leverage and solvency of the business organisation. They depict the ability of business to repay the long-term financial obligations such as debentures, long term bank loan, and public deposits. It includes the following ratios:

1. Debt to Equity or Debt Equity Ratio (DE) (relationship between shareholders' funds and debt)
2. Total Assets to Debt Ratio (relationship between total assets and debt)
3. Proprietary Ratio (relationship between shareholders fund and total assets)
4. Interest Coverage Ratio (relationship between interest and earnings before interest)

Debt-to Equity Ratio: This ratio is widely used in the industry and is concerned with analysing the relationship between borrowed funds or long-term external debts (includes long-term loans, debentures, public deposits and long-term provisions) and Owners' fund or Equity (Proprietary funds / Equity/Shareholders' Funds consisting of share capital and reserves and surplus).

It determines the capital structure-the mix of outside debts (borrowed funds) and owner's funds invested in the total resources of the organisation. It assesses long-term financial soundness of the business enterprise and indicates dependency of business enterprise on external borrowed funds for financing its resources. It is expressed in the form of Pure Ratio.

$$\text{Debt to Equity Ratio} = \frac{\text{Debt (Non-current liabilities)}}{\text{Equity (Shareholder's Funds)}}$$

Debt includes the following items:

1. Long term Borrowings (debentures, public deposits, loans from bank)
2. Long term Provisions (provision for Gratuity, leave encashment)
3. Deferred tax Liabilities
4. Other Non-Current liabilities

Long term Borrowings:

- These are the borrowings that are due to be settled beyond 12 months from the reporting date (31st March) or after the operating cycle period whichever is higher.

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- Part of Long Term Borrowings payable within 12 months from the reporting date or normal operating cycle period whichever is higher, then such borrowing is termed as 'Current Maturities of Long Term Debts' shown under the head Current Liabilities and will not be considered as Debt while calculating Debt to Equity ratio.

Long term Provisions: These are the provisions for liabilities to be settled after 12 months from Balance Sheet date or normal Operating Cycle period whichever is higher. These are shown as line item under the head Non-current liabilities in the balance sheet.

Debt = Long-term Borrowings + Long-term Provisions+ deferred tax liabilities + other long term liabilities

Or

= Total of Equity and liabilities – Non current liabilities -Current Liabilities

Or

= Capital Employed – Equity (shareholders fund)

Equity = Share Capital + Reserves & Surplus

Capital Employed = Non-Current liabilities + Shareholder fund (Share Capital + Reserves and Surplus)

Non-Current Assets = Tangible Fixed Assets (Property Plant Equipment) + Intangible Fixed Assets + Non-Current Trade Investments + Deferred tax Assets + Long-term Loans and Advances + Other Non-Currents Assets.

Working Capital = Current Assets – Current Liabilities

Note: If there exists Negative Balance of profit in Statement of Profit & Loss under Reserves and Surplus is deducted from Reserves and Surplus to calculate the Shareholders' Funds.

Example: Consider the following information:

Particulars	**Amount**
Property Plant and Equipment	16,80,000
Accumulated Depreciation on Property Plant and Equipment	2,80,000
Non-current Investments in shares and securities	28,000
Long-term Loans and Advances to related parties	1,12,000

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Current Assets	7,00,000
Current Liabilities	5,60,000
16% Long-term Borrowings	8,40,000
Long-term Provision for gratuity	2,80,000

Determine Debt to Equity Ratio

Solution:

Debt = 16% Long-term Borrowings + Long-term Provision for gratuity

= 8,40,000+2,80,000 = 11,20,000

Equity = Total Assets - Total external Debts

= (16,80,000 -2,80,000+28,000+1,12,000+7,00,000) -(4,20,000-1,40,000 -2,80,000)

= 5,60,000

Debt /Equity Ratio = Debt (Non-Current Liabilities)/Equity (Shareholders Funds)

=11,20,000/5,60,000=2:1

Total Assets to Debt Ratio: It is the ratio which is concerned with explaining relationship between total assets (Current as well as Non-Current) and Non-Current Liabilities of the business enterprise.

It determines the proportion to which payment of Long term debt or borrowing is covered by the total assets both current and non-current assets. It calculates the 'Safety Margin or cover' available to the lenders or outside debt holders to recover their debts.

A high total assets to debt ratio indicates higher safety margin for lenders and vice versa. It is expressed in the form of a Pure Ratio.

Formula for Total Assets to Debt Ratio is given as follows:

$$\text{Total Assets to Debt Ratio} = \frac{\text{Total Assets (Non-current Assets + Current Assets)}}{\text{Debt (Long-term Debts)}}$$

Total Assets: These include both Non-current and Current assets which are as follows:

Non-Current Assets: This includes the following assets:

- Fixed assets or Property Plant and Equipment and Intangible Assets (tangible and intangible fixed assets, capital work in progress, intangible assets under development)
- Non-Current Investments (in shares and securities of other entities)
- Deferred Tax Assets (net of Deferred Tax Assets and Deferred Tax Liabilities)

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- Long term Loans and Advances
- Other non-current assets (not included in above)

Current Assets: This includes the following assets:

1. Current Investments (in shares and securities of other entities)
2. Inventories (including spare parts and loose tools)
3. Trade Receivables (sum of sundry debtors and trade receivables)
4. Cash and Cash Equivalents (cash in hand, credit balance in current account with bank, time deposits of up to three months, cheques/drafts in hand and other marketable securities)
5. Short-term Loans and Advances (advance or loan given to directors, managers, employees)
6. Other Current Assets (such as prepaid insurance, prepaid rent, etc.)

Debts: This will include:

1. Long-term Borrowings
2. Deferred Tax liabilities
3. Long-term Provisions
4. Other non-current liabilities

Proprietary Ratio: this ratio is concerned with explaining the relationship between proprietor's fund (Shareholders' Funds or Equity) and total assets of the business enterprise showing the financial strength and financial risk or leverage of the business. It shows the proportion of total assets funded by the shareholders' money in the form of shareholders' funds. Lenders and banks use it identify the portion of shareholders' funds and external borrowed funds in the total assets employed to measure safety margin or cover available to them against their funds invested in the form of loans.

A very high Proprietary ratio indicates that management is not using the concept of trading on equity and there is improper mix of owner' funds and borrowed funds leading to lower return on investment to equity owners. However it indicates the safety margin for creditors and lenders while, lower ratio means inadequate cover for lenders of funds.

$$\text{Proprietary Ratio} = \frac{\text{Proprietor's Funds or Shareholders' Funds or Equity}}{\text{Total Assets (Current Assets + Non-Current Asset)}}$$

Proprietors' Funds/ Shareholders' Funds: This can be calculated using two approaches:

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1. **Liabilities Approach:** In this approach,

   Proprietors' funds = Share Capital (Equity Share Capital+ Preference Share Capital) + Reserves and Surplus (General Reserve, Securities Premium reserve, credit balance of Surplus).

2. **Assets Approach:** In this approach,

   Proprietors' funds = Non-current Assets + Working Capital (Current Assets – Current Liabilities) – Non-current Liabilities.

Interest Coverage Ratio: This is the most popular ratio used in the industry by professionals, credit rating agencies as it explains the relationship between Net Income before Interest and Tax and Interest on Long Term borrowings or other fixed financial charges. It evaluates profit available to provide as cover against fixed financial service obligations or interest on long term debts including preference dividend. It is expressed in number of times.

A high Interest Coverage Ratio provides a signal of high cover of profit to meet the interest payments, thereby creating a confidence among the lenders about the financial strength and earning capacity of the entity.

Formula for Interest Coverage Ratio is given as:

$$\text{Interest Coverage Ratio} = \frac{\text{Profit before Interest and Tax}}{\text{Interest on Long-Term Debt + Preference Dividend}}$$

5.11 ACTIVITY RATIOS

Inventory Turnover Ratio (ITR):

a. It shows relationship between Cost of Goods Sold and Inventory.

b. It determines whether the investment in stock is efficiently utilised to generate sales.

c. It depicts the number of times a business organisation sells and replaces its inventory during a year.

d. A high ratio indicates more sales per rupee of investment in the inventories.

$$\text{ITR} = \frac{\text{Cost of Revenue from Operations (Cost of Goods Sold)}}{\text{Average Inventory (Opening Inventory + Closing Inventory)}}$$

Calculation of Cost of Revenue from Operations or Cost of Goods Sold:

In case of a trader:

Cost of Revenue from Operations = Opening Inventory+ Net Purchases (Purchases-Purchase

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return) + Direct Expenses (Carriage Inward + Wages) - Closing Inventory

In case of a Manufacturer:

Cost of Revenue from Operations = Cost of Raw Materials Consumed + Purchases of Stock-in-Trade + Changes in Inventories of Finished Goods, Work in Progress & Stock- in-Trade + Direct Expenses (Carriage Inward + Wages)

Direct Expenses: if no direct expenses are given in question, then assume it to be nil.

Average Inventory: (Opening Inventory + Closing Inventory) ÷ 2

Example: Consider the following information:

Revenue from Operations: 32,00,000

Average Inventory: 4,40,000

Gross Loss Ratio 10%

From the above information, calculate Inventory Turnover Ratio

Solution:

Gross Loss = Cost of Revenue from Operations (Cost of Goods Sold) - Revenue from Operations (sales)

Cost of Revenue from Operations = Sales +Gross Loss

= 32,00,000+1,60,000

= 33,60,000

Inventory Turnover Ratio = Cost of Goods Sold /Average Inventory

= 33,60,000/4,40,000 = 7.64 times

Example: Consider the following information:

Particulars	Amount in Rs.
Sales	8,00,000
Gross Profit	2,00,000
Closing stock	2, 40,000
Excess of Closing Inventory over Opening Inventory	80,000

Calculate Inventory Turnover Ratio from the above information.

Solution:

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Sales	= 8,00,000
Gross Profit	= 2,00,000
	= Sales − Gross Profit
	= 8,00,000 − 2,00,000
Cost of Goods Sold	= 6,00,000
Let Opening Inventory	= x
Closing Inventory	= x + 80,000
2,40,000	**= x +** 80,000
x	= 1,60,000
Opening Inventory	= 1,60,000

Average Inventory= (1, 60,000+2,40,000)/2

Average Inventory= 2,00,000

Cost of Goods Sold = Revenue - Gross Profit

Cost of Goods Sold = 8,00,000 - 2,00,000=6,00,000

Inventory turnover Ratio (ITR) = Cost of Goods Sold or Cost of revenue from operation/Average inventory

ITR = 6,00,000/2,00,000

Inventory turnover Ratio = 3 Times

Example: Consider the following financial information of Abhishek limited:

Particulars	**2021-22**	**2022-23**
Closing Inventory on 31st March	14,00,000	34,00,000
Sales during the year	1,00,00,000	1,50,00,000

Gross Profit is 25% on Cost of Goods Sold

In the year 2021-22, inventory increased by 4,00,000.

Calculate the Inventory Turnover Ratio for the years 2021-22 and 2022-23 from the above information

Solution:

Gross Profit=1,00,00,000×25/125=20,00,000

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Cost of goods sold=1,00,00,000-20,00,000 =80,00,000

Opening Inventory=14,00,000-4,00,000=10,00,000

Average Inventory= (10,00,000+14,00,000)/2=12,00,000

Inventory turnover Ratio (2021-22) = 80,00,000/12,00,000

Inventory turnover Ratio (2021-22) = 6.67 Times

Gross Profit=1,50,00,000×25/125=30,00,000

Cost of goods sold=1,50,00,000-30,00,000 =1,20,00,000

Average Inventory= (14,00,000+34,00,000)/2=24,00,000

Inventory turnover Ratio (2022-23) = 1,20,00,000/24,00,000

Inventory turnover Ratio (2022-23) = 5 Times

Debtor/ Trade Receivables Turnover ratio: This is one of the most popular and widely used ratio which is concerned with explaining the relationship between Credit Revenue from Operations (Net Credit Sales) and Average Trade Receivables (Average debtors + Average bills receivable).

It shows the number of times debtors are turned over or realized in a year with respect to credit sales. I.e. how efficiently and readily trade receivables are realised or converted into Cash and Cash Equivalents It indicates the efficiency in recovery and collection of cash from debtors.

A higher ratio indicates that debts are collected more frequently and strict credit policy as less credit period is involved or less investment in debtors is blocked.

Formula for Trade Receivable Turnover Ratio (DTR) is given as:

$$DTR = \frac{\text{Credit Revenue from Operations (Credit Sales)}}{\text{Average Trade Receivables (Average debtors + Average bills receivable)}}$$

It is expressed in Times

Note 1: Note: provision for doubtful debts is not to be deducted from sundry debtors.

Credit Revenue from Operations (Net Credit Sales) = Credit Sales – Sales Return

Or

= Revenue from Operations – Cash Revenue from Operations

Average Trade Receivables = (Opening Trade Receivables + Closing Trade Receivables)/2

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Average Trade Rec. = (Opening Debtors + Closing Debtors + Opening B/R + Closing B/R)/2

Example: Consider the following information:

Closing Trade Receivables 8,00,000

Cash Sales being 25% of Credit Sales

Excess of Closing Trade Receivables over Opening Trade Receivables 4,00,000;

Revenue from Operations or Net Sales 30,00,000.

Calculate Trade Receivables Turnover Ratio from the above information.

Answer:

Let Credit Sales be	= *x*
Cash Sales	=25% of Credit Sale
	=x×25/100
Cash Sales	=25x/100
Total Sales	= Cash Sales + Credit Sales
30,00,000	=25x/100+x
Or, 125x/100	=30,00,000
Or, x	=30,00,000×100/125=24,00,000
Opening Trade Receivables	= Closing Trade Receivables − 4,00,000
	= 8,00,000 − 4,00,000 = 4,00,000
Average receivables	= Opening Receivables +Closing Receivables/2
Average receivables	= (4,00,000+8,00,000)/2=6,00,000
	=Net Credit Sales/Average Trade Receivables
Trade Receivables Turnover Ratio	=24,00,000/6,00,000
	=4

Therefore, Trades Receivable Turnover Ratio is 4 Times

Debt Collection Period: It shows the average time taken in collection of cash from debtors.

$$\text{Debt Collection Period} = \frac{\text{365 Days/ 12 months}}{\text{Trade Receivables Turnover Ratio}}$$

Lower Debt Collection Period is better. It is expressed in number of days or months.

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Trade Payables Turnover Ratio:

a. It explains the relationship between the net credit purchases and trade payables

b. It indicates the number of times the trade payables are turned over as compared to credit purchases.

c. A high ratio implies that the enterprise has high credit worthiness among creditors and high bargaining power with suppliers\

d. It is expressed in Times.

$$\text{Trade Payables Turnover Ratio} = \frac{\text{Net Credit Purchases}}{\text{Average Trade Payables}}$$

$$\text{Average Trade Payables} = \frac{(\text{Opening Trade Payables} + \text{Closing Trade Payables})}{2}$$

Or

Average Trade Payables = (Opening Creditors + Closing Creditors + Opening B/P + Closing B/P) ÷ 2

Average Payment Period or Average Age of Payables:

It shows the credit period enjoyed by the enterprise in paying creditors.

$$\text{Average Payment Period} = \frac{\text{Average Trade Payables X Number of Months/Days}}{\text{Net Credit Purchases}}$$

or

$$\frac{\text{Months or Days in a Year (12/365)}}{\text{Trade Payables Turnover Ratio}}$$

Example: Consider the following information:

Opening Creditors 1,25,000

Opening Bills Payable 10,000

Closing Creditors 90,000

Closing bills Payable 5,000

Purchases 9,50,000

Cash Purchases 1,00,000

Purchases Return 45,000.

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Determine the Trade payables Turnover Ratio from the above information.

Solution:

Net Credit Purchases = Purchases – Cash Purchases – Purchase Return

= 19,00,000 -2,00,000-90,000 = 16,10,000

Average Trade Payables = (Opening Creditors & Bills payables + Closing Creditors & Bills payables) / 2

= 2,50,000 + 20,000 + 1,80,000 + 10,000/2

= 2,30,000

Trade Payables turnover ratio = 16,10,000/2,30,000 = 7 times

Example: Closing Trade Payables 10,80,000, Net purchases `86,40,000, Cash purchases `21,60,000. Calculate Trade Payables Turnover Ratio

Solution: Trade payable turnover ratio= credit purchases/ average trade payable

Trade payable turnover ratio =64,80,000 / 10,80,000= 6 Times

Credit purchases= net purchases - cash purchases

64,80,000 = 86,40,000- 21,60,000

Working Capital Turnover ratio:

a. It explains the relationship between working capital and net sales.

b. It shows the number of times a unit of rupee invested in working capital generates sales.

c. It determines whether working capital is effectively used in generating sales.

d. A higher ratio implies overtrading with less use of current assets.

Working Capital Turnover Ratio = $\frac{\text{Revenue from Operations/COGS}}{\text{Working Capital}}$

It is expressed in number of times.

Revenue from Operations:

It is the revenue earned by the company from its Operating Activities.

If Revenue from Operations is not given, then take Cost of Goods Sold.

Working Capital: = Current Assets – Current Liabilities

Consider the following information:

Cost of Revenue from Operations (Cost of Goods Sold) 10,00,000

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Current Assets 500,000

Current Liabilities 3,00,000

Determine Working Capital Turnover Ratio from the above information:

Solution:

Working Capital = Current Assets - Current Liabilities

= 5,00,000 - 3,00,000

= 2,00,000

Therefore,

Working Capital Turnover ratio = Cost of Revenue from Operations (or Cost of goods sold)/ Working Capital

= 10,00,000/2,00,000

= 5 times

Example: Consider the following financial information:

Cash Sales 10,00,000

Credit Sales 12,00,000

Sales Return 2,00,000. Current Assets 6,00,000;

Current Liabilities 2,00,000.

Determine Working Capital Turnover Ratio from the above information.

Solution:

Net Sales = Cash Sales + Credit Sales − Sales Returns

= 10,00,000 + 12,00,000 − 2,00,000 = 20,00,000

Working Capital= Current Assets - Current Liabilities

Working Capital Turnover= Net sales/ Working Capital

=20,00,000/4,00,000

= 5 Times

5.12 PROFITABILITY RATIOS

Gross Profit Ratio: It shows the relationship between the Gross Profit and Revenue from Operations (Net Sales). It shows the average gross margin on goods sold or the services

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rendered in the ordinary course of business. It indicates the efficiency with which production and/or purchase operations and selling operations are carried on. It is used fixing selling prices and determining the efficiency of trading activities.

Gross Profit Ratio= Gross Profit x 100

Revenue from Operations

It is expressed as percentage of net sales.

Gross Profit: It is calculated as follows:

Gross Profit = Revenue from Operations (i.e. Net Sales) – Cost of Revenue from Operations (COGS)

Cost of Revenue from Operations: It is calculated using the following:

Cost of Revenue from Operations = Opening Inventory (excl. Spare parts & loose tools) + Net Purchases + Direct Expenses – Closing Inventory (excl. Spare parts & loose tools)

Or

= Cost of Materials Consumed+ Purchases of Stock-in-Trade+ Change in Inventories of FG, WIP & SIT + Direct Expenses

Or

Revenue from Operations-Gross Profit

Reasons for decline or increase in Gross Profit Ratio:

Increase: This ratio increases because of the following reasons:

a. If the selling price increases and the cost of revenue from operations is constant.

b. If the Cost of revenue from operations decreases and the selling price is constant.

c. If there exists a combination of above two situations.

Decrease: This ratio decreases if the above reasons are reversed.

Operating profit Ratio: It shows the relationship between Operating Costs incurred in running the business and related Sales. It is the proportion of Cost of Revenue from Operations and Operating Expenses to Sales. It helps in determining the operational efficiency of the business. It is expressed as the percentage of Sales or Revenue from Operations that is utilized in the Operating costs.

A low operating ratio indicates higher profit margin to meet non-operating expenses such as dividend, etc. On the other hand, a high operating ratio indicates reduction in the efficiency of business operations. It is expressed as percentage of sales or revenue from operations.

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Operating Ratio = $\frac{\text{Operating Cost X 100}}{\text{Revenue from Operations (Net Sales)}}$

Operating profit Ratio = $\frac{\text{Operating profit X 100}}{\text{Revenue from Operations (Net Sales)}}$

Operating Profit = Gross Profit + Other Operating Income-Other Operating Expenses

Or

Operating Profit = Net Profit before Tax + (Non-operating Expense/Losses) - (Non-Operating Incomes)

Or

Operating Profit = Revenue from Operations -Operating Cost

Relationship between Operating Profit and Operating Ratio

Operating Ratio + Operating Profit Ratio = 100%

Net Profit Ratio: It shows the relationship between Net Profit and Revenue from Operations i.e., Net Sales. It helps in determining the operating efficiency of the business operations. It indicates the actual earnings performance of business activities.

A higher Net Profit Ratio indicates higher profitability. An increase in the ratio over the past period shows improvement in the operational efficiency. It is expressed in percentage.

Net Profit Ratio = $\frac{\text{Net Profit after Tax X 100}}{\text{Revenue from Operations i.e. Net Sales}}$

Net Profit = Revenue from Operations or Net sales – Cost of Revenue from Operations – Operating Expenses – Non-Operating Expenses + Non-Operating Income – Tax.

Return on Investment or Capital Employed: It shows the relationship between Net Profit/Earnings before interest and tax with capital employed. It measures the efficiency with which the resources are being used. It is a measure of the profitability for comparison with the other businesses in the same industry. It assesses the overall performance based on the total long term fund employed in the business. It is expressed as percentage of capital employed.

ROI = $\frac{\text{Net Profit before Interest, Tax and Dividend X 100}}{\text{Capital Employed}}$

Computation of Capital Employed: It can be computed through following two

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approaches:

1. **Liabilities Approach:** Under this approach, Capital employed is calculated by adding the following:

   i. Shareholders' Funds/Equity (Share Capital + Reserves and Surplus) and

   ii. Non-current Liabilities (Long-term Borrowings (debenture, public deposits) + Long-term Provisions + Deferred Tax Liabilities + Other Non-Current Liabilities)

Capital employed = Share Capital + Reserves and Surplus + Long-term Borrowings + Long-term Provisions + Deferred Tax Liabilities + Other Non-Current Liabilities

Note: if balance of surplus in Statement of profit and loss is negative, it is deducted to calculate Shareholders' funds.

2. **Assets Approach:** Under this approach, Capital employed is calculated adding the following:

   iii. Non-current Assets (Fixed Assets (Tangible & Non-Tangible) + Deferred Tax Asset + Non-current Trade Investments + Long-term Loans and Advances +Other Non-Current Asset)

   iv. Working Capital (Current Assets – Current Liabilities)

Capital employed = Non-current Assets+ Current Assets – Current Liabilities

5.13 SUMMARY

Accounting Ratio Analysis: It is concerned with studying relationship among various financial variables in a business with the help of accounting ratios. It is a mechanism of determining and interpreting relationships between financial variables given in the financial statements to obtain an understanding of the financial performance and position of a business enterprise.

Ratio: It is a mathematical expression of relationship between two interdependent quantities which can be financial items or variables in the financial statements or two accounting figures.

Accounting Ratio: It is a ratio which is calculated on the basis of accounting information given in the financial statements, balance sheet, profit and loss account such as profit, sales, assets, liabilities, debtors, creditors, etc.

Forms of Expressing Accounting Ratios:

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- Pure
- Percentage
- Times

Advantages of Ratio Analysis:

- Tool for analysis of Financial Statements
- Simplifies Accounting Data
- Assessment of Operating Efficiency of Business
- Assists in Forecasting
- Identifies Weak Areas
- Facilitates Inter-firm and Intra-firm Comparison

Limitations of Ratio Analysis:

- Reliability of Ratios
- Only Quantitative Factors considered
- No Standard Ratio
- Non Comparable
- Price Level Changes Ignored
- Window Dressing
- Personal Bias

Types of Ratios:

1. **Liquidity (short-term solvency):** show the ability of the enterprise to meet its short-term financial obligations. It includes:
   i. Current Ratio
   ii. Quick Ratio
2. **Solvency (long-term solvency):** assess the long-term financial position of the enterprise. They assess the ability to meet the long-term financial obligations of the enterprise. It includes:
   i. Debt to Equity Ratio
   ii. Total Assets to Debt Ratio
   iii. Proprietary Ratio
   iv. Interest Coverage Ratio

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3. **Activity/Turnover:** shows how efficiently the enterprise resources are being used for the business operations. It includes:
   i. Inventory Turnover Ratio
   ii. Trade Receivables Turnover Ratio
   iii. Trade Payables Turnover Ratio
   iv. Working Capital Turnover Ratio
4. **Profitability:** show the profitability of the enterprise. It includes:
   i. Gross Profit Ratio
   ii. Operating Ratio
   iii. Operating Profit Ratio
   iv. Net Profit Ratio
   v. Return on Investment

5.14 GLOSSARY

Capital: It is amount of resources invested by the owners into the business organisation either in the form of cash or cash equivalents or in kind or assets. The amount can be invested in the form of cash, goods, or any other asset. For Business Entity, capital is a liability towards the owners which is to be settled only in the event of closure or transfer of the business. In case of corporates it is called as share capital.

Drawings: It represents an amount of cash, goods or any other assets which the owner withdraws from business for personal use. E.g. if the life insurance premium of proprietor is paid from the business bank account, goods withdrawn for personal use. It will result in reduction in the owners' capital.

Asset: Asset is a resource controlled by the business entity from which probable future economic assets will flow to the entity by using it for generating future profits. Assets can be tangible and intangible.

Tangible Assets: are the assets which have some physical existence. They can be seen, touched and felt such as:

- Plant and Machinery
- Furniture and Fittings
- Land and Building
- Books and periodicals
- Computers and laptops

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- Vehicles

Intangible assets: Assets which have no physical existence (cannot be seen or felt although they help to generate revenue in future) and whose value is determined and restricted by the rights and expected future benefits that their possession confers upon the owner such as

- Goodwill
- Patents
- Trade-marks
- Copyrights
- Brand equity
- Industrial designs
- Other intellectual property rights, etc.

Assets can also be classified into Current Assets and Non-Current Assets.

Current Assets – Asset which satisfies any of the following:

e. It is expected to be realised in, or is intended for sale or consumption in the company's normal operating cycle,

f. It is held primarily for the purpose of being traded ,

g. It is due to be realised within 12 months after the reporting date, or

h. It is cash or cash Equivalent unless it is restricted from being exchanged or used to settle a liability for at least 12 months after the reporting date.

Current Asset includes:

- Inventory
- Trade receivables (sundry debtors and bill receivables)
- Prepaid expenses
- Current investments
- Cash and cash equivalents
- Short term loans and advances

Non-Current Assets – All other assets which are not classified as current assets are non-current assets such as:

- Plant and Machinery
- Furniture and Fittings
- Land and Building

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- Patent
- Trade-mark
- Copyright

Non-Current Liabilities – All other liabilities not classified as current liabilities shall be classified as Non-current liabilities such as:

- Debentures
- Public deposits
- Long term bank loan
- Inter corporate loans
- Long term loan from director

Internal Liability: It refers to owner's equity, i.e. all the amounts which proprietors are entitled such as:

- Capital
- General reserve
- Debenture redemption reserve
- Undistributed profits, etc.

Working capital: The assets which are held to maintain the flows of revenue from operation in the form of current assets such as:

- Cash required to pay for expenses or to the creditors
- Inventories required to smoothen production and sale
- Accounts receivables (debtors and bills receivable) to increase the sales.
- Cash at bank
- Prepaid expenses

The total of current assets constitute the working capital of a firm which is termed as Gross working capital.

Gross working capital = Total current assets = long term internal liabilities + long term debts + the current liabilities – Non current assets.

Net working capital is the excess of current assets over current liabilities. It is the amount of current assets that remain in a firm if all its current liabilities are paid. This aspect of working capital is a more realistic concept.

Working capital (net) = Current assets – Currents liabilities.

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5.15 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of Ratio and ratio Analysis
2. What are the Objectives of Ratio Analysis?
3. What is the significance of ratio Analysis?
4. Discuss the various types of Liquidity and Short term Solvency ratios
5. Write a Short Note on Debt Equity ratio, Creditors turnover Ratio and inventory turnover ratio.
6. Consider the following information of ABC ltd:

Particulars	**Amount (in Rs)**
Revenue from Operation	20,00,000
Sales Return	2,00,000
Gross Profit	3,60,000
Closing Stock	4,00,000
Excess of Closing Inventory over Opening Inventory	80,000

Calculate Inventory Turnover Ratio from the above information

7. From the following information, calculate Revenue from operation:

   Quick Ratio 2,

   Current Ratio 3

   Total Current Assets 40,00,000

   Inventory Turnover Ratio 6 Times.

   Goods are sold on 25% Profit on Sales

8. Consider the following information:

   Fixed Assets: 1,50,00,000

   Current Assets: 80,00,000

   Current Liabilities: 54,00,000

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14% Debentures: 1,60,00,000

Net Profit before Interest, Tax and Dividend: 29,00,000.

From above information, calculate:

(a) Return on Investment and

(b) Total Assets to Debt Ratio

9. From the following information, calculate Return on Investment (or Return on Capital Employed):

Particulars	**Amount**
Share Capital	10,00,000
Reserves and Surplus	5,00,000
Property Plant and Equipment	45,00,000
Long term Investments in shares	5,00,000
Current Assets	22,00,000
16% Long-term Borrowings	40,00,000
Current Liabilities	17,00,000

5.16 SUGGESTED READINGS

Latest editions of the following text books to be used:

1. Narayanaswamy R. Financial Accounting: A Managerial Perspective. PHI Learning Pvt. Ltd., Delhi

2. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.

3. Garg CA Kamal, and Sehrawat Neeraj Kumar. Beginner`s Guide to Ind AS & IFRS. Bharat Law House Pvt. Ltd., New Delhi

4. Maheshwari S. N., Maheshwari Sunil K., and Maheshwari Sharad K, An Introduction to Accountancy, Vikas Publishing House Pvt. Ltd.

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LESSON 6

CASH FLOW STATEMENT

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STRUCTURE

6.1 Learning Objectives
6.2 Introduction
6.3 Meaning of Cash Flow Statement/ Statement of Cash Flows
6.4 Objective of Cash Flow Statement
6.5 Benefits of Cash Flow Statement
6.6 Scope of IND AS 7: Statement of Cash Flow
6.7 Some Important Definitions as per IND AS 7
6.8 Cash and Cash Equivalents and Related Issues
6.9 Presentation of Statement of Cash Flows
6.10 Reporting of Cash Flows from Operating Activities
6.11 Cash Flows in Foreign Exchange or Currency
6.12 Non-Operating Inflows: Interest and Dividends
6.13 Taxes on Income and Gains
6.14 Investments in Subsidiaries, Associates and Joint Ventures
6.15 Changes in Ownerships Interests Held In Associates, Subsidiaries, Joint Ventures and Other Businesses Arrangements
6.16 Non-Cash Transactions
6.17 Summary
6.18 Self-Assessment Questions
6.19 Suggested Readings

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6.1 LEARNING OBJECTIVES

After reading this lessons, students will be able to understand:

- Concept of Cash Flow Statement
- Objective of Ind AS -2
- Significance of Cash Flow Statement and classification of activities
- Meaning of Cash and Cash Equivalents and its components
- How to prepare Statement of Cash Flows or Cash Flow Statement
- How to report Cash Flows from Operating, Investing and Financing activities
- How to treat Investments in Subsidiaries, Associates and Joint Ventures while preparing Cash Flow Statement

6.2 INTRODUCTION

Financial Statement of any company as per the Companies Act 2013 includes Balance Sheet, Statement of Profit and Loss, Cash Flow Statement and Notes to accounts. The balance sheet is a blueprint or summarized sheet of entity's financial position in the form of resources (assets) equity (shareholder's funds) and outside obligations (sources of financing resources) at a particular point of time which is the end of accounting period or reporting date (31st March of the Accounting year) and the income statement or statement of profit and loss which reflects the financial performance/results (profit or loss) during the accounting period.

The financial statements as per provisions of The Companies Act 2013 are to be prepared on accrual basis of accounting. Financial statements does not separately indicates the inflow and outflows of Cash and Cash Equivalents. It is the Statement of Cash Flows which shows the inflow and outflows of Cash and Cash Equivalents from three activities of any business organization which are: operating, investing and financing activities separately and it does not account for or considers transactions which do not involve cash receipts and payments. Cash flow statement shows how much cash and cash equivalents are generated or used by a particular activity which can be operating, investing and financing activities.

Every business organisation, whether small or big, manufacturing or trading concern or service organization requires cash for financing the operational expenses and assets for running its business and to provide funding investments in the form of mergers or acquisitions. Cash is also required to pay dividends, interest and repay loans and borrowings.

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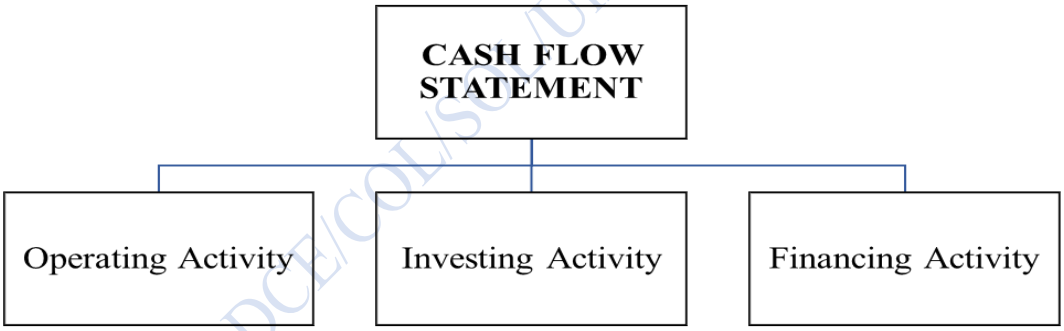
Therefore every business enterprise should generate the cash continuously to make payments.

Even Banks and Financial institutions deals with financial products, accept deposits and give loans, therefore should also generate the cash profits to make payments on time and to finance investments in new branches and launch of new products. Therefore statement of cash flow is also essential for Banks and Financial Institutions.

6.3 MEANING OF CASH FLOW STATEMENT/ STATEMENT OF CASH FLOWS

Cash flow statement or Statement of Cash Flows is a statement showing how the cash is generated by an entity during a particular accounting period and how it is applied or used by it in that period. It classifies the inflows and outflows of cash and cash equivalents in three activities:

1. Operating Activity
2. Investing Activity
3. Financing Activity



6.4 OBJECTIVE OF CASH FLOW STATEMENT

Cash Flow Statements serves the following objectives:

- To provide information on changes in cash and cash equivalents from different activities
- To evaluate the ability of the business organisation to obtain cash and cash equivalents to make payments for financial obligations
- To show the timing and certainty when Cash and Cash Equivalents can be generated or utilised in future to prepare cash budgets.

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6.5 BENEFITS OF CASH FLOW STATEMENT

Significance of Cash Flow Statement can be understand with the help of following points:

- Provides information about changes in net assets and financial structure (Liquidity and solvency)
- Provide measure on the ability to manage the Cash and Cash Equivalents.
- Assess and compare the utilization and generation of future cash flows from different activities.
- Act as a tool to compare the efficiency of different entities in the same industry.

6.6 SCOPE OF IND AS 7: STATEMENT OF CASH FLOW

Companies following IND AS based Financial Reporting Framework shall prepare Statement of Cash Flows as per IND AS 7

IND AS 7 prescribes rules and provide guidance on preparation and presentation of Statement of Cash Flow Statements showing the inflow and outflows of Cash and Cash Equivalents from operating, investing and financing activities during a particular accounting period

Statement of Cash Flows should also become an integral part of the financial statements.

6.7 SOME IMPORTANT DEFINITIONS AS PER IND AS 7

Some of the definition which are important while preparing Statement of Cash Flows are as follows:

Cash: refers to the sum cash in hand and demand deposits with banks and financial institutions which are repayable on demand.

Cash Equivalents: These includes the marketable securities or are investments which are short-term, highly liquid and can be readily converted into certain value of cash or money and are subjected to an very low risk of changes in their value due to market price fluctuations.

Cash flows: refers to both inflows and outflows of cash and cash equivalents from operating, investing and financing activities during a particular accounting period.

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Operating activities: these activities are concerned with the principal and main revenue-generating operations of the business organisation and have no relation with acquisition of fixed assets or fund raising activities.

Investing activities: these are the activities which are concerned with the acquisition, purchase or construction and sale of long-term tangible and intangible fixed assets and investments and related earning from such investments such as dividend received, rental income, and interest income.

Financing activities are activities that are concerned with raising funds, repayment of funds raised and the payment of dividend and other fixed financial charges such as interest, preference dividend, these activities are related to capital structure (size and composition of equity and external borrowings).

6.8 CASH AND CASH EQUIVALENTS AND RELATED ISSUES

Now let us understand the meaning of Cash Equivalents.

Cash Equivalents: includes the marketable securities and are investments which are short-term, highly liquid and can be easily converted into certain value of cash and are subjected to an insignificant risk of changes in their value due to market price fluctuations. Some of the point to be considered in relation to Cash equivalents are as follows:

a) **Purpose:** held for meeting short-term cash obligations rather than for long term strategic investment purposes.

b) **Liquid and insignificant price fluctuation risk:** Investments to be considered as Cash equivalents they must be readily convertible to certain amount of cash without any significant risk of changes in their value and they must have short maturity (upto three month from the date of their acquisition).

c) **Not Equity investments:** These are not considered as cash equivalents unless they have very short maturity preference shares purchased having maturity of less than three months from date of their acquisition.

d) **Bank borrowings and Bank Overdraft**: considered as outflows and inflows in financing activities. Bank overdrafts repayable on demand are considered as negative cash and cash equivalents.

e) **Cash Management:** Cash flows does not includes movements among cash or cash equivalents as these are the part of cash management (investment of excess cash in marketable securities to earn additional income) rather than operating, investing and financing activities.

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6.9 PRESENTATION OF STATEMENT OF CASH FLOWS

As per IND AS 7, the statement of cash flows shall present and report cash flows (both inflows and outflows) of Cash and Cash equivalents during the accounting period into following three categories:

i. Operating activities

ii. Investing activities

iii. Financing activities.

Let us understand each of the activities in detail:

Operating Activity: These are the principal and main revenue-generating activities of the business organisation and are not related investing or financing activities such as sale of goods in cash, receipt of cash from debtors, cash payment of salaries and rent, etc.

Some of the examples of Inflows and outflows of cash and cash equivalents from Operating activities is given below:

Cash Inflows from Operating Activity	**Cash Outflows from Operating Activity**
Proceeds from the sale of goods and provision of services in the ordinary course of business	Payments made to suppliers for purchase goods and or availing services from the suppliers
Cash receipts from incomes such as royalties, fee, interest income, commission and rent received.	Cash payment for revenue expenses such as electricity, repairs, etc. Cash payments to employees and workers in the form of salary and wages.
Cash receipts from insurance claims, refund of income tax.	Cash payments of income taxes unless they belong to financing and investing activities, cash payment of indirect taxes such GST and customs duties

Some important Issues to be considered while determining Inflows and outflows of cash and cash equivalents from Operating activities**:**

1. **Profit / Loss on Sale of Fixed Assets or Property, Plant and Equipment:** Profit / Loss on Sale of Fixed Assets is transferred to statement of profit and loss of period in which sale transaction took place. The cash flows from such sale transaction are treated as cash flows from investing activities and not operating activities.

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2. **Construction or acquisition of Investment Properties for let out purposes:** Cash payments for expenditure on Construction or acquisition of Investment Properties for held for rental to others and for resale are treated as cash flows from investment activities. However the cash receipts in the form of rent are treated also treated as cash flows from investing activities.

3. **Financial Institutions and Banks:** Financial Institutions and Banks usually holds securities and loans trading purposes same as inventory held by other business for resale in the ordinary course of business. Thus, cash flows from the purchase and sale such securities is treated as cash flows from operating activities. Similarly, cash advances and loans by Financial Institutions and Banks are treated as cash outflows in operating activities because they are considered as principle revenue generating activities.

Investing Activity: these are the activities which are concerned with the acquisition and disposal of long-term assets and investments and earning from such investments.

Some of the examples of Inflows and outflows of cash and cash equivalents from investing activities is given below:

Cash Inflows from Investing Activities	**Investing Cash Outflows in Investing Activities**
Proceeds in cash from sale of fixed assets or property, plant and equipment, intangibles or intellectual property rights and non-current assets	Cash payments to acquire or construct fixed assets or property, plant and equipment, intangibles or intellectual property rights and other non-current assets. Payment towards capitalised research and development costs.
Cash proceeds from sales of investments in equity shares or debentures of other entities and interests in subsidiaries, associates and joint ventures.	Cash payments to purchase or invest in equity or debt instruments of other entities or to invest in equity interests in subsidiaries, associates and joint ventures
Cash proceeds from the repayment of advances and loans given to directors, inter-corporate deposits.	Cash advances and loans given
Cash proceeds from derivative contracts such as such as futures, forward, option and swaps.	Cash payments for investment in derivative contracts such as futures, forward, option and swaps.

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Financing Activity: are activities that are concerned with the changes acquisition and disposal of funds and the payment of fixed financial charges, these activities are related to capital structure (size and composition of equity and external borrowings).

Some of the examples of Inflows and outflows of cash and cash equivalents from financing activities are given below:

Cash Inflows from Financing Activity	Cash Outflows from Financing Activity
Cash proceeds from issuing shares, share warrants, call money received, issue of preference shares, secured premium notes	Cash payments to buyback equity shares or Redeem preference shares;
Cash proceeds from issuing public deposits, debentures, loans, notes, bonds, mortgages, etc.	Cash repayments of loans and advances taken, redemption of debentures
Cash proceed from short-term or long-term borrowings, loans from banks, loans from related parties other corporates	Cash payment towards settlement of liability under financial lease.

6.10 REPORTING OF CASH FLOWS FROM OPERATING ACTIVITIES

Cash Inflows and Outflows arising on account of operating activities can be reported and accounted for in Statement of Cash Flows by applying one of the following two methods:

1. **Direct method:** In this method, broader groups of cash receipts and cash payments are reported showing only cash payments and receipts. No adjustments are made for increase or decrease in current assets and current liabilities, non-operating incomes and expenses, financing nature.
2. **Indirect method**: In this method, profit or loss is adjusted to account for non-cash transactions, working capital adjustments including increase or decrease in current assets and current liabilities, non-operating incomes and expenses, financing nature payments such as interest or dividend payments.

Question: Find out the cash from operations by direct method and indirect method from the following information:

Operating statement of ABC Co for the year ended 31.3.2023

Particulars Rs

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Sales	500,000
Less: Cost of goods sold	350,000
Administration & Selling Overheads	55,000
Depreciation	7,000
Interest Paid	3,000
Loss on sale of fixed asset	2,000
Profit before income tax	83,000
Income Tax	(30,000)
Profit After income tax	53,000

Balance Sheet as on 31st March

Equity and Liabilities	**2023**	**2022**
Shareholders' Funds	60,000	50,000
Non-current Liabilities	25,000	30,000
Current Liabilities		
Creditors	12,000	8,000
Creditors for Expenses	10,000	7,000
Provisions	8,000	5,000
Total	**115000**	**1,00,000**
Assets		
Fixed Assets	75,000	65,000
Investment	12,000	10,000
Current Assets		
Inventories	12,000	13,000
Debtors	10,000	7,000
Cash	6,000	5,000
Total	**115,000**	**100,000**

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6.11 CASH FLOWS IN FOREIGN EXCHANGE OR CURRENCY

IND AS 7 provides following guidance on Cash flows arising in a foreign currency:

- Cash flows arising in a foreign currency shall be accounted for by converting into in functional currency of the business organization by using exchange rate between the functional currency (currency in which entity present its financial statements) and the foreign currency prevailing at the date of the inflow or outflow of cash as the case may be.

  For example: Cash received from export sales in US $ on 15th March 2023. The company prepares the accounts in indian rupees. Exchange rate between USD and Rupee as on 15th March 2023 will be taken for translation of exports proceeds into indian rupees.

- Cash flows from foreign subsidiary (such as loan to or by subsidiary or repatriation of profits from subsidiary in foreign country) shall be converted into functional currency at the exchange rates prevailing at the date of the cash flows.

- If there is any gains and losses which are not realized and which occur due to fluctuations in exchange rates are not considered as cash flows. However, the effect of such exchange rate changes on balance of cash and cash equivalents held in a foreign currency must be accounted for in the statement of cash flows so as to reconcile the opening and closing balances of cash and cash equivalents. This amount of effect must be reported and presented separately from cash flows from operating, investing and financing activities.

6.12 NON OPERATING INFLOWS: INTEREST AND DIVIDENDS

Non-operating Cash flows such as cash flows from interest and dividends received or paid shall each be disclosed separately in the Statement of Cash Flows.

Cash flows from interest and dividends received or paid shall be classified as follows

	In case of Financing Company	**Other than financing company**
Interest Paid	Cash outflows uunder operating activities	Cash outflows under financing activities
Interest and Dividend Received	Cash inflows from operating activities	Cash inflows from investing activities

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Dividend Paid	Cash outflows under financing activities	Cash outflows under financing activities

Question:

A firm invests in a five-year bond of another company with a face value of Rs.10,00,000 by paying Rs.5,00,000. The effective rate is 15%. The firm recognises proportionate interest income in its income statement throughout the period of bond. Based on the above information answer the following question:

a) How the interest income will be treated in cash flow statement during the period of bond?

b) On maturity, whether the receipt of Rs.10,00,000 should be split between

Interest income and receipts from investment activity.

6.13 TAXES ON INCOME AND GAINS

Cash flows on account of payment or refund of taxes on income shall be separately reported and treated as cash flows from operating activities unless they can be specifically identified and attributed to financing and investing activities. However, the related tax cash flows are usually very difficult to identify and may occur in a subsequent accounting period different from the accounting period in which the cash flows relating underlying transaction occurs. Therefore, for the sake of ease taxes paid and refunds of income taxes are usually treated as cash flows from operating activities.

Cash flows arising from payment and refund of Taxes on income are classified as cash flows from operating, investing or financing activities in the statement of cash flows.

However, where it is feasible and easy to identify the taxes and refunds with individual investing, operating or financing activities, then cash flows on account of tax payment or refunds are treated as cash flows from investing or financing activity as the case may be.

For example: ABC ltd. paid an advance tax of Rs.10,60,000 during the current financial year including Rs.30,000 as tax on long term capital gains. Outflow of Rs. 10,30,000 will be treated under operating activity and outflow of Rs. 30,000 will be treated under investing activity.

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6.14 INVESTMENTS IN SUBSIDIARIES, ASSOCIATES AND JOINT VENTURES

If there is any transaction relating to investment in an associate company, joint venture or subsidiary, which is accounted as per the equity or cost method and the business which acquires interest restricts its accounting and reporting in the statement of cash flows by considering the cash flows only between itself and the investee, for instance only transactions relating to dividends and loan and advances between investor and investee are accounted for in the statement of profit and loss.

6.15 CHANGES IN OWNERSHIPS INTERESTS HELD IN ASSOCIATES, SUBSIDIARIES, JOINT VENTURES AND OTHER BUSINESSES ARRANGEMENTS

Let us consider some of the issues relating to Changes in Ownerships Interests Held in Associates, Subsidiaries, Joint Ventures and other Businesses Arrangements and how they are be dealt while preparing Statement of Cash flows:

1. If there is any transaction relating to obtaining or losing control or equity interest in Associates, Subsidiaries, Joint Ventures and other Businesses, the cash flows from such transactions shall be reported separately and treated as cash flows from investing activities.

2. Following disclosures shall be made with respect to transaction involving obtaining or losing control or equity interest in Associates, Subsidiaries, Joint Ventures and other Businesses:

    a. Amount of total consideration paid or received;

    b. Portion of the consideration paid in cash and cash equivalents;

    c. The amount of cash and cash equivalents in Associate company, Subsidiaries, Joint Ventures and other Businesses over which control is obtained or lost;

    d. Amount of the assets and liabilities other than cash or cash equivalents in Associates, Subsidiaries, Joint Ventures and other Businesses over which control is obtained or lost

3. Aggregate amount of Cash flows on account of obtaining or losing control or equity interest in Associates, Subsidiaries, Joint Ventures and other Businesses shall be

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presented separately as a single line items along with separate disclosure with respect to assets and liabilities acquired or disposed. The cash flow effects of losing control are not deducted from those of obtaining control, therefore net cash flow effect is to be reported.

4. If there is any transaction relating to changes in ownership interests in a subsidiary that do not result in a loss of control, then Cash flows arising from such transactions shall be treated as cash flows from financing activities, unless the ownership interests is held by an investment entity, where ownership interests are measured at fair value through profit or loss as per Ind AS 110.

6.16 NON-CASH TRANSACTIONS

Let us consider some of the issues relating to Non Cash transactions and how they are be dealt while preparing Statement of Cash flows:

1. Investing and financing transactions that do not involve the usage of cash or cash equivalents such as purchase of machinery by issuing shares to the vendor, conversion of preference shares into equity shares on maturity shall be not be considered while preparing a statement of cash flows as there is not inflow or outflow of cash and cash equivalents.
2. However disclosures for non-cash transactions shall be made in the financial statements so as to provide relevant information to the users.
3. Non Cash transactions do not affect cash flows however they can cast a significant influence on the capital structure and asset composition of the business
4. Some of the examples of non-cash transactions are as follows:
   a. Acquisition or purchase of assets against issue of Security instruments;
   b. Conversion of one form of security instrument into the another;
   c. Sale of goods against cancellation of a liability

6.17 SUMMARY

Cash flow statement is a statement, which shows how the cash and cash equivalents are generated and how it is applied in different activities (operating, investing and financing) by an entity during the particular accounting period.

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Cash: refers to the sum cash in hand and demand deposits with banks and financial institutions which are repayable on demand.

Cash Equivalents: are the short-term, highly liquid investments which can be readily converted into certain value of cash or money and are subjected to a very low risk of changes in their value due to market price fluctuations.

Cash flows: refers to both inflows and outflows of cash and cash equivalents from operating, investing and financing activities during a particular accounting period.

Operating activities: these activities are concerned with the principal and main revenue-generating operations of the business organisation and have no relation with acquisition of fixed assets or fund raising activities.

Investing activities: these are the activities which are concerned with the acquisition, purchase or construction and sale of long-term tangible and intangible fixed assets and investments and related earning from such investments such as dividend received, rental income, and interest income.

Financing activities are activities that are concerned with raising funds, repayment of funds raised and the payment of dividend and other fixed financial charges such as interest, preference dividend, these activities are related to capital structure (size and composition of equity and external borrowings).

6.18 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of learning. Discuss personal factors that influence learning, with suitable examples.
2. Discuss some effective methods of learning that you would like your students to practice in class and at home. Illustrate your answer with relevant examples.
3. Company has provided the following information regarding the various assets held by company on 31st March 2011. Find out, which of the following items will be part of cash and cash equivalents for the purpose of preparation of cash flow statement as per the guidance provided in Ind AS 7:

Name of Security	Additional Information
Government Bonds	5%, open ended, main purpose was to park the excess funds for temporary period
Fixed deposit with SBI	12%, 3 years maturity on 1st Jan 2014

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Fixed deposit with HDFC	10%, original term was for 2 years, but due for maturity on 30.06.2011
Redeemable Preference shares in ABC ltd	The redemption is due on 30th April 2011
Cash balances at various banks	All branches of all banks in India
Cash balances at various banks	All international branches of Indian banks
Cash balances at various banks	Branches of foreign banks outside India
Bank overdraft of SBI Fort branch	Temporary overdraft, which is payable on demand
Treasury Bills	90 days maturity

4. From the following transactions, identify which transactions will be qualified for the calculation of operating cash flows, if company is into the business of trading of mobile phones

Nature of Transactions
Receipt from sale of mobile phones
Purchases of mobile phones from various companies
Employees expenses paid
Advertisement expenses paid
Credit sales of mobile
Misc. charges received from customers for repairs of mobiles
Warranty claims received from the companies
Loss due to decrease in market value of the closing stock of old mobile phones
Payment to suppliers of mobile phones
Depreciation on furniture of sales showrooms
Interest paid on cash credit facility of the bank
Profit on sale of old computers and printers, in exchange of new laptop and printer

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Advance received from customers
Sales Tax and excise duty paid
Proposed dividend for the current financial year

5. From the following transactions taken from a private sector bank operating in India, identify which transactions will be classified as operating and which would be classified as Investing activity.

Nature of transaction paid
Interest received on loans
Interest paid on Deposits
Deposits accepted
Loans given to customers
Loans repaid by the customers
Deposits repaid
Commission received
Lease rentals paid for various branches
Service tax paid
Furniture purchased for new branches
Implementation of upgraded banking software
Purchase of shares in 100% subsidiary for opening a branch in Abu Dhabi
New cars purchased from Honda dealer, in exchange of old cars
Provident fund paid for the employees
Issued employee stock options

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6. From the following transactions taken from a parent company having multiple businesses and multiple segments, identify which transactions will be classified as operating Investing and Financing:

Nature of transaction
Issued Preference Shares
Purchased the shares of 100% subsidiary company
Dividend received from shares of subsidiaries
Dividend received from other companies
Bonus shares issued
Purchased license for manufacturing of special drugs
Royalty received from the goods patented by the company
Rent received from the let out building (letting out is not main business)
Interest received from the advances given
Dividend paid
Interest paid on security deposits
Purchased goodwill
Acquired the assets of a company by issue of equity shares (not parting any cash)
Interim dividends paid
Dissolved the 100% subsidiary and received the amount in final settlement

6.19 SUGGESTED READINGS

Latest editions of the following text books to be used:

1. Narayanaswamy R. Financial Accounting: A Managerial Perspective. PHI Learning Pvt. Ltd., Delhi
2. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.
3. Garg CA Kamal, and Sehrawat Neeraj Kumar. Beginner`s Guide to Ind AS & IFRS. Bharat Law House Pvt. Ltd., New Delhi
4. Maheshwari S. N., Maheshwari Sunil K., and Maheshwari Sharad K, An Introduction to Accountancy, Vikas Publishing House Pvt. Ltd.

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LESSON 7

RESPONSIBILITY ACCOUNTING AND DIVISIONAL PERFORMANCE MEASUREMENT

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STRUCTURE

7.1 Learning Objectives
7.2 Introduction
7.3 Responsibility Accounting
  7.3.1 Centres of control in Responsibility Accounting
  7.3.2 Advantages and Disadvantages of Responsibility Accounting
7.4 Divisional Performance Measurements
  7.4.1 Traditional Measures
    (a) Return on Investment (ROI)
    (b) Residual Income (RI)
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    (a) Economic Value Added (EVA)
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7.5 Summary
7.6 Glossary
7.7 Answers to In-text Questions
7.8 Self-Assessment Questions
7.9 References
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7.1 LEARNING OBJECTIVES

Structures with divisions are common in large organisations. Measuring the effectiveness of the divisions and their divisional managers is a crucial aspect of the head office

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management's function in these organisations. Understanding the difference between management performance and divisional performance is crucial in this situation.

This lesson discuss financial performance measurements, including how they are used to evaluate performance and their benefits and drawbacks. The objectives of the lesson are:

1. To understand the idea of responsibility centres in an organisation.
2. The benefits and drawbacks of decentralisation in a big company.
3. Describe how to assess the effectiveness of the various responsibility centres.
4. To explain the application of ROI and RI and assess their applicability.
5. To describe recently created methods of performance measurements, such as EVA and BSC.
6. Recognize how to utilise economic value added (EVA), residual income (RI), and return on investment (ROI) (EVA).

7.2 INTRODUCTION

The majority of significant businesses today are decentralising as their operations get more intricate and they expand internationally. Geographical and complex operations make management more challenging to control, therefore managers of business units are in charge of a variety of choices that the head office takes into account.

Numerous operations are carried out by large organisations in various regions. Such an organisation may be divided into various units, each of which is in charge of planning and controlling its own operations as well as some decision-making, in order to be managed successfully. A division of the corporation is the term used to describe each individual unit. The methods for evaluating and comparing divisional performance are described in this chapter.

After studying this chapter, the learner will be able to explain the role of responsibility accounting and divisional performance measurement in value creation, strategy implementation and monitoring performance to improve strategies.

7.3 RESPONSIBILITY ACCOUNTING

The term "responsibility accounting" refers to the accounting procedure that documents how well managers of responsibility centres have carried out their duties. Responsibility Accounting is an accounting system that acknowledges numerous responsibility centres and

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reflects each center's intentions and actions by allocating specific revenues and expenditures to the one with the appropriate responsibility. Therefore, the gathering, summarising, and reporting of financial data is known as responsibility accounting, and it places specific expenses, revenues, or assets of the company under the accountability of each management. The data relates to the organization's decision-making centres. It is also known as activity accounting or profitability accounting.

Responsibility accounting as defined by (CIMA) is a system of accounting that segregates revenue and costs into areas of personal responsibility in order to asses the performance attained by persons to whom authority has been assigned. Responsibility accounting can also be referred to as activity accounting. It is used to measures evaluate and monitor decentralization process.

For the purpose of performance evaluation, responsibility accounting assesses the actual and expected performance. Where decision-making authority has been delegated by senior management, responsibility accounting is appropriate. According to responsibility accounting, a manager's effectiveness should be assessed based on how successfully they handle the matters that are within their sphere of influence.

The logic underpinning responsibility accounting is that a manager's effectiveness should be assessed based on how successfully they handle the matters placed under their direct authority by upper management.

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"Responsibility accounting as a method of accounting in which cost are identified with persons assigned to their control rather than with products or functions" -Eric L. Kohler

"The basic idea behind responsibility accounting is that a manager should be held responsible for those items - only those items - that the manager can actually control to a significant extent."- Garrison & Noreen

Responsibility Centres

The main focus of responsibility accounting lies on the responsibility centres. Responsibility centre is a unit or function of an organization headed by a manager having direct responsibility for its performance. It is a sub unit of an organization under the control of a

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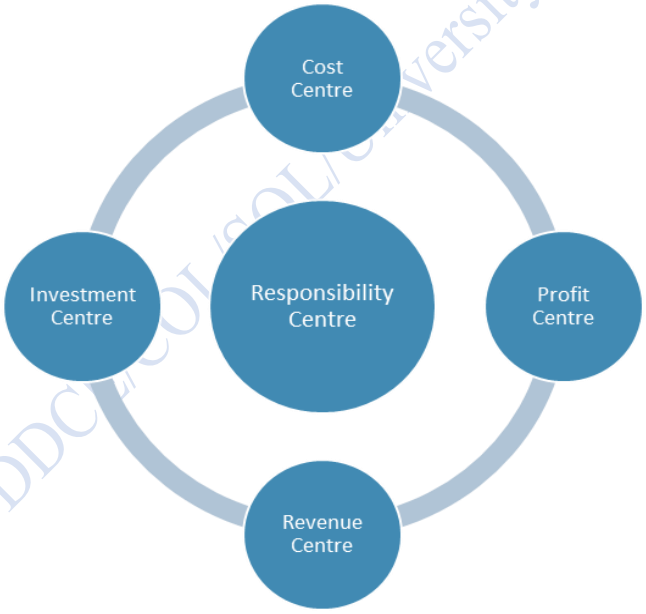
manager who is held responsible for the activities of that centre. In other words, it is a personalized group of cost centre under the control of a responsible individual.

Under this approach, the accounting system generates information on the basis of managerial responsibility, allowing that information to be used directly in motivating and controlling each manager's actions incharge of Responsibility centre. It is like a small business to achieve the objectives of a large organisation.

Based on cost allocation and profit measurement, managerial units are classified into the following:

1) Cost Centre
2) Revenue Centre
3) Profit Centre
4) Investment Centre



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7.3.1 Centres of control in Responsibility Accounting

1. **Cost or Expense Centres**

A cost centre, also known as an expenditure centre, is a division of an organisation where managers are only accountable for the costs, not the profits. It refers to determining costs for control reasons and serves as the foundation for constructing costs in-depth. So, the main

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focus of cost centre is on cost minimisation. According to CIMA's official terminology *"a production or service, function, activity or item of equipment whose costs may be attributed to cost units."*

A place, function, department, or division that allows for the estimation of costs and their relation to cost units only for control purposes is referred to as a cost centre. The foundation for creating cost records for cost monitoring, budgeting, and management is the cost centre. Functional department managers may be made accountable for their expenses and considered as cost centres, for example, the maintenance division's performance is tracked using variance analysis.

Cost centres are prevalent varieties of responsibility centres. In functional organisation styles, this degree of decentralisation is typical. The main features of the cost centres are:

- In charge of cost incurrence and control.
- Cost is used to gauge performance.
- Performance is assessed by contrasting actual and anticipated costs.
- The cost centre manager is exclusively in charge of controlled expenses.

2. **Revenue Centres**

Revenue Centers are areas of responsibility where the manager is only focused on increasing revenue and has no accountability for costs. Actual revenue is contrasted with budgeted revenue to assess performance. Monitoring sales deviations from the budget would be the main metrics used to evaluate success. A revenue centre, such as a sales centre, is a centre solely responsible for generating income.

It is a responsibility centre in which a management is only accountable for the monetary outputs or amount of revenue of a centre, but not for the price of the products or services the centre offers. In short, revenue centre is in charge of generating income. An individual sales representative or the marketing manager for a particular product line are two examples of revenue centres.

3. Profit Centres

Profit Centers are areas of responsibility where the management is in charge of both the revenue and expenses associated with the assets assigned to the division. Performance is therefore assessed as the difference between the expenses and revenues associated with a profit centre. So, a profit center's primary goal is to make money.

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Profit centre managers should be in charge of both income and expenses, which implies that there should be enough decentralisation of power within the organisation to allow managers of profit centres to decide on selling prices and output levels at those prices. It requires the existence of organisational units to which both income and costs may be assigned individually.

A profit centre is any organisational component to which expenditures and revenues are allocated so that the subunit's profitability may be calculated. The main features of the const centres are:

- Has the power and duty to make decisions that impact a division's profitability.
- Accountable for both revenue and cost.
- Performance is evaluated by contrasting predicted and actual profits.

4. Investment Centres

Profit centres do not take into account the sum of money needed to invest in order to make a profit. Investment centres act as a link between profit and the quantity of asset used to generate such profits. Investment Centers are responsibility centres where the management is in charge of making investment choices about the sale and purchase of assets, as well as the assets that produce the expenses and revenues associated with the centre.

It is a division within an organisation where the divisional manager is given certain latitude about the level of investment made by the division. Profit earned must be compared to capital invested when evaluating the center's performance. Return on Investment and residual income are two metrics used to assess an investment center's financial performance.

7.3.2 Advantages and Disadvantages of Responsibility Accounting

To enable the lowest level of management in the organisational hierarchy to control revenue and expenses, responsible accounting entails a collection of advantages realised through the use of planning budgets, cost accounting, reporting, and management tools.

The following are some of the main benefits of responsibility:

1. It offers a system of closer control.

Responsibility accounting makes use of the market-specific expertise of divisional managers. It assigns local managers the duty of deciding which trade-offs to make. It enhances and regulates the business' operational operations to provide results that are both effective and efficient.

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Through responsibility accounting, tighter cost and revenue management is made possible, and planning and decision-making are aided. So, as a management technique, it fosters "cost consciousness" among employees.

2. Delegation of power aids in establishing accountability.

Responsibility accounting exhorts management to recognise the organisational structure of the business, determine who is responsible for what, and address issues. The managers' focus and awareness are improved since they must explain the variances for which they are accountable.

Each person is given a certain amount of responsibility and is held responsible for his actions. No one can delegate their own obligation to another. This system fixes accountability on an individual basis.

3. Help in measuring each individual performance.

Individual employees feel more efficient since their work and accomplishments are evaluated. And information presentation is made possible through this mechanism. On that foundation, a framework for management performance review systems may be built in addition to inspiring managers to behave in the business' best interest.

Any fully established responsibility accounting system includes exception reporting. By comparing the accomplishments between the intended objectives and the actual outcomes it helps managers to focus on the pressing problems that require their attention.

4. Provide up to date information

Through responsibility accounting it is possible to get current and pertinent data that may be utilised to forecast future expenses and/or revenues and establish benchmarks for departmental budgets. It simplifies the form of the report and offers tips for timely reporting.

Responsibilty accounting directs management in structuring and planning the company's future income and expenses. The best method is used to define and express both personal and corporate goals. It measures performance at the divisional level and forces management to create reasonable budgets and strategies.

5. Aids in the training of aspiring managers

Managers feel themselves vital members of the organisation when accountability is outlined for each area. It enhances employees' motivation and fosters an entrepreneurial spirit. It

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encourages managers to work hard in the areas they are in charge of and promotes strong employee motivational factor.

Disadvantages of Responsibility Accounting:

The primary tenet of the responsibility accounting concept is that managing a sizable, diverse business may be effectively managed by segmenting a corporation into responsibility centres.

However, responsibility accounting has several issues like- it is difficult to introduce, it confuses division's results with manager's performance and overemphasizes on short term results.

Following are some of the main drawbacks of responsibility accounting:

1. In responsibility accounting goal congruence is challenging to organise. As separate departmental pursuits may lead to inter-departmental rivalry and it may be prejudicial to the interest of the enterprise as a whole. Managers may act in the best interest of their own, but not in the best interest of the enterprise.So, instead of enhancing organisational performance overall, more attention is paid to boosting divisional performance.
2. For responsibility accounting to be effective, a proper classification between controllable and non-controllable costs is a prime requisite. But practical difficulties arise while doing so on account of the complex nature & variety of costs.
3. Responsibility accounting cannot be used exclusively as a management control tool. It just focus management's attention on performance areas that need more inquiry.
4. In case of responsibility accounting, creating an organisational chart that clearly shows responsibility hierarchies and exercising power is a challenging endeavour. The accounting reports may be overloaded with all available information. And there is always a risk that errors made by divisional managers that senior management may be able to prevent.

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IN-TEXT QUESTIONS

1. Select the correct answer for the following multiple choice questions:
   (a) When a manager of a division is given the responsibility for or authority to make decisions that affect costs and revenues but no responsibility for investments, the division is termed as:
   (i) A Cost Centre; (ii) A Profit Centre;
   (iii) An Investment Centre; (iv) Revenue centre;
   (v) None of the above
2. Please indicate if each of the following assertions is true or false.
   a. Personalization of expenses is emphasised in responsibility accounting.
   b. In a responsibility accounting, the amount of authority delegation determines how much accountability a cost centre has.
   c. Accounts for responsibility are exclusively based on previous costs.
3. Responsibility accounting is applicable in situations where senior management has the……. power to make choices.
4. The fundamental tenet of responsibility accounting is that enormous..... businesses are challenging, if not impossible, to operate as a single unit.
5. A..... is a component of a group that raises operating expenses for a business but does not result in immediate financial gain.

7.4 DIVISIONAL PERFORMANCE MEASUREMENT

Performance measurement is a crucial tool that an organisation uses to assess the success of goals and objectives. Utilizing metrics deemed acceptable for this type of review, an evaluation is carried out to determine whether goals have been met. When evaluating performance, one (usually) compares it to a standard, such as a past accomplishment, an expectation, or the accomplishment of rivals.

It is common practise to divide an organisation into segments or divisions, which are important business units. It assign divisional managers with duty and authority. This aids in

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enhancing information availability and timeliness, contribute to the long-term strategic planning of the entire business, make decisions locally,boost the dedication and inspiration of managers in charge of each unit.

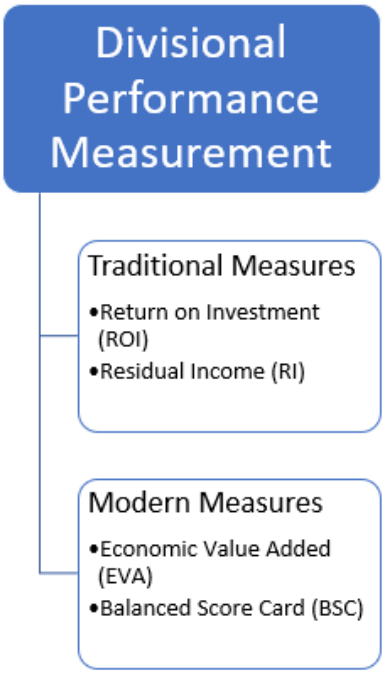
An entity's performance measurement system often matches its organisational structure. In other words, each department, group, or division recognises its contribution to the organization's overarching aim and is assessed based on this contribution.

An entity adopts an organisational structure to assist guide and manage its resources in order to accomplish its objective. It aids in defining a division's scope of power and duty. The performance of the accountable manager is evaluated based on how well the division as a whole contributes to the entity's objective. The controllable and non-controllable cost and revenue should be clearly identified for analysing divisional performance.

A divisional performance report is created with the objective to evaluate each division's performance and advice on how to price goods and services. And to determine how much is being invested in each division.This help in analyzing the general efficacy and efficiency of each division.

MEASURING DIVISIONAL PERFORMANCE

Finding out how well each section of an organisation is performing is the main goal of a responsibility accounting. The managers of the organization's various cost centres are in charge of generating an appropriate profit, which is determined by the profit center's divsion or rate of return on sales. The divisional performance is a measurement of the revenue generated by a certain divsion.



The manager of an investment centre is in charge of generating a rate of return on the assets that the division has invested in. Different metrics, such as profit on turnover, sales per employee, and sales growth, among others, are used to assess divisional success.

The most often used standards are:

1) Return on Investment (ROI)

2) Residual Income (RI)

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3) Economic Value Added (EVA)

4) Balanced Score Card (BSC)

7.4.1 Traditional Measures

Return on Investment (ROI)

Most businesses concentrate on a division's return on investment (ROI) rather than just the quantity of its earnings in absolute terms. Divisional profit is expressed as a percentage of the assets used in the division by ROI. Total divisional assets, assets under the divisional manager's management, or net assets can all be used to characterise assets employed. Since ROI is a widely used metric, it is perfect for comparing business divisions of comparable size and industry.

According to Kohler ROI is "an overall, ultimate, ratio measure of the profits achieved by a firm through its basic operations. It is considered a useful indicator of management's general effectiveness and efficiency."

Return on investment (ROI) is calculated as:

$$\text{Return on Investment} = \frac{\text{Divisional Income}}{\text{Divisional Investment}}$$

Or

$$\text{Return on Investment} = \frac{\text{Profit}}{\text{Capital employed}} \times 100$$

Or

$$\text{ROI} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital employed}}$$

For example, let's say an entrepreneur sets up a company selling products through department shop and disount outlet that it has established for operational sales.

	Department shop	**Disount outlet**
Divisonal Profit	28,000	40,000
Divisonal Investment	1,50,000	2,00,000

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From the above data, the ROIs of both businesses will be calculated as:

ROI (Department Shop) = (Divisional Profit ÷ Divisional Investment) × 100

= (28,000 ÷ 1,50,000) ×100

= 18.67 %

ROI (Disount outlet) = (Divisional Profit ÷ Divisional Investment) × 100

= (40,000 ÷ 2,00,000) ×100

= 20 %

The ROI is different for both the divisions. That implies that division with higher ROI is more successful. The discount outlet ROI (20 %) is higher than department shop ROI (18.67 %).

If all other variables remain the same, any of the following acts will boost ROI:

1) A rise in sales volume or price;

2) A fall in operating expenses; and

3) A drop in divisional investment.

The benefits of return on investment are as follows:

(a) It provides a better gauge of divisional profitability by connecting net income to investments made in the division.

(b) Other ratios that are helpful for analytical reasons can be derived from it.

(c) Because it is based on financial accounting measurement, it is simple to grasp.

(d) It is acceptable for use in interfirm comparisons as long as the businesses whose results are being contrasted are similar in size and belong to the same sector.

Over many years, it has been recognised and acknowledged that using ROI to assess a division manager's performance has limits and can lead to dysfunctional behaviours.The limitations of return on investment are as follows:

(a) It is challenging to locate satisfactory definitions of profit and investment. PBIT, PAIT, controlled profit, profit after deducting all assigned fixed expenses, and other ideas fall under the umbrella of profit. In a similar vein, the phrase "investment" can refer to a variety of concepts, including gross book value (GBV), net book value

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(NBV), historical cost of assets (HCA), current cost of assets (CCA), and assets including or excluding intangible assets (IA).

(b) A divisional manager may be influenced by ROI to only choose investments with high rates of return, that is, rates that are in line with or higher than his goal ROI. Investments that might increase enterprise value but decreasing segment ROI may be denied. Some sectors may use the available cash to sponsor initiatives that boost their return on investment at the expense of the organisation as a whole.

(c) In order to compare the ROI of various segments, it is essential that they employ comparable accounting rules and procedures for the valuation of stocks, fixed assets, apportionment of overhead, handling of R&D expenses, etc.

Residual Income (RI)

Operating profit less an interest charge based on the assets used and held by the division is known as residual income (RI). In other words, the profit that remains after deducting the cost of capital on investment is known as residual income. It is the difference between net income and the cost of capital. Profit for the business is any income received beyond the cost of capital.

The Residual Income may be calculated as:

Residual Income = Profit – (Capital Charge x Investment Centre Asset)

Residual income is defined as controllable contribution less a cost of capital charge on the investment that the divisional manager can control for the purposes of measuring the performance of divisional managers. Each division will be charged capital costs at the same rate that the company as a whole is subject to. The business will do better the more income it generates over its cost of capital.

Managers wanted an absolute metric, such as residual income, to get beyond the limits of return on Investment (ROI) measurements. The residual income strategy can be utilised to get around some of the problematic effects of ROI. There is a higher likelihood that managers will be encouraged to act in the company's best interests as well as their own if residual income is utilised to gauge the managerial performance of investment centres.

Let us suppose, the information relating to operation of Division A of a manufacturing concern is given:

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Sales : (25,000 units @ Rs. 4 each)	1,00,000
Less Variable costs @ Rs. 3 per unit	75,000
Contribution	25,000
Less Fixed costs	5,000
Divisional Profit	20,000

The amount of divisional investment is Rs. 1,00,000. Find out the Residual Income (RI), if the cost of capial is 10%.

The Residual Income may be calculated as:

Residual Income = Divisional Profit – (Cost of Capital × Divisional Investment)

= 20,000 – (0.10 × 1,00,000)

= 20,000 – 10,000

= Rs. 10,000

So, the Residual Income of Division A is Rs. 10,000. The amount that a division's profit exceeds its cost of capital is shown by residual income.

The benefits of the residual income metric are as follows:

(i) Accounting for each division's cost of capital guarantees that decisions made by various divisions are in line with the objectives of the firm as a whole.

(ii) By embracing possibilities that provide returns beyond the cost of capital, it enhances business development and boosts stockholder value.

(iii) It prevents making bad choices since investments aren't turned down only because they reduce the divisional manager's ROI.

However, Residual Income measure is not free from the limitations. Similar to ROI, it might be challenging to define "divisional profit" and "divisional investment" in a way that is suitable. It could be challenging to determine what divisional-level issues are under your control and what are not. Also, it could be challenging to determine the precise cost of capital. Additionally, a choice must be made on whether to utilise the division's cost of capital or the company's cost of capital. The former improves the alignment of divisional goals, and the latter shows how risky each division is.

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It is challenging to compare a division's performance to that of other divisions or firms of a different size since residual income has the drawbacks of being an absolute metric. For instance, a big division is more likely than a small division to provide a higher residual revenue. For each division, targeted or budgeted residual income levels that are in line with asset size and market circumstances should be established in order to make up for this deficit.

7.4.2 MODERN MEASURES

As indicators of divisional success, return on investment (ROI) and residual income (RI) have been under criticism for years. Many consulting companies and academics suggested modifying the conventional metric, such as residual income, in order to address the objections.

Economic Value Added (EVA)

The Stern Stewart consulting firm, based in the USA, invented the concept known as economic value added. The acronym EVA™ has been listed as their trade mark. They developed a slightly different measure of residual income and marketed the measure as Economic Value Added (EVA). The concept of residual revenue is the foundation of economic value added. Similar to residual income, economic value added charges an investment centre or division for the cost of its working capital and long-term asset investments. Instead of depending on the financial accounting rules within historical cost accounting, the Stern Stewart technique applies accounting modifications to divisional earnings to arrive at a result that reflects economic profit. It is only when operational revenue after taxes is greater than the cost of capital investment does economic value emerge.

Economic Value Added (EVA) = after tax operating income- (weighted average cost of capital x total capital employed)

Balanced Score Card (BSC)

Financial indicators like contribution margin, profit, ROI, and RI have the drawback of being backward-looking, which makes them problematic for performance evaluation. In other words, they pay more attention to previous financial results than to what management are doing to increase future shareholder value.

The Balance Scorecard is a method created by consultant David Norton and Harvard Professor Robert Kaplan that tackles this constraint.

Kaplan and Norton comment on balanced scorecard (BSC) as follows:

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"The Balanced Score-card (BSC) provides managers with the instrumentation they need to navigate to future competitive success. Today, organizations are competing in complex environments so that an accurate understanding of their goals and the methods for attaining those goals is vital. The Balanced Scorecard translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system. The balanced scorecard retains an emphasis on achieving financial objectives, but also include the performance drivers of these financial objectives. The scorecard measures organizational performance across four balanced perspectives: financial, customers, internal business processes and learning and growth. The BSC enables companies to track financial results while simultaneously monitoring progress in building the capabilities and acquiring the intangible assets they need for future growth."

The balanced scorecard is a tool used by businesses to monitor their performance in relation to their primary and secondary goals. In this sense, the planning and strategy of the business, which specifies the relationships it must forge with its workers, suppliers, and the community to succeed with its target consumers, determines the emphasis and scope of the balanced scorecard.

Dimensions of Balancescore Card

A collection of performance goals and outcomes related to four performance dimensions—financial, customer, internal process, and innovation—make up the balanced scorecard. A management strategy that concentrates on accomplishing corporate goals is the balanced scorecard. It acknowledges that businesses have obligations to a variety of stakeholder groups, including consumers, suppliers, employees, and community members. The balanced scorecard displays how well a company is doing at reaching its goals in relation to its stakeholders. Sometimes, the desires of various stakeholders might vary. Employees, for instance, rely on an organisation for their employment. Investors depend on a company to protect their capital. These conflicting desires must be balanced by the organisation. As a result, the purpose of a balanced scorecard is to assess how effectively a company is performing in light of divergent stakeholder interests.

According to Hensen and Mowen, the balanced scorecard is a "strategicbased responsibility accounting system" that translates an organization's mission and strategy into operational goals and metrics for four distinct perspectives: the infrastructure (learning and growth), the customer, the process, and the financial perspective.

So, Customers, internal business, learning and innovation, and finance are the four separate views that make up the core framework that Kaplan and Norton developed.

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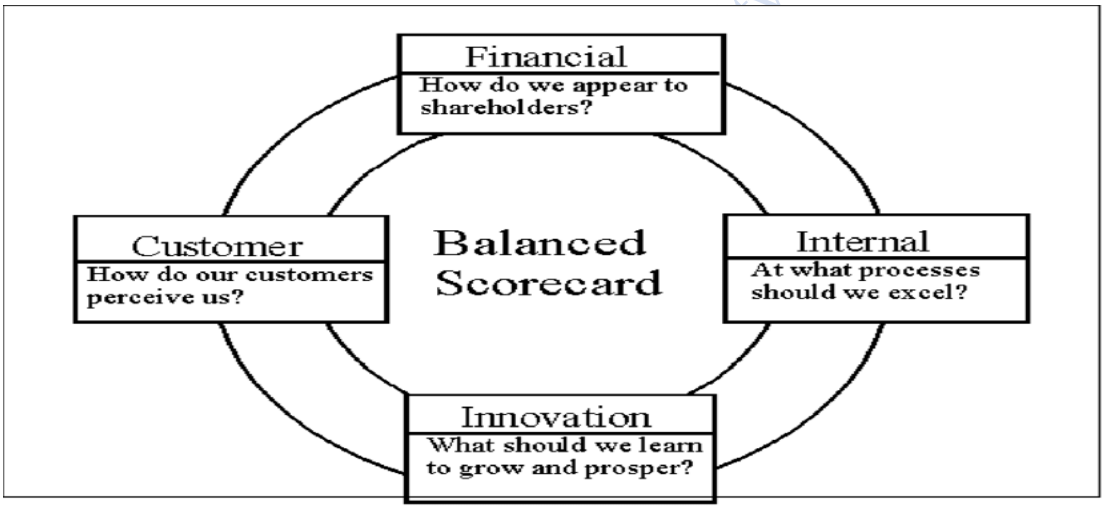
(a) Customer perspective (What customers experience and perceive)

Companies determine the markets and customer segments in which they compete as well as the ways in which they add value to these markets and consumers during this stage. Customers have a significant role in determining a company's performance, thus it is important to understand how the consumer feels about the product. Companies place a great deal of significance on the value they provide to customers. Managers can translate their overarching purpose statement for providing excellent customer service into specific stages using the balanced scorecard. Customers are concerned with time performance, quality, and service. The amount of time needed by the business to meet consumer demands is measured by lead time. Customers' perceptions of the goods or services they will offer are put to the test for quality. For customers, performance and service are valuable. With the use of BSC, organisations may define and decipher expectations in terms of time, cost, efficiency, and product.



(Source: Kaplan and Norton 1996)

(b) Finance Perspective (The perspective of shareholders)

Financial performance indicators show if a company's execution of its strategy is generating revenue and profits. Metrics under the financial perspective show if the creation and execution of the business strategy boost the bottom line. Measures like operating income, ROI, ROE, and market share will come from the financial perspective. Revenue and profit are obvious objectives that any firm would include in this perspective. Many people have attacked financial efforts for being valueless and having a retrograde direction. Many

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detractors take it a step further and claim that financial controls have no bearing on customer satisfaction, but these claims are frequently untrue because a well-planned financial control procedure can enhance a company's overall quality management programme.

(c) Internal business (The key processes that the company use to meet and exceed customer and shareholder requirements)

Companies determine at this stage the procedures and actions required to accomplish the goals identified at the stage of the financial and consumer perspectives. By reevaluating the value chain and making the required adjustments to the current operating operations, these goals may be accomplished. Companies must adapt in order to satisfy client expectations, yet doing so requires them to improvise their internal operations. Managers must prioritise crucial internal processes if they want to live up to customer expectations. The importance of addressing cycle time, performance, expertise, and labour efficiency. The company's vision, mission, and objectives should be understood by all employees, from the top down, so that they may give their all and have a clear understanding of the decisions, actions, and changes that need to be made in order to achieve the company's objectives. A significant part in identifying the error in an organisation is played by information systems. When a problem arises in BSC, it is simple to track it down, pinpoint the issue, and respond right away.

(d) Innovation and learning (How the company foster ongoing change and continuous improvement)

The learning and growth viewpoint helps businesses identify the initiatives and support systems needed to foster long-term success and meet the goals outlined in the first three views. Organizations are adapting to match the global standards as the world is changing quickly. The others will fail to meet the high standards and fall behind those who keep up with the pace, improve themselves, and improvise themselves. The worth of a corporation is correlated with its capacity for innovation, self-improvement, and learning. In other words, the company must boost operational effectiveness, introduce new goods, and improvise to gain market share before it can increase revenue and boost shareholder value.

Characteristics of good Balanced Scorecards

For balanced scorecards to be effective and helpful, they should exhibit the traits listed below:

1. By converting the strategy into a logical and connected set of comprehensible and quantifiable operational objectives, balanced scorecards should aid in conveying the plan developed to all members of a business. Managers and staff then act in

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accordance with the scorecard to carry out the firm's plan. It is recommended to create scorecards at the division and department levels in order to facilitate choices and actions that are in compliance with scorecards.

2. The balanced scorecard places a lot of focus on financial goals and metrics in profit-driven organisations. Managers occasionally place too much emphasis on innovation, quality, and customer pleasure, even though these factors may not directly result in financial gains. In order to achieve and enhance future financial success, a strong balanced scorecard takes non-financial criteria into account. Many non-financial performance variables act as leading indications of future financial performance when they are correctly connected in balance scorecards.

3. In order to showcase a company's strategy, balanced scorecards should emphasise cause-and-effect relationships. Let's say ABC Ltd. wants to produce goods at a low cost and expand quickly. The balanced scorecards ought to provide goals and metrics from a "learning and growth viewpoint," since this might enhance internal company operations. These would then translate into increased levels of client satisfaction, market share, operating revenue, and shareholder wealth.

4. The scorecard draws attention to poor trade-offs that managers could make if they don't take operational and financial factors into account simultaneously. For instance, a business where innovation is important might improve its short-term financial performance by cutting back on R&D. A strong balanced scorecard would indicate that the drop in R & D output and spending, a leading predictor of that performance, may indicate that short-term financial performance was obtained at the expense of future financial performance.

A company can better express its vision and strategy and put it into action with the aid of a balanced scorecard. A company use it to promote efficient and reliable communication since everyone speaks the same metrics language; drive attention to important requirements, regularly facilitate evaluations and guarantee organisational alignment. The good thing about the scorecard is that businesses can interact with it in accordance with the market's nature and culture and add additional insight and KPI as they see fit. For this reason, businesses are currently experimenting with various improvements to the scorecard. The scorecard has drawn a lot of criticism, but it remains a popular performance management tool.

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IN-TEXT QUESTIONS

6. State which of the following statements is 'True' or 'False'.
(a) Both ROI and RI should be considered while evaluating performance.
(b) In assessing divisional performance, it is usually preferable to use a minimum rate of return on investment.

7. ROI may be determined by multiplying the margin by
a) Average total assets b) Asset turnover
c) Inventory Turnover d) Net income
e) Net sales

ILLUSTRATION

Illustration 1. XYZ Ltd. Company has several divisons. Of these 4 divions are- Venus, Mars, Jupiter and Saturn. Below are the data for these divisions.

	Divisions			
	Venus	Mars	Jupiter	Saturn
Sales	5,00,000	6,00,000	7,00,000	8,00,000
Income	50,000	1,00,000	1,50,000	2,00,000
Investment	5,00,000	5,00,000	5,00,000	5,00,000

You are required to calculate ROI of the four divisions and rank these divisions on the basis of their performance.

Solution From the above data, the ROIs will be calculated as:

ROI = (Divisional Profit ÷ Divisional Investment) × 100

Divisions	**ROI** (Divisional Profit ÷ Divisional Investment) × 100	Ranking

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Venus	(50,0000 ÷ 5,00,000) ×100 = 10%	4
Mars	(1,00,0000 ÷ 5,00,000) ×100 = 20%	3
Jupiter	(1,50,0000 ÷ 5,00,000) ×100 = 30%	2
Saturn	(2,00,0000 ÷ 5,00,000) ×100 = 40%	1

Illustration 2. The information relating to Xeros Ltd Company is given:

Sales : (80,000 units @ Rs. 5 each)	4,00,000
Less Variable costs @ Rs. 3 per unit	2,40,000
Contribution	1,60,000
Less Fixed costs	50,000
Divisional Profit	1,10,000

The amount of divisional investment is Rs. 5, 00,000), if the cost of capial is 10%. You are required to calculate:

(i) Return on Investment (ROI)

(ii) Residual Income (RI)

(iii)Comment on the results of (i) and (ii)

Solution: (i) ROI = (Divisional Profit ÷ Divisional Investment) × 100

ROI = (1,10,000 ÷ 5,00,000) × 100

= 22%

(ii) Residual Income = Divisional Profit – (Cost of Capital × Divisional Investment)

= 1,10,000 – (0.10 × 5,00,000)

= 1,10,000 – 50,000

= Rs. 60,000

(iii) The performance of the division is encouraging. ROI is higher than the necessary rate of return. And the residual income is also in the positive.

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Illustration 3 For an investment of Rs. 10,00,000, the division of a business makes a profit of Rs. 4,00,000. There is an opportunity to make an additional investment of Rs.3,50,000, which yields a Rs. 1,00,000 yearly return. If the company requires a minimum return of 12 per cent on its investment. Calculate calculate residual income and comment.

Solution : First of all, We need to calualte the residual Income from existing investment as well as from additional investment. And formula to calculate the Residual Income is:

Residual Income (RI) = Divisional Profit – (Cost of Capital × Divisional Investment).

Residual Income (Before the additional Investment):

RI = Rs.4,00,000 – (12% of Rs.10,00,000)

= Rs.4,00,000 – Rs.1,20,000

= Rs.2,80,000

Residual Income (From additional Investment):

RI = Rs.1,00,000 – (12% of 3,50,000)

= Rs.1,00,000 – Rs.42,000

= Rs. 58,000

An investment of Rs. 13,50,000 yields a total residual income of Rs. 3,38,000. The increased investment boosts residual revenue and raises the performance indicator.

7.5 SUMMARY

One of the greatest cost management methods used in large organisations in the event of decentralisation or divisionalization to lessen the burden of controlling the business is responsibility accounting. Responsibility canters are distinct areas inside a corporation where specific managers have agreed to take responsibility and authority. Responsibility canters specify the specific resources and tasks that each manager is in charge of. To assess the effectiveness of each responsibility centre, managers create a responsibility report. In this report, individual deviations are measured and analysed in relation to the responsibility center's budgeted and actual performance. In order to prevent managers from being held accountable for actions they have no control over, responsibility reports should only contain expenses that can be controlled.

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7.6 GLOSSARY

Responsibility Center (RC): A division or unit of the company where a particular manager is given the power and duty to make decisions.

Cost centre: A is a division of a corporation that raises operating expenses while producing no direct profit.

Investment Center: A section inside a company whose management oversees both earnings and has some control over capital expenditures.

Profit Center: A division of a company where expenses, revenues, and profits are measured independently.

Revenue Center: A division of an organisation called a revenue centre is in charge of raising money.

Performance Report: A document created by each decision-making centre that details budgeted and performance measures as well as deviations from the plan.

Return on Investment: The division's profit controllable as a proportion of the investment in assets that generates that profit is used to determine return on investment.

Residual Income: Operating profit less an interest charge based on the assets used and controlled by the division is known as residual income.

Economic value added: The concept of residual revenue is the foundation of economic value added. The cost of capital charge based on the division's assets is subtracted from divisional earnings to determine the EVA for each division.

7.7 ANSWERS TO IN-TEXT QUESTIONS

1.Profit Centre

2. (a) True

(b) True

(c) False

3. Delegated

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4. Diversified

5. Cost center

6. (a) True

   (b) False

7. Asset turnover

7.8 SELF-ASSESSMENT QUESTIONS

1. Explain what is Responisbility accounting. Describe various responsibility centres that are essential to the system of responsibility accounting's effectiveness.
2. What distinguishes a profit centre from an investment centre?
3. How well-versed are you with responsibility accounting?
4. What benefits does the residual income method offer?
5. What circumstances might prevent a division manager from making decisions that are in line with their goals while using ROI measures?
6. Calculate the return on investment for a company with average assets of Rs. 8,00,000 and a profit margin of Rs. 2,00,000.
7. Assets for XYZ Company are valued Rs. 2,80,000, operational income is Rs. 1,00,000, and capital costs are Rs. 20%. Calculate residual income and return on investment.
8. The business is thinking about launching a new product. What is the product's new return on investment and the firm's new return on investment if the company needs to invest an extra asset worth Rs. 2,50,000 and the increased profit margin is anticipated to be Rs. 80,000, respectively?
9. Describe Economic Value Added (EVA). What distinguishes it from ROI and RI?
10. Describe three ways a business might increase its economic value added (EVA).

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LESSON 8

TRANSFER PRICING

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STRUCTURE

8.1 Learning Objectives
8.2 Introduction
8.3 Significance of Transfer Pricing
8.4 Fair Value/ Arm's Length Price
8.5 Transfer Pricing Methods
8.6 Transfer Pricing and Goal Congruence
8.7 Transfer Pricing under different circumstances
8.8 Proposals for Resolving Transfer Pricing Conflict
8.9 International Transfer Pricing
8.10 International Transfer Pricing and Currency Management
8.11 Summary
8.12 Glossary
8.13 Self-Assessment Questions
8.14 Suggested Readings

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8.1 LEARNING OBJECTIVES

After studying this chapter, students will be able to understand:

- The basis for determining a transfer price
- Methods of determining Transfer Price
- Concept of Goal congruence
- How transfer prices can distort Goal Congruence
- How to compare Divisional performance and consider the problems in comparisons

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8.2 INTRODUCTION

Most of business enterprises throughout the world are now following a decentralized form of organizational structure whereby top management delegates daily routine nature operations and responsibilities to their subordinates. This leads to creation of responsibility centres or divisions within the organisation. Divisional managers are solely responsible for their division's operations, returns and profit and losses. Though each division aims towards achieving its own individual goal of their profit maximisation, but their goals have to be aligned with or in congruence with the organization's overall objectives known as **Goal Congruence**.

A divisional manager have the authority and responsibility to control either the division's cost (cost centre) or both cost and revenue (profit centre). Inter-divisional transactions could involve:

- Sale purchase of goods and services
- Acquisition or sharing of intangibles and intellectual property rights such as trademark, copyright, patent against royalty fee or license fee.
- Inter-divisional loans against interest payments.

Determining a value for inter-divisional transfer of goods and services is called **Transfer Pricing**.

8.3 SIGNIFICANCE OF TRANSFER PRICING

Significance of Transfer Pricing is discussed as follows:

1. **Helps in performance evaluation:** Each division is accountable for the profit earned which is used to evaluate its performance and motivating each divisional manager to maximize the division's profitability and improving company's overall profitability.
2. **Helps in employee engagement and compensation:** Usually managers are given incentives and promotion based on performance of their division. Since transfer pricing influences profit of division, therefore it must be priced at a fair rate by all the divisional managers to give a true and fair measurement of their performance.
3. **Helps in resource allocation among divisions:** Proper co-ordination among divisions for purchase, production and sales helps in optimum allocation and utilization of resources such as capacity of the machines, labour, land and building, etc. On the basis of transfer price, decisions regarding operations can be taken such as deciding either to produce component in -house or to purchase from outside, to

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expand operations or not etc. to maximize their individual profits, while also promoting goal congruence.

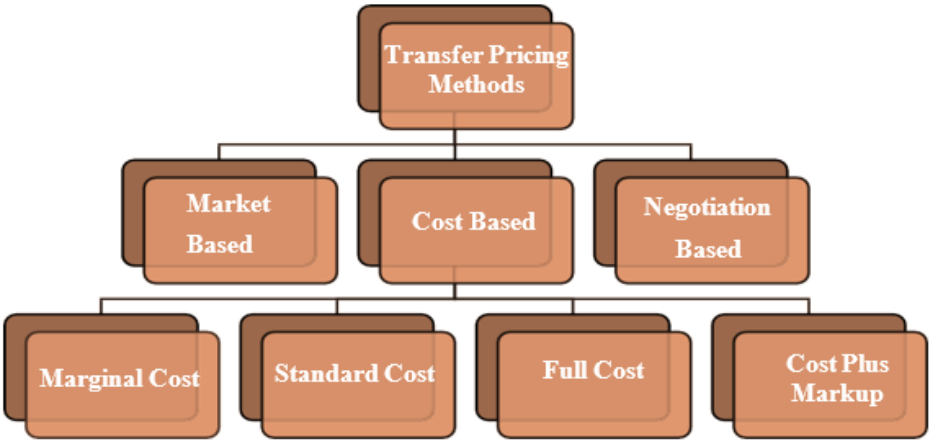
4. **Helps in taxation and profit remittance to the Head Office:** Since transfer pricing influence profits of MNCs having inter-divisional transfers which might affect the over-all tax burden as well as the profits because some divisions might be operating in high tax jurisdiction and some in low tax jurisdiction.

8.4 FAIR VALUE/ ARM'S LENGTH PRICE

The price for inter-divisional transfer should be fair, reasonable and competitive enough as if divisions are dealing with an outside third party independently where both the parties are in pursuit of their own individual goals of profit maximisation.

Transfer price would become revenue for the supplying division which the goods/services and cost for the divisions which receives the goods/services. Where each division is profit centre, any interdivisional transaction becomes more profit oriented where each division strives to maximize its revenue and minimize its costs, same as to how customers and businesses compete with each other using their bargaining power to set the price favourable to them. To deal or transact at the fair price for the divisions becomes necessary because it changes their profitability.

8.5 TRANSFER PRICING METHODS



Market Based Transfer Price

In this method Transfer price is determined on the basis of market price of goods or services which are identical or similar to the goods or services transferred between the

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divisions. The interdivisional transfer is recorded at the market price, after adjusting or deducting for any costs saved due to internal transfer such as selling and distribution expenses, commission, packaging cost, etc.

Advantages

- It is unbiased: because demand and supply forces determine the market price.
- More clear and reliable compared to cost-based pricing because it cannot be manipulated by the internal managers.
- Objective measurement of performance of the division: because the market based pricing is competitive.

Disadvantages

- It might not be completely unbiased in the absence competitive environment such as in case of distress sale or manipulative pricing strategies like price rigging which distorts the fairness of the market price.
- Market prices might fluctuate quickly to lead the data irrelevant.
- Sometimes market price may not be readily available for intermediate goods due to lack of active market for them.

Cost Based Transfer Price

It is based on the cost accounting records which are prepared by internal cost accounting departments of the company. It is applied when the management wants to compare actual performance with the standard costs set within the company or as an alternative method to calculate the transfer price when market prices cannot be determined because of non-existence of comparable and relevant market. It might consider:

- variable cost
- standard cost
- full cost and
- full cost plus profit mark-up.

Advantages

- Performance can be benchmarked on the basis of internal cost budgets which are readily available within the entity.
- Information is comparatively more easily available to market price. Cost elements can be divided further into more sub components, therefore basis for transfer pricing

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is more clearly defined as compared to market price, which is subjected to uncertain fluctuations in demand and supply.

Disadvantages

- The cost basis used can be subjective as there can be multiple alternatives of breaking and allocating the costs such as variable cost, full cost methods, etc. Different divisional managers might not simultaneously agree on which basis to be adopted to determine the transfer price as they will prefer to apply the method which met their profit targets and is most beneficial to their division.
- Since in case of interdivisional transfers, cost is passed on to another division by raising invoice on the receiving division, sometimes managers of the supplying division find it beneficial for their division to minimise the cost of production by applying cost efficient cost accounting methods to determine the transfer price.

Marginal Cost Based Transfer Price

Transfer price is the marginal cost which is the addition to the total cost required to produce one more additional unit.

Advantage

- It is applied when supplying division has excess capacity in the form of idle machinery, labour, land and factory space.
- It assumes that the supplying division will just recovers the cost of internal transfer without any markup, while the purchasing division enjoys all the benefit of a lower price as compared to the market.

Disadvantage

Since no fixed cost or mark-up can be charged from the purchasing division. Each unit of internal sale will lead to a loss at fixed cost per unit at the supplying division.

Standard Cost Based Transfer Price

Transfer price is set on the basis of some predetermined costs based on budgets and assumptions with respect to factors of productions such as capacity utilization, labour hours, etc. Any variation between the cost absorbed on the basis of standard cost and the actual cost incurred, is either absorbed by the supplying unit or it can be passed on to the purchasing unit.

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Advantage

- Performance evaluation can go in contradiction to budgeted cost targets.
- It facilitates better understanding of costs through variance analysis so that measures can be taken to improve performance.

Disadvantage

- Profit performance measurement is centralized and cannot be carried out for each individual divisions.

Full Cost Based Transfer Price

Transfer price is determined on the basis of full product cost which includes cost of production plus a share of other costs such as selling and distribution expenses, administrative expenses, research and development costs, etc.

Advantage

- Supplying division recovers full cost of goods transferred from the receiving division. Therefore supplying division will not incur any loss.

Disadvantage

- Since no mark-up can be charged on internal transfers by the supplying division from the receiving division which discourages the supplying division to supply internally.

Cost plus a Mark-up Based Transfer Price

Transfer price is based on full product cost plus a mark-up usually as a percentage of full product cost or of capital employed.

Advantage

- Since the supplying division makes a profit by charging a desired markup, this method encourages the supplying division to supply internally.

Disadvantage

Since the transfer price under this method is near to market price, the purchasing division may bear a share of the selling expenses even though nothing is incurred for such internal transfer which could distort the performance of purchasing division.

Negotiation Based Transfer Price

This is mid-way between market and cost methods. Divisional managers of the purchasing and supplying divisions independently negotiate with each other to arrive at a mutually agreed transfer price.

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Advantage

- Managers are given full autonomy to decide whether to purchase/acquire (or sell) from its sister unit internally or source then from (or sell to) external market.

Disadvantage

It requires sufficient information with respect to external market price, terms of trade etc. Internal cost must also be considered in order to negotiate a reasonable price.

8.6 TRANSFER PRICING AND GOAL CONGRUENCE

Transfer pricing creates a competitiveness among divisional managers whereby they operate in the best interest of their individual performance which leads to sub-optimal utilization of resources. In such cases, transfer pricing policy must be established to ensure goal congruence.

Range of transfer price that promotes goal congruence:

Minimum Transfer Price (by the supplying division) = additional outlay cost per unit + opportunity cost per unit.

Additional outlay cost = marginal cost + incidental costs incurred by the supplying division e.g. storage, transportation, packaging cost etc.

Opportunity cost is the benefit that is foregone from selling internally to the division instead of supplying externally.

Maximum Transfer Price (by the purchasing division) = lower of Net marginal revenue and the External buy-in price

Net marginal revenue = Marginal revenue (selling price per unit) – Marginal cost to purchasing division

8.7 TRANSFER PRICING UNDER DIFFERENT CIRCUMSTANCES

Different Capacity Levels

1. When the supplying division has excess capacity, the range for transfer pricing would be

   Minimum Transfer Price = marginal cost per unit

   This ensures that the supplying division is able to recover at least its additional cost incurred due to interdivisional transfer. Fixed cost is a sunk cost therefore it is not considered. The purchasing division gets the benefit of getting the goods at a lower cost than market price.

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Maximum Transfer Price = lower of Net Marginal Revenue and the External Buy-in Price

2. When the supplying division operates at full capacity, the range for transfer pricing would be:

Minimum Transfer Price = Marginal cost per unit + Opportunity cost per unit

Since the supplying division is operating at full capacity, it has no incentive to sell the goods to the purchasing division at a price lower than the market price. If the internal order is accepted, capacity is to be diverted from external sale to internal sale. Therefore the supplying division would additionally charge the lost contribution that could have been earned from external sales which are sacrificed.

Maximum Transfer Price = Lower of Net Marginal Revenue and the External Buy-in Price.

Different Demand Levels

A supplying division fulfills the demand from:

(i) internal divisions

(ii) external markets

(iii) any special orders.

Production level is subject to available capacity in the form of labour, number of machineries, factory area, available raw material etc. Production cost is reduced due to economies of scale. For example, a machinery has a normal capacity of producing 10,000 units. However, production beyond 10,000 units requires the purchase of another machine requiring additional space, labour, supervisor, etc. This increases the fixed cost of the production department. Hence, production cost is dependent on economies to scale.

Certain types of demand may also leads to cost savings. For example, internal sales require lower packaging and transportation costs because the product may be transferred in bulk to the purchasing division. Special orders saves selling expenses as it is the customer who approaches the company to sell the product and no broker or agent is involved in the deal.

Therefore, in case of different demand categories, associated cost savings should be considered to determine the transfer price subject to general rule for minimum and maximum range of transfer price as discussed above.

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8.8 PROPOSALS FOR RESOLVING TRANSFER PRICING CONFLICT

Following System of Transfer Pricing can be adopted resolve the conflict of interest between interests of individual divisions and the company and to achieve goal congruence:

Dual Rate Transfer Pricing System

The supplying division records transfer price (inter-sale price) by including a normal profit margin thereby showing reasonable profit. The purchasing division records transfer price (inter-purchase price) at marginal cost thus recording purchases at minimum cost. This allows for better performance evaluation of each division and improves co-operation between divisions, promoting goal congruence and reduces sub-optimization of resources.

Drawbacks of Dual Pricing are:

1. It can complicate the records due to two transfer prices, thereby requires adjustments and may result in errors in the overall records.
2. Profits reported by the divisions are only artificial and need to be used only for internal evaluations.

Two Part Transfer Pricing System

This system also aimed at resolving problems of distortions caused by the full cost based transfer pricing method. Therefore, transfer price should be as follows:

Transfer price = marginal cost of production + a lump-sum charge (two part to pricing).

Where marginal cost component ensures recovery of additional cost of production related to the goods transferred, lump-sum charge helps in the recovery of some part of the fixed cost of the supplying division. Therefore, it is beneficial for both the divisions as the supplying division can report better profitability and the purchasing division is also benefited as it can purchase at a lower rate compared to the market price.

8.9 INTERNATIONAL TRANSFER PRICING

Due to Globalisation, advancement in technology and dynamic business models, business enterprises are spreading their operations across countries exploiting and reaping benefits from multiple countries. Business have benefitted by following multi-national business model. Multinationals considerations for these business models are driven by many factors:

- Demand for their product.
- Availability of raw materials. For example DeBeers Group sources diamonds from Tata Group of companies in India.

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- Availability of low-cost labor with specialized skills. India and China are the most lucrative sources for companies throughout the world.

The interdivisional transactions in multi-national companies could involve:

1. Buying and selling of goods
2. Provision of services
3. Providing or sharing intangibles such as patents, copyrights, trademarks or brands against royalty payments.
4. Providing loans against interest payments.

Taxation, profit repatriation and transfer prices are major considerations for the senior management of the multi-national organisations which try to maximize profits by using transfer pricing as a tool to reduce the overall tax burden. If, the supplying division is operating in a high tax jurisdiction such as USA, and purchasing division is operating in zero or low tax jurisdiction such as Andora, Cayman Islands, then the transfer price will be deliberately set lower reflect low revenue for supplying divisions (paying high tax rate on small profits) and low cost for the purchasing division (paying low tax rate on large income), thereby paying lower taxes in totality .Similarly, supply from divisions operating in lower tax rate countries are priced higher to report higher earnings for supplying division paying low tax rate.

Tax authorities of different countries check whether the interdivisional transfers between the divisions of the MNCs operating in different countries are priced at Arm's Length Price, so as to evaluate whether transfer pricing is used as tool of base erosion and profit shifting. For understanding this we can take the recent case of Starbucks UK subsidiary vs. British authorities. Starbucks is known for their world famous coffee on which they huge profit margins due their brand name and quality but their tax records and income tax computations reported losses every year. Tax investigations revealed that the UK subsidiary paid its Netherland unit (holding ownership of brand name and trade secrets) 6% of sales as royalty for intellectual property such as trademark and business processes. The tax authorities raised question whether 6% royalty is at arms-length and whether it is comparable with market terms for similar transactions between unrelated parties under uncontrolled conditions.

In India, Tax authorities regulates such tax avoidance measures through section 92A to 92F of the Income Tax Act, 1961.

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8.10 INTERNATIONAL TRANSFER PRICING AND CURRENCY MANAGEMENT

Multinational firms or companies are often exposed to foreign exchange rate fluctuation risks which create uncertain cash flows in corporate currency and also can misrepresent and misevaluate performance of subsidiaries operating in different countries. In case of inter-divisional transfers between subsidiaries operating in different countries, when one subsidiary makes a loss due to unfavorable exchange rate movement, the other might make a profit if the movement is favorable for the later one. The organization therefore should manage its exposures to currency risks. The treasury/finance department or mangers of overall profit centre is responsible for managing the currency risk. A multinational corporation which is fairly - certain about exchange rate movement in the future always try to set transfer prices in a currency such that any currency losses arise to that subsidiary which operates in the high-tax country or jurisdiction, and currency profits arise to subsidiary in the country with the lower tax rate.

8.11 SUMMARY

Organisation having multinational operations or large scale organisations are usually divided into departments or divisions which spread across countries in case of multinational corporations.

Inter divisional transfers may be in form of following transactions:

- ✓ Sale/ purchase of goods and services
- ✓ Royalty fee payments for providing right to use in respect of intangibles or intellectual property rights like brand name, patent, copyright, etc.
- ✓ Inter-divisional loans against periodic interest payments.

Pricing of transactions involving inter-divisional transfer of goods and services between divisions or departments of the same organisation is known as **Transfer Pricing**.

1. Performance Evaluation of Divisions in the form of profitability of divisions.
2. Motivation and Compensation for Divisional managers and employees (fair profit evaluation motivates employees and managers in improving their performance and increasing divisional profits for earning bonus and promotions).
3. Resource Allocation (optimum allocation of resources and decisions such as make or buy).
4. Compliance of Income Tax provisions and Profit Remittance by the divisions (impact taxable profits of MNCs affecting the over-all tax burden and the profits

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transferred by the divisions or subsidiary to head office or parent company).

Fair Value – Transfer Pricing is mainly concerned with "arms-length" price which states that the transfer price used for inter-divisional transfer between division or subsidiaries should be fair and competent as if the divisions are transacting with a third party seeking to maximize their own profits.

Transfer Pricing Methods and Transfer Pricing in different cases–

Market Price – Transfer price is determined on the basis of market price of goods or services identical or similar to the ones transferred between the divisions after making adjustments for any costs saved due to internal transfer between divisions such as, commission, transportation, packaging cost, etc.

Advantages –

1. It is Unbiased
2. It is less–ambiguous
3. It more objectively evaluates divisional performances.

Disadvantages –

1. Market prices keeps on fluctuating
2. Non-availability of market prices intermediate goods
3. Manipulative pricing strategies in case of price rigging by business combinations.

Shared Profit Relative to Cost Method – It is based on the costs incurred by each individual division thereby depicting its value addition to the product as a proportion of total cost to determine the selling price of the product to be sold to customer. This method distributes profit based on the amount of value addition by each division to the final product in terms of cost incurred by it.

Cost Price Method – Transfer price is determined on the basis of cost records of the organisation. This method is applied where management wants to compare actual performance with the standard cost targets and also when market prices for the goods cannot be determined due to lack of active, relevant and comparable market.

Advantages:

1. Comparison to standard cost or budget
2. Easy availability of cost records and information.

Disadvantages:

1. Multiple ways of analysing costs such as variable cost, standard cost, full cost, etc.

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2. Very low incentive to lower the cost of production.

Variable Cost – Transfer price is equal to the marginal cost required to produce one additional unit.

Advantages –

1. Supplying division can use its excess capacity.
2. Purchasing division gets the benefit of a lower price as compared to the external market price which is usually higher.

Disadvantages – No fixed cost or profit mark-up is allowed to be charged to the purchasing division.

Standard Cost – Transfer price is set on the basis of some predetermined costs based on budgets and assumptions with respect to factors of productions such as capacity utilization, labour hours, etc.

Advantages –

1. Performance evaluation against budgeted costs
2. Proper variance analysis.

Disadvantages – Profit performance measurement is centralized.

Full Cost – Transfer price is determined on the basis of full product cost which includes cost of production plus a share of other costs such as selling and distribution expenses, administrative expenses, research and development costs, etc.

Advantages – Supplying division will not show a loss.

Disadvantages – Since mark-up cannot be charged on internal transfers, the supplying division does not record any profit on these sales

Full cost plus Mark-up – Transfer price is based on full product cost plus a mark-up usually as a percentage of full product cost or of capital employed.

Advantages – High incentive to supplying division.

Disadvantages – The purchasing division may bear a share of the selling expenses.

Bargained or Negotiated Pricing – Managers of the purchasing and supplying divisions independently negotiate and arrive at a mutually agreeable transfer price for the inter divisional transfer.

Advantages – Independent power to decide whether to purchase (or sell) from its sister unit or source then from (or to) external market.

Disadvantages – Requires sufficient external information with respect to the

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external market price, terms of trade etc. Internal cost information is required to be shared in order to negotiate a reasonable price which is fair for both the divisions.

Divisional Conflict–

Dual Pricing – The supplying division records transfer price by including a normal profit margin thereby showing reasonable revenue. The purchasing division records transfer price at marginal cost thereby recording purchases at minimum cost.

Advantages – Allows better evaluation of each division's performance, improves co- operation between divisions, promoting goal congruence and reduction of sub-optimization of resources.

Disadvantages – Complicate the records, artificial profits can be used only for internal evaluations

Two Part Pricing System –

Transfer Price = Marginal Cost of Production + a Lump-Sum Charge (two part to pricing).

Lump-Sum charge enables the recovery of some portion of the fixed cost of the supplying division. Therefore, while the supplying division can show better profitability, the purchasing division can purchase the goods a lower rate compared to the market price.

Transfer Pricing and Goal Congruence –

Minimum Transfer Price (from the supplying division)

= Additional Outlay Cost per unit + Opportunity Cost per unit.

Where Additional Outlay Cost = Marginal Cost + Incidental Costs such as storage, transportation etc.

Maximum Transfer Price (from the purchasing division)

= Net Marginal Revenue and the External Buy-in Price whichever is lower

Where Net Marginal Revenue = Marginal Revenue (Selling Price per unit) – Marginal Cost to Purchasing Division

Transfer Pricing Different Capacity Levels –

Excess capacity with supplying division

a) Minimum Transfer Price = Marginal Cost per unit.

b) Maximum Transfer Price = Net Marginal Revenue and the External Buy-in Price whichever is lower

Supplying division operates at full capacity:

a) Minimum Transfer Price = Marginal Cost per unit + Opportunity Cost per unit

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b) Maximum Transfer Price = Net Marginal Revenue and the External Buy-in Price whichever is lower

Transfer Pricing Decision – Different Demand Levels: while catering to different levels of demand, any change in cost should also be accounted for to calculate transfer pricing. The general rule for minimum and maximum range of transfer price applies here too.

International Transfer Pricing –Transfer pricing is also considered important in case of Multinational companies to deal with important area such as:

1. Taxation
2. Profit repatriation to head office.

Multi-national companies try to reduce overall tax burden to maximize profits by using manipulative transfer pricing tools.

If, the supplying division is operating in a high tax jurisdiction such as USA, and purchasing division is operating in zero or low tax jurisdiction such as Andora, Cayman Islands, then the transfer price will be deliberately set lower reflect low revenue for supplying divisions (paying high tax rate on small profits) and low cost for the purchasing division (paying low tax rate on large income), thereby paying lower taxes in totality .Similarly, supply from divisions operating in lower tax rate countries are priced higher to report higher earnings for supplying division paying low tax rate.

In case of inter-divisional transfers between subsidiaries operating in different countries, MNCs try to set transfer prices in a currency such that any currency losses arise to that subsidiary which operates in the high-tax country or jurisdiction, and currency profits arise to subsidiary in the country with the lower tax rate.

8.12 GLOSSARY

Goal Congruence: Though each division aims towards achieving its own individual goal of their profit maximisation, but their goals have to be aligned with or in congruence with the organization's overall objectives.

Transfer pricing: Determining a value for inter-divisional transfer of goods and services is called

8.13 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of Transfer Pricing. Discuss its Significance.

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2. What is Arm's Length Price?
3. Explain in detail different Transfer Pricing Methods
4. Discuss the concept of Goal Congruency in Transfer pricing.
5. Explain the solutions for resolving Transfer pricing Conflicts.
6. Discuss the concept of International Transfer Pricing.

8.14 SUGGESTED READINGS

Latest editions of the following text books to be used:

1. Narayanaswamy R. Financial Accounting: A Managerial Perspective. PHI Learning Pvt. Ltd., Delhi
2. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.
3. Garg CA Kamal, and Sehrawat Neeraj Kumar. Beginner`s Guide to Ind AS & IFRS. Bharat Law House Pvt. Ltd., New Delhi
4. Maheshwari S. N., Maheshwari Sunil K., and Maheshwari Sharad K, An Introduction to Accountancy, Vikas Publishing House Pvt. Ltd.

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LESSON 9

RECENT DEVELOPMENT IN THE FIELD OF ACCOUNTING

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STRUCTURE

9.1 Learning Objectives
9.2 Introduction
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9.7 International Accounting
9.8 Creative Accounting
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9.1 LEARNING OBJECTIVES

- Explain some of the recent development in the field of financial and management accounting
- Overview special issues of accounting like inflation accounting, historical accounting, environmental accounting etc.
- Explain the recent development in the field of accounting in respect of technology
- Overview of health accounting based system.

9.2 INTRODUCTION

One of the prominent roles of accounting is the recording of financial transactions in a summarized and presenting them in a meaningful form in the form of Profit and Loss Account, Balance Sheet and Cash flow statement. These three statements are also used in companies in preparing companies annual reports, but some statements are being prepared for internal use also. A number of statements are being prepared by Cost Accountants and their main motive of preparing these statements is to have knowledge about cost of production. Due to globalisation and changes in the world, the accounting field is also witnessing many changes.

The work of accountant is also being changed due to coming of new technology. Now the image of accountants have also been changed as compared to traditional accountants sitting with strained faces and a huge amount of files on their tables. Now a days our accountants have become modern and are well updated with the latest information in the market. Modern accountant are going with these changes and are aware about all the intrinsic details that are needed to manage the business in a different manner. The tax laws are also being simplified and due to this simplification the role of accountant is also declining. When machines are playing a major role in industrial world then it is the responsibility of accountant to provide materialistic based information of the company. Today in many companies knowledge have became the greatest asset. Now social behaviour is coming in the corporate sector instead of preparing statements of long nature. Now accountants have to provide additional information also. Now a day's special reports are being prepared by the accountants. The emerging trends in the field of accounting have provided many opportunitites to business and and they can challenges efficiently in this dynamic and globalised world. In this chapter some of the reports which are being prepared now days is being discussed and also highlights the recent developments that have taken place in the field of accounting. In the technological world it is expected that accountants should be more intelligent as conventional accounting is diminishing and computerised accounting is taking place.

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In this chapter an attempt has been made that the students will study the various developments in varied branches of accounting like tax accounting, health accounting, social accounting, international accounting etc.

9.3 INFLATION ACCOUNTING

Inflation can be defined as the percentage change in the price level from the current period. The prominent role of inflation accounting is to check conventional historical cost accounts which are being used in the understatement of inventory and plant and which are being used in the production of goods, the cost of goods sold and depreciation in order to prevent erosion of capital during inflation. Inflation accounting being used to give information that is beneficial for the potential and present investors and also to creditors in making decisions and also assessing the timing and uncertainty in cash receipts which can be in form of dividends or proceeds from the sale of redemption of securities or loans. The main objectives of inflation accounting is

- To show the real profit and loss for the period under consideration against the profit or loss based on historical cost.
- To show the real value of assets and liabilities instead of showing on the basis of historical cost.
- To see that sufficient amount of funds will be available when replacement of assets is being done.

Inflation accounting can be calculated by two methods current purchasing power method and current cost accounting method.

i. **Current Purchasing Power:** Under this method monetary and non monetary items are shown separately. The accounting adjustments for monetary items are being shown by recording of net gain or net loss. Non monetary items are being updated into figures according to inflation conversion factor which is equivalent to the consumer price index at the end of accounting period which is being divided by consumer price index when the transaction is being done at a particular date.

ii. **Current Cost Accounting:** This method calculates assets at their fair market value rather taking into consideration the historical cost, which is the price incurred when the asset is being purchased. Under this method both monetary and non monetary items are shown at their current values.

Inflation accounting can be better understood with the help of following practical examples.

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Practical Example 1

Inflation accounting is being used by a company for adjustment of its equipment value in 2022. The equipment was purchased for 20000 in 2006 when the price index was 116 and the price index for 2022 is 180. The new value using the CPP method can be found out as

Current Index Price= Revaluation (2006⟶2022)

Historical Price*Conversion factor

2000*(180/116) = 60000. Now the new value of the equipment is Rs 60000 in 2022 based on conversion factor of 3 and this new value would be recorded in the balance sheet as the closing balance at the end of the period.

Practical Example 2 :

Calculate the net monetary value

	Jan 2020	**Dec 2020**
Current Assets	30000	42000
Current Liabilties	35000	45000
Retail Price Index	250	350
Annual average 300		

Calculate net monetary value

Monetary Liabilties= 35000*350/250=49000

Increase in liabilities= 10000*350/300=11667

End of Balance Current Liabilties= 45000

Gain on holding liabilities= 15667

Monetary Assets= 30000*350/250=42000

Increase in Assets= 12000*350/300=14000

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Balance at the end= 42000

Net gain= 14000

Net monetary value = 15667-14000=1667

ACTIVITY 1

A company provides inflation adjusted accounting, in your opinion who gains the most by using such kind of accounting.

IN-TEXT QUESTIONS

1. Inflation is measured by _____.
2. The CPP method distinguishes between _____and _____ .
3. CPP is a mixed method in which _____ are prepared on historical basis
4. The current purchasing power method is also known as _____ .

9.4 HUMAN RESOURCEACCOUNTING

In manufacturing units most of the assets are in physical form and these assets can be easily trace and valued. The value of the firm can be easily calculated without much difficulty. Manufacturing firms have other assets also other than physical assets like intangible assets, goodwill, brand value etc. Human capital is the most important factor in any organization and they do things that ultimately lead the company to the path of success, and the importance of human asset is mostly seen in software firms. Can it be made possible to assign value to every individual working in the firm? It is an important question that human beings should be valued as they form an important asset in the firm. Yes human valuation is considered very necessary.. It can be said that HRA is a system which informs management about various changes taking place in the human resources of the company. It is also engaged in the accounting process of how investments are being done in people and what can be the replacement costs of such human resources working in the organization. The present accounting system is not in a position to provide the actual value of human resources working

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in the organization who are showing their knowledge and capabilities at different level. This will indirectly affect the investments to be done in near future of the company as the cost incurred on training and recruitment of human resources increases day by day.

The information which is being generated by HRA systems can be used in taking a variety of managerial decisions like selection, recruitment, planning, analysis of turnover, and capital budgeting and these kind of decision will save the company from any trouble arising in near future. Most of the companies in India like BHEL, Reliance, and Infosys have implemented the concept of HRA system and are also working on it. Infosys have started showing human resources as an asset in its companies Balance Sheet and due to this Infosys is enjoying high market valuations and earning good profits in the market. Thus human resource accounting can be defined as the measurement of various costs and reporting those cost and value of people as organizational resources. There are several kind of methods used in human resource accounting are:

- **Capitalization of Historical Cost Method:** This method was developed by William Pyle in 1967. Under this method the amount incurred on recruitment, training and selection of the employee is capitalized and written off from the value expected from human resources. Thus for this purpose a proper record is being maintained about the expenses incurred in recruitment selection and training of employee. Some amount of the expense is written off from next year so that some value might be left for the human service provider in the next year.
- **Replacement Cost method:** This method was developed by Renis Likert and it tells about the cost of replacing an existing human resource in an organization. It also indicates the amount spent on training recruitment and selection of human resource in an organization. This method is more realistic in nature as it reflects the current values of human resources in an organization.
- **Opportunity Cost method:** This method was developed by Kiman and Jones for a company who was engaged in bidding services. Thus opportunity cost means the cost of an asset which can be use in a alternate way. The value of human resource is calculated on the basis of the cost of the individual. If the employee is recruited from external source then it has no opportunity cost.
- **Economic Value Method:** According to this method the value of human resource is measured according to the contribution made by an individual in an organization. This method estimated the total cash inflow generated by a person for his services in an organization.

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- **Standard Cost:** The standard cost method reflects the total cost incurred in recruiting and selection of human resource in an organization. According to this method the economic value is the amount spent on the entire workforce and it is equivalent to the money incurred on training and hiring of a human resource during the accounting period.
- **Cost benefit method:** Under this method the estimated benefit is being calculated which an employee gives to an organization. After estimation of benefits the value of the benefits is being calculated which an employee gives to the organization and the difference of the benefit is the real value of the human resource.
- **Non monetary method:** This method relies on ratings and indices. It is a kind of behavioural assessment technique of an individual which gives rating to the individual according to his performance. This method measures the skills of the employee and also measures the attitude of the employee towards the job and tries to evaluate the performance of the employees and also assess the capabilities of employees for promotion purpose.

Human resource accounting also operates through various models. These models are

- **Lev and Schwartz Model:** This model was given by Lev and Schwartz and they estimated the future earnings during the remaining service life of the employee which is arrived by discounting the cost of capital. When quantifiable data is available then this method is being applied for ascertainment of human resources. Under this method all employees are classified according to their age groups and then the average is worked out according to their ages and the total earnings are discounted at the cost of capital and this is the value of human resources.
- **Eric FalmHoltz Model:** This model was developed in 1996 by Falm holtz and this model is an improvement on the present and future value of earnings. This model considers the movement of employee from one place to another or earlier death or retirement. A five step approach is followed for calculation like forecasting the expected service life of the individual and then identifying the role each one is having in the organization and the position held by an individual and then estimating the future probability and then discounting the value at a predetermined rate.
- **Morse Model:** This model says that the value of human resources is equivalent to the total benefits derived by an organization from the service of its employees. In this method gross value is calculated and then the value of direct and indirect future payments is worked out and the excess value of human resources is worked out.

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- **Likert Model**: This model was developed by Likert in the year 1960 to start research in the field of human resources. This model works on three variables like casual variable, Interim Variable and End result Variable.
- **Ogans Model:** This model was given by Pekin Ogan in 1976 and this model was the extension model of net benefit approach. According to this model the uncertainties that are going to arise in the near future should also be taken into consideration and also the net benefits which an employee will derive should also to be taken into account.

IN-TEXT QUESTIONS

5. _____model was the extension model of net benefit approach
6. _____model works on variables.
7. Ogan model was launched in the year _____ .

9.5 SOCIAL ACCOUNTING

It can be defined as when a person or firm is answerable to other people for his action and deeds in the society. Profitable and good organizations are now engaging stakeholders, suppliers, consumers, regulators, Non Government organization and communities at large to have a dialogue in open forum at all levels of the company which will affect the decision making and various business activities in a firm. Companies are now volunteering information from the stake holders so that their social performance can be measured and the stakeholders become accountable for their social performance by giving such information to the firm. In many developing countries social and ethical accounting and auditing practices is still a new concept. Therefore it can be said that social accounting and auditing build such kind of framework which helps the organization in building the existing documentation practices followed by the company and such kind of reporting framework bounds the company for its social performance. By building a social reporting framework the company can frame up a action plan for the improvement of its performance and it will also help the firm in understanding the impact on the community and the company will be accountable to the society for its performance and to all its stakeholders also. If a company is engaged in social accounting then it will enhance a image for the company. Some of the important indicators which are to be included in social accounting framework is:

- Health and Safety of the employees.

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- Relationship with the stakeholders towards the company.
- What measures taken for employment equity
- What standards are being followed by the company regarding environmental performance?
- How much a company is investing in social projects?
- What quality of products and service given to the society
- What kind of quality being opted by the management.

9.5a Environmental Accounting:

Environmental accounting can be defined as the accounting contribution of the accountants towards the measures for environmental sensitivity taken in the organization. This concept gained popularity in the 1990's. Practical developments in the field of environmental accounting witnessed a tremendous growth in the recent and this is also being highlighted in the various research activities undertaken in the field of environmental accounting. It can be concluded from the various research that environmental accounting plays a very important role in operations of daily routine nature and not disturbing the environmental conditions in the society. The accountant's capability towards environment in firms can be reflected in their accounting auditing and reporting skills. The work of the accountant while handling environmental issues is not only applicable for internal purpose but also extends through outside world. Accountants are also responsible for disclosing the environmental information in the corporate reports and they can use any other medium of communication for disclosure of information related with environment. It also reflects the accountability of the firm and accountants towards the society at a larger scale regarding issues related with environmental consciousness.

9.5b Sustainability Accounting:

Sustainability accounting is also known as social responsibility accounting and it also provides information to regarding social and economic sustainability to various interested parties. Sustainability accounting works on 3 dimensions economic, social and environmental. Economic impact means that through organisation operations how much of livelihood is generated in the country. The company is able to provide sufficient employment opportunities also have an economic impact in the society. The company also manages the social and environmental risks by identifying what kind of resources are hazardous and can harm the society and disturb the environmental conditions in the society. Now a day's most of the companies are engaged in CSR activities for the benefit of the society. Recycling of the waste paper and converting into a notebook is an example of Sustainability accounting.

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9.5c National Income Accounting:

This kind of accounting analyses the economic activities of the nation. It analyses the total expenditure which is being incurred by a country while performing any business activity. It can also be referred as a government system of book keeping which measures the economic activity of a country. It also includes the total revenue earned by domestic corporations, how much amount paid for the wages, and also collects the sales and income data of the companies. It also helps in assessing the current standard of living of the people in the country and also assesses how the income will be distributed within the population. The formula for calculating National Income is Y= C+I+G+ (N-M) .

Y is National Income, C is Personal Consumption Expenditure, I is Private investment, G is Government spending X is Export and M is Imports.

The concept of National Income Accounting can be better understood with the help of following practical example:

Calculate National Income

Particular	Amount(in lakhs)
Compensation of employees	2500
Rent	1300
Interest	750
Mixed Income of self employed	7500
Net current transfer to abroad	700
Net export	-600
Net Indirect taxes	2000
Net factor income to abroad	560
Consumption of fixed capital	620

NDP at Factor Cost= Compensation of Employees+Mixed Income+Rent+Interest+Profit

= 2500+7500+800+750+1300=12850

NNP at Factor Cost= NDP at Factor Cost+NFIA = 12850-560= 12290.

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IN-TEXT QUESTIONS

8. _____analyze the economic activities of the nation
9. Recycling of waste paper is a part of _____.
10. By building a_____ framework the company can frame up a plan of action
11. Which accounting is also referred as government system of book keeping _____.

9.6 HEALTH ACCOUNTING

The main motive of any health care industry is prevention and treatment of a disease. The ultimate goal of any hospital is to help the patients in living a healthy and a longer life and this can all be possible if a proper accounting system is practiced in hospitals and a proper budget is being prepared by the hospitals, to have an idea how much money is coming in the hospital and how much money is going out from the hospital. This will help the hospitals to plan out their facilities offered in a better way.

Health accounting is that branch of accounting that lay emphasis on the collection and reporting of financial information regarding with health care organizations. This kind of accounting can be used by doctors, patients, nurses, lab technician etc. Certified Medical Accountants and Health managers are responsible for the maintenance of all the accounting records of the hospital. They keep a record of financial reports, balance sheet and other financial information of a healthcare organization. There are two basic types of information rendered by the hospitals Balance Sheet and Income Statement. The balance sheet of a hospital depicts its assets and liabilities and income statement measures the revenue earned and expenses incurred by a hospital. The income of the hospital includes donation, amount received from trusts, grants received from government, patient fees and operation charges also form part of hospital income. Special registers are being maintained by hospitals for the income and it is to be incorporated on a daily basis. The expenses of a hospital include charities, establishment expenses, purchase of surgical equipments etc.

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The income statement of a hospital is shown below

Actual Amount	Budgeted Amount		Actual Amount	Budgeted Amount
Daily		Income:	Monthly	
		Income from routine service		
		Less: Reduction of patient income		
		Add: Non operating income		
		Grants from government donation		
		Less: Expenses		
		Dietary		
		Operating rooms		
		Professional care of patients		

IN-TEXT QUESTIONS

12. Grants received from government is _____ .
13. _____ maintained by hospitals for incorporation of income.
14. Which accounting lay emphasis on collecting information of hospitals _____.

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9.7 INTERNATIONAL ACCOUNTING

Most of the Indian companies especially in pharmaceutical and software industry are also operating at overseas. Liberalisation in trade has compelled most of the Indian Companies to become multinational firms in the near future. When firms starts operating at global level then not only it affects the manufacturing activities but marketing activities of the firm are also affected and it also affects the investor activities also who are engaged in different business operations of the firm, and it becomes very difficult for a firm to locate all these business operations under one roof. Accounting standards vary from country to country and investors who are the stakeholders in the firm expects that the financial statements of the company should be prepared according to the accounting standards followed in their country, so that they find it easy for comparison purpose of one accounting standard with the other accounting standard of other country. This can be explained with the help of an example, if you are a shareholder of Reliance or Hindustan Lever you would like to prefer that the accounts be prepared under the Indian GAAP. But if a investor of Reliance in USA has majority stake in Reliance would demand to prepare the financial statements according to the GAAP followed in their country. This consolidation of data of different countries should also be reflected while preparing financial statements. This consolidation becomes more complex if varied investors located in varied countries. Now a day's most of the companies have started giving financial statements using major countries GAAP so that the investors from other countries are also satisfied.

IN-TEXT QUESTIONS

15. The account in which the financial statement of the company and its subsidiary are added together is known as _____.

16. Which concept motivated Indian Companies to become multinational _____.

9.8 CREATIVE ACCOUNTING

According to Cambridge Dictionary" Creative accounting is the use of methods of recording financial information about a company which are legal but which do not show the real situation clearly, usually making the company seems more successful than it really is". So many means are available in accounting world for manipulation of figures but the most

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popular way of manipulating is profit and this is being done to avoid excessive taxation in the near future. The tax figures calculated from various books of account are found to be generally incorrect and the manipulation of figures is being done at the grass root level. Manipulation of figures and data is being done by some companies to show that their financial position of the company is in a sound condition and the investors would start investing in their companies. The most popular methods of creative accounting are:

i. **Companies showing a wrong estimation of inventory:** A wrong estimation of the inventory is being done by some companies to overstate the value of inventory. This is being done to show that their cost of goods sold is good and when cost of goods sold is good then the profits of the company will also increase in the current year and which will reflect a good sound financial position for the company.

ii. **Contingent liabilities not shown properly:** This method is very technical in nature. The contingent liability is not reflected in notes to accounts and thus it will give the impression that the company is not having any contingent liability.

iii. **Showing expenses at a lower value:** Companies show expenses at a lower value and this is being done when any client makes a payment in the form of cash or an outdated cheque and this practice will help the management to book the expenses at a lower rate every year and a fewer expenses will be reflected in the books of account which will help in attracting investors.

iv. **Manipulation in Depreciation methods:** This technique is being used by companies to have a good impression among the investor. Companies make a change in the method of depreciation by sampling putting a disclaimer, but in reality no estimation can increase the life of the asset. The company management sets up an imaginary life span of the asset which is much higher than the expected level. This will show a lesser depreciation value and due to this the salvage and asset value of the company will increase.

v. **Manipulation in revenue and sales figure:** This manipulation is very common and is being done by most of the companies. Sometimes the revenue will be lowered down in order to evade taxes and sometimes revenue figures will be raised to show that the company is earning profit and will attract the potential investors in the company.

So many companies are following creative accounting techniques, but a very famous case where fudging of assets, liabilities and profit has been done was the case of "Satyam Computers" in 2008 which inflated its assets cash and bank balances of more than 1.5 billion and also overstated its debtor position to 100 million.

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IN-TEXT QUESTIONS

17. _____ is a method of recording financial statement which are not real
18. Fudging of assets and liabilities is called _____ .
19. Which scam regarding creative accounting occurred in 2008 _____.

9.9 PROJECT ACCOUNTING

This kind of accounting focuses its attention on the transactions of financial nature related with the management of the project which includes cost of the project, billing of the project and revenue earned from that project. Project managers and accountants are being appointed by the company to look after the working of the project and project managers mainly rely on the advice of project accountants who gives them the data about the status of direct cost, overhead cost, and any other revenue earned in a specified period of time. Project managers prepare the reports on the data furnished by the project accountants, which helps in making a project budget. Various revenue recognition methods are being used in a project but the most common revenue recognition methods are:

i. **Sales Basis:** Accountant keep a record of the revenue when the sales take place or sometimes when the goods are being billed which means when exchanges of goods and services have taken place. For example If a customer pays for the RO service then the company will record this service in its payment book when the service has been delivered to the consumer.

ii. **Instalment method:** This customer is being taken into consideration when the consumer pays the amount in instalments. The company will record the revenue when the customer will pay the instalment amount. For example in construction linked project plans the customer use to pay the amount in instalments as the work is being done on step to step basis. When a customer will make a down payment on the completion of the first floor then the company will record in its payment book as revenue.

iii. **Percentage of Completion Method:** This method is being used when it is a long term contract. The service providers will be able to generate revenue only when the work is being completed on a percentage basis. This method is commonly used in engineering and construction firms. For example 75 percent of the work is being done

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by the contractor then the cost of 75 percent work done will be calculated and accordingly the payment will be made.

iv. **Completed Contract:** This method is being used when the requirement of percentage completion method fails. When the project is being completed and all the deliverables are handed over to the customer then the payment is being made and only when the contract is completed then the service providers will generate revenue.

v. **Cost recoverability:** Under this method the gross revenue will not be recognized until and unless the cost is fully recovered and after the recovery of the cost further income will be shown in gross profit.

IN-TEXT QUESTIONS

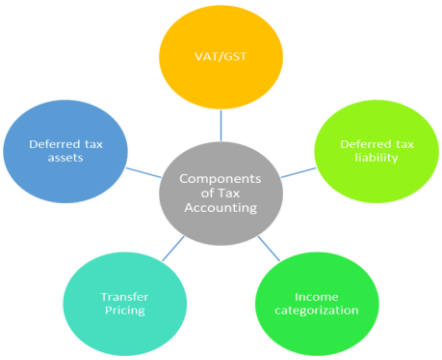
20. _____ looks after the work of the project

21. _____ method is used in long term contract

22. Which method is being used when requirement of percentage completion method fails _____ .

9.10 TAX ACCOUNTING

Tax accounting can be defined as the collection of information for the calculation and reporting of taxes instead of preparing this information in the form of financial statements. This kind of accounting is being managed by Internal Revenue Code and not with the provisions of GAAP. This code highlights certain rules and regulations to be followed while filing of tax returns. There are four components in tax accounting which are being represented with the help of following diagram.



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i. **Deferred Tax Assets:** This component occurs because of the difference in timings book value of profits and profits which are being taxable. For example provision for bad and doubtful debts is deducted from debtors in normal course of accounting but when taxation point comes provision for doubtful debts can be allowed as bad debt if it is being declared as bad debt in the current which may or mot be a possibility that it will occur as bad debt in the current year. In such a scenario the taxable profit will differ. So we can say that the extra amount of money which a business pays in the form of taxes due to provision amount not eligible for deduction known as deferred tax.

ii. **Deferred tax liability**: This kind of liability also arises when there is a difference in timings and the taxable profit is less than the accounting profit. It can also be defined as the amount of taxes which the company has underpaid but will be paying in the near future. This can be explained with the help of following example ABC company limited sells a wooden furniture for Rs 2000 plus a 20 percent sales tax payable in monthly instalment. The customer will pay the tax 400+400 for 2 years. In financial the records the company will show as a sale of Rs 2000 but for tax records it will be recorded as 400 for 2 years. The deferred tax liability would be 400*20% =80.

iii. **VAT Accounting**: VAT and GST are not considered as an expense but these go by a different tax procedure for payment and credit of taxes and also follow a procedure regarding invoicing and registration of taxes.

iv. **Transfer Pricing**: When the world is becoming a globalised village most of the companies are opening and operating in different parts of the country. The exchange of goods and services takes place between different units of other country. Such kind of transactions gives a rise to transfer pricing concept. The main idea behind such concept that the main entity must not get the products and services at a lower cost if same product is being sold to third party. For example if a company is opening an office overseas than it has to pay a certain percentage of tax on the expenses the company incurred in opening of the office overseas.

v. **Income categorization**: In normal accounting only a extract of receipts and payment is being prepared and we consider all kind of receipts and payment while preparing such a extract but for tax purposes all receipts and payment are not taken into consideration this can be explained with the help of following example.

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TABLE 1 Profit and Loss Account of ABC LTD

Particular	Amount	Particular	Amount
To Rent	6000	By Gross Profit	40000
To Salaries	13000	By Interest on Deposit	6000
To other expenses	9000	By Profit on Sale of Land	7000
To Net Profit	25000		
TOTAL	**53000**		**53000**

TABLE 2 Statement of Profit and Loss for taxation purpose

	Amount	Amount
A Business Income		
Gross Profit	**40000**	
Less: All expense		
Rent 6000		
Salaries 13000		
Others 9000	**28000**	**12000**
B Income from other sources		**6000**
C Long term Capital gain		**7000**
Total Income		**25000**

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In table 1 one can see the extract and in table 2 how categorization of all types of income is being done.

IN-TEXT QUESTIONS

23. Collection of information for tax purpose is known as _____ .
24. Full form of GST is _____ .
25. When taxable profit is less than the accounting profit is known as _____.

9.11 IT DEVELOPMENT IN ACCOUNTING

Accounting is one of the earliest professions which have witnessed the early computerization in the commercial world. Today we are on that phase where most of the accounting operations are being done with the help of computers. Most of the companies now days are using ERP system like SAP, People Soft etc. ERP helps in integrating all the functions of the department with the help of software through a common database. For example if you are a good planner and wants to operate through ERP system then it should be operated in such a manner that if inventory level comes down to a certain level then the ERP system will automatically generate all purchase order in electronic form on the same day the order is being placed with the vendor. When the material is being supplied by the vendor then has to make dual entries one at the store level when receipt of the order takes place and one at the account level for data invoicing. The machine will compare both the data and pass the bill for payment. When the due date will come automatically the cheques will be printed in electronic mode.

One of the recent developments that have taken place in the field of accounting in respect to information technology is Cloud Accounting, Block Chain Accounting, and Artificial Intelligence Systems.

1. **Cloud Accounting:**

   Cloud accounting has revolutionised the world of accounting which helps in providing a real time solutions to varied problems. Before coming of cloud technology the accounting software were desktop based and one has to access the actual application from the hard drive of the computer and the major disadvantage was the updatation of software which was very costly. Cloud accounting is a kind of accounting which has same kind of functions but the whole process operates in cloud.

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There is no desktop application and all the data is saved in a cloud server. It gives 24*7 accesses from any location and thereby removing the need for accessing form the central computer. It also helps in real time reporting and also helps in examination of current financial position of the company on periodic basis.

2. **Block chain Accounting:**

Block chain accounting gained popularity in accounting field when the height of bit coin was looking fancy and suddenly its value crashed in the year 2017. At that time a decentralized database was built which helped in real time verification and communication of information. This was linked to a Google accessible document to network members. Different members were given different access levels and they can access the network from different places and each level was having a cryptography and other tools which help in providing information on various cryptographic currency.

3. **Artifical Intelligence Systems.**

It helps in collecting and analysing voluminous amount of data which expects a lot of exercise to be done by the accountants in traditional times. Data collection has become very easy with the coming of artificial intelligence systems. It analyze a huge amount of data with the help of algorithms. Now the work of audit has also become easy and data base can be presented in the form of spreadsheets. Sales forecasting reporting and tracking has also become easy due to coming of artificial intelligence system.

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IN-TEXT QUESTIONS

26. _____ analyze store data in cloud
27. _____ is the study of crypto's
28. Which system helps in collecting large voluminous amount of data _____ .

9.12 FORSENIC ACCOUNTING

Forensic accounting can be defined as the investigation of frauds and misrepresentation of facts. In forensic accounting one conducts a in-depth analysis of financial data. Accountants use to prepare a detailed report and submit the findings of the report for judicial proceedings. So one can say that forensic accounting is being applied which use scientific techniques and

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helps in detection of various kind of fraudulent activities. Advances in technology and increase of various scandals and scams have increased tremendously the need for forensic accounting.

IN-TEXT QUESTIONS

29. _____ analysis undertaken in foresenic accounting

30. _____ reports are submitted in court of law.

31 What kind of techniques are being used in forsenic accounting _____ .

9.13 SUMMARY

Accounting is a combination of various monetary transactions which takes place between the company and the others who prepares the financial statements. Accounting information is being used by various interested parties. Now days the information is being presented with the help of various accounting software's. As the world is also changing at a faster pace it is the requirement on the part of accountants also that they should upgrade their knowledge and skills. Top management of the companies also now expects that accountants should use modern tools of accounting while preparing balance sheet and income statements. So it has become a need of the hour that accountants should be computer savvy and should be familiar to work in a computerised networking environment. Today the accounting process is becoming centralised and shared service providers are coming to look after the reports of the companies. So it is the duty of the accountant to have a thorough knowledge of all the developments taking place in the current scenario.

9.14 GLOSSARY

1. **Project Accounting**: It focuses on the financial transaction related to managing a project.
2. **Tax Accounting**: It refers to collection of information for reporting of taxes.
3. **Foresenic Accounting:** Collection of data and reporting fraudulent activities
4. **Cloud Accounting**: A online accounting in which data is stored in cloud
5. **Block Chain Accounting**: A decentralized database for verification of accounts.

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6. **Transfer Pricing**: . The exchange of goods and services takes place between different units of other country.
7. **Deferred tax liability**: This kind of liability also arises when there is a difference in timings and the taxable profit is less than the accounting profit.

9.15 ANSWERS TO IN-TEXT QUESTIONS

1. Consumer Price Index	10. Social reporting framework
2. Monetary and non monetary assets	11 National Income Accounting
3. Financial statement	12. Income of hospital
4. General Price level accounting	13. Special registers
5. Ogans Model	14 Health accounting
6. Likert Model	15. Consolidation
7 1976	16 Liberalisation
8. National Income Accounting	17 Creative accounting
9. Sustanibility Accounting	18 Creative accounting
	19 Satyam Computer case
	20. Project Managers
	21 Percentage Completion method
	22 Completed Contract
	23. Tax accounting
	24 Goods and Services Tax
	25 Defeered tax asset
	26 Cloud Accounting
	27 Block chain accounting
	28 Artifical Intelligence
	29. Indepth analysis
	30. Detailed reports
	31 Forsenic Accounting.

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9.16 SELF-ASSESSMENT QUESTIONS

Q1. Explain the recent development in the field of accounting in respect of technology.

Q2. Discuss the components of tax accounting.

Q3. Discuss the importance of accounting in a health care sector.

Q4. Discuss the important components of social accounting.

Q5. How creative accounting will affect business.

Q6. Discuss the components of Project Accounting.

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MARKETING MANAGEMENT

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LESSON 1

INTRODUCTION TO MARKETING

STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 What is marketing?
  1.3.1 Some important definitions
  1.3.2 Nature and scope of marketing
  1.3.3 Marketing and its importance
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1.1 LEARNING OBJECTIVES

After going through this chapter, you are expected to:

- ✓ Define marketing and discuss its central concepts.
- ✓ Understand marketing management as well as how marketers manage to develop healthy customer relationships by satisfying customer demand.
- ✓ Think about five marketing philosophies and be able to explain management of demand as well as customer value creation and customer satisfaction.
- ✓ Understand the marketing mix elements

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- ✓ Have an idea about the key marketing difficulties to be faced by marketers in the fourth coming times.

1.2 INTRODUCTION

All small and big businesses strive for one thing i.e., success in achieving its goals, Numerous factors all together help the business to achieve what they strive for- various factor endowments like hard-working employees, free flow of information, planning, resource utilization, strategies, execution of plan, control mechanism etc. But modern businesses have one thing in common, they prioritize customers and heavily invest in marketing, they understand the fact that customer is king and accordingly they predict the needs and wants of customers way in advance by analysing the market, serve to those needs and wants and ultimately satisfying (delighting) their customers in a manner that it leaves a positive impact on the target market.

Marketing has different meaning to different people, further in the chapter we will discuss various definitions of marketing given by eminent authors and institutions, So, marketing can be considered a lifestyle, marketing is getting the right product (goods, services, people, places, experience, event etc.) to the right people (target market, customers) at the right places at the right time at the right price with the right communication and promotion to deliver more than the perceived value to the customer which will make them delighted. Businesses now a days know it well that if they take good care of their customers, every other goal will fall in place including profitability, customer base and an edge over competitors.

In any business, there are several functional departments, marketing is one such departmental function which directly deals with customers. Delivering the right value or sometimes more than perceived value keeps the customers delighted enough to become another medium of promotion for the business as well as it retains the customer for a longer period of time.

It is normally perceived that only large businesses having huge profits, practice marketing or invest in it, but if we pay attention to the environment or markets, we are in, we will notice that some sort of marketing is being used by all businesses around us, for example a small vendor on the road side, if you analyze you will find that the vendor has its own pricing strategy, an unique product mix, the place where this vendor sells is by choice on the

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basis of footfall to that place. So, you consider any business small or big, local or global, marketing has a role to play in the success story of that business.

Marketing has its own history as well, if you search the term marketing in the dictionaries of before 1910, you would not find this term in it, but for the first time this term was propounded in 1910 and was also instilled in dictionaries as well with a clear meaning, but that meaning has evolved a lot from the era of industrial revolution to the era of digital revolution. Marketing firstly was brought in use by consumer packaged-goods, consumer durable and industrial equipment companies and all sort of industries saw the magic of marketing unfold and then the world saw the evolution of marketing, we will discuss more about history and evolution of marketing as we move further in this chapter.

Marketing is not confined to core product business only, organization's working for welfare of society and providing services have started marketing in modern world like hospitals, educational institutions, NGOs, police departments etc. Even service providers like advocates and chartered accountants also market their services.

Source-https://www.advertgallery.com

You already have an in-depth understanding of marketing; you see it happening around you on a daily basis:

- You see and experience marketing through various mails and messages pouring in your mailbox and inbox.
- While surfing the internet various pop-ups make you curious about attaining more information of the marketer.

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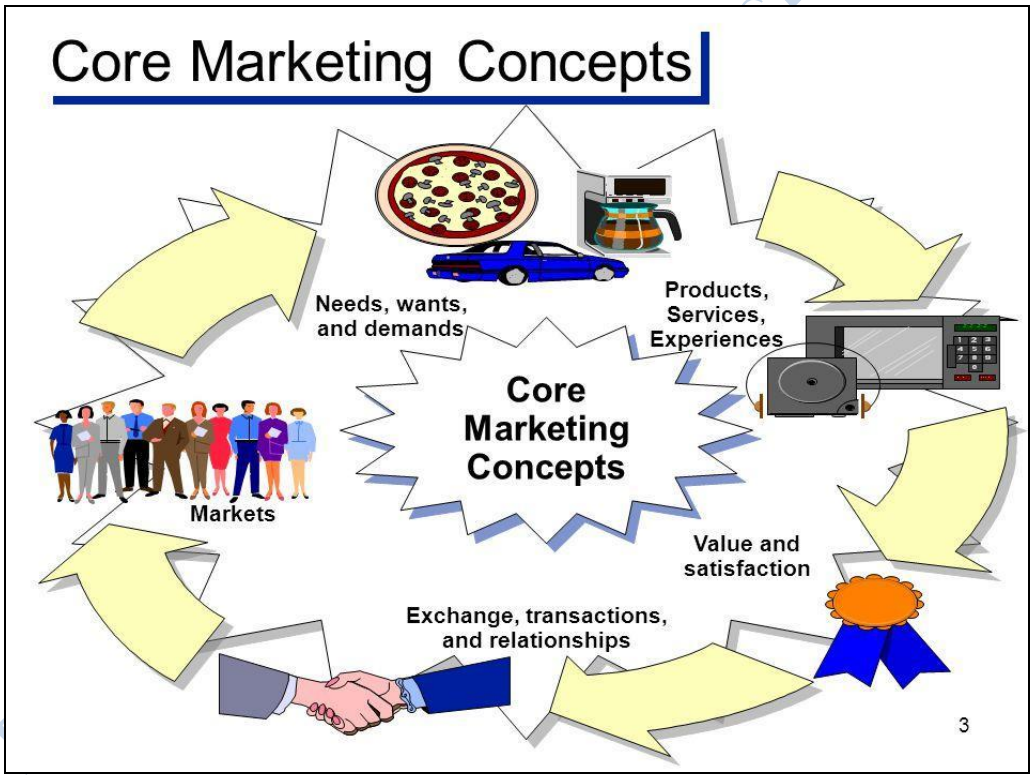
- Knowingly or unknowingly, you are hammered through television, radio, newspaper and social media etc. in the form of advertisement again and again.
- On a regular basis your eye balls capture hundreds of brands, even while travelling you see bombardment of advertisement through different modes like transit advertising, hoardings, pamphlets etc.

But marketing is more than what your eyes see on a regular basis, behind what your eyes see or your mind experience as marketing is a huge number of people working tirelessly to withdraw your attention and extract money out of your pocket by promising to deliver you some value. Most of us are confused and assume marketing and advertising as one and the same thing, but it is not, we will have much better understanding about what marketing actually is further in this chapter.



Core marketing concepts: Source: *https://slideplayer.com/slide/5689557/*

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1.3 WHAT IS MARKETING?

What marketing is all about? It will make you realize after you conduct proper research over this topic that it's more than what you thought it to be. In simple language, if we define marketing as per our understanding it is analyzing the perceived value, expectations or preferences of customers for their money about a product (it includes everything like services, person, idea or experience etc.), and approaching those customers to deliver the expected value to delight them, it is nothing but exchange of value for the satisfaction of human needs and wants.

It is not to be assumed as mere **selling** like old times, but it is more than selling and delivering value to the customer for satisfaction (delightedness) in modern times like now. In introduction as we discussed that marketing and advertising is confused to be the same thing, but it is not, advertising is just one out of many ways of marketing, it is not the innocent people's mistake to assume marketing or advertising or selling the same thing, as we see a lot of advertisements on a daily basis on television, newspapers, magazines, transport mediums trying to persuade us to buy a new thing every now and then, our minds has been approached by these marketers through advertising so many times in a day that we clearly assume marketing and advertising to be the same thing. If any marketer focuses well on customer's needs and develop a product which gives the customer more than the expected value, also makes that product reach to every customer in demand as well as promotes it well, product will sell off without putting much efforts, in today's world if you have the right combination of quality and quantity of a particular product it will sell with minimum efforts.

1.3.1 Some important definitions:

A platform or a place that facilitates marketing is known as market in simple language. If you have watched a movie named "Mohenjo-Daro" starred by Hritik Roshan and if you can recollect there is a place in that movie where our hero went to sell indigo cultivation in exchange of some grains, Whole point of bringing out this example in this discussion is giving you a view of how traditional markets used to be in the ages of barter exchange, in narrow sense where ever seller and buyer meets in order to exchange their products or something of value to each other is a market. In modern world a virtual space can be a market, for example during covid days there were many home kitchens delivering food through swingy or Zomato without having any physical presence in the market. So, market can facilitate marketing to bring more ease to buyers and sellers and whenever or wherever seller and buyers are ready to exchange value to each other, marketing occurs.

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Human needs and wants are the main things to be satisfied by any marketer offering a product in exchange of monetary value. If we talk about needs, they arise out of deprivation state, for example food, shelter, clothing, safety etc. and wants are desires which arises when basic needs are fulfilled, and they keep on changing time to time as and when your social status changes, your wants also are reshaped, basically stressing upon a specific need is a want, for example- need is having bread to meet hunger state of body, want is deciding what exactly to eat out of many choices available. North Indian households would want chapattis as their main food but South Indians might want rice etc. Human needs might be very few but wants can be numerous. Once wants are backed by purchasing power it becomes demand, in other words, demand is willingness and ability to buy a wanted product. So, to understand marketing we must have a clear understanding of needs, wants and demand as marketing exist because of these terms. Marketers stress much on demand creation; they would always want to stimulate demand by attracting the customers through offering better quality product or through packaging or sometimes through advertising heavily.

Products are the medium to satisfy the needs and wants of customers. Anything which is offered to market for satisfaction of need and want is called product. In marketing terminology product is not just physical object like television, fan, table or chair, services, experience, events, places, ideas and even people come in the category of product. A customer would buy a product for satisfying their need and want, they might buy it up till it serves some value to them as expected, otherwise product is of no use to them. Different customers might choose different product for the same need as per their purchasing power or taste and preferences or sometimes various other factors play a role in product buying decision. For example, any one might require mobile phone for communication as its core feature but some might go for a smart phone, some might choose a simple table phone for communication, some might choose an advanced version of top class smart phone, core function of all these devices is communication but people showcase different choices and behavior while buying a product as per the purchasing power capacity or because of various other variables.

You must be embezzled many a times while choosing from alternatives available to buy a product or service? Questions starts creeping in your mind about choosing the best alternative and you start creating perception-based value for each alternative product by processing thoughts in your mind as well as by seeking opinion from your close friends, relatives and near and dear ones. So, **Value** is your perception about a product's ability to satisfy your needs. If customer's expectation from a product delivering value is met a customer feels satisfied, **satisfaction** is that state of mind when a customer judges the

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product's actual value in comparison to expected value, the customer experiences satisfaction when actual value meets expected value.

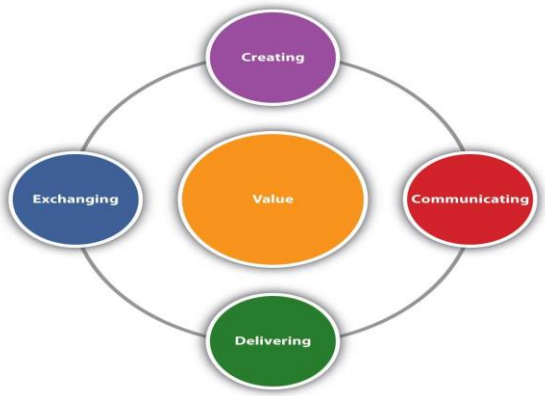
Marketing exchange takes place when two or more parties are involved in the activity of **exchange** of something valuable by both the parties, there are certain conditions to be fulfilled to name it as exchange, which are as follows: -

- There must be two or more parties willing to exchange.
- Both the parties must possess something of value to each other.
- They must communicate well with each other as well as can take delivery of valuable item being exchanged.
- There must be consent from and rights with both the parties to accept or reject the exchange being done.
- There should be trustworthiness amongst both the parties dealing with each other.

According to (Philip Kotler, Gary Armstrong, J. Saunders, V. Wong, 1999) marketing is "A social and managerial process by which individuals and groups obtain what they need and want through creating and exchanging products and value with others".

According to AMA (American Marketing Association,) (American Marketing Association, 2017) "Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large".

If you break this definition intently and try to understand it, you see that there are four exercises, or parts, of marketing:



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- Creating. The most common way of teaming up with providers and customers to make contributions that have value.
- Communicating. Comprehensively, portraying those offerings, as well as gaining from customers.
- Delivering. Getting those offerings to the shopper in a manner that enhances value.
- Exchanging. Exchanging value for those offerings.

ACTIVITY

Find out people near you who are still at need fulfilling stage or want fulfilling stage or are they demanding in the market?

Also list 5 products each which will fall in category of needs, wants and demands respectively.

1.3.2 Nature and scope of marketing:

Global world is full of marketing phenomena, if we observe on a regular basis from waking up in the morning till, we sleep in night and even after our sleep there is a lot of marketing involved to which we usually do not pay attention to.

For example after you wake up in the morning and you directly pick up your phone which is sold to you by a specific brand, while surfing through the internet and social media there are numerous brands which pass by through your eyeballs and then you use a particular toothpaste and tooth brush provided by various brands but you choose a specific one to keep your oral hygiene, then getting ready and wearing clothes and shoes of a specific brand, the car through which you commute is again a result of marketing because of which you choose that car, then your eyes see a lot of advertisements outside while you commute, the food you eat, the water you drink, the bed in which you sleep, everything around you is a result of tireless marketing done by companies. For this very reason marketing is considered as:

- **Fulfilling needs and wants:** The very basic feature of marketing is to understand the changing needs and wants of customers, for that marketers will have to keep a track on the customers changing taste and preferences, marketing not only satisfy current needs and wants but also predicts future needs of customer by analyzing through the

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feedback or information provided by customers and takes up all the necessary ventures to meet the upcoming needs of customer.

- **Satisfied customers:** Any marketing campaign can be considered successful only when marketing activities have provided satisfaction to customers by delivering them the value, they expected their chosen product or brand to deliver. Sometimes companies try to offer more than customer satisfaction which is called customer delightedness. For example, if you visit a restaurant in search of good food only and you are offered a nice ambience in addition to good food, you will be more than satisfied and you will be delighted to visit that restaurant as it exceeded your expectation.
- **Exchange of value is the result of marketing:** Any transaction made by seller in order to serve to the needs of buyer is communicated to the buyer once product or service is delivered and after that buyer provides some value in exchange either through money or through some other product which is of value to seller.
- **Plays a critical role in business:** Any start-up in modern world would require analyzing the market for the needs and wants and then requirements to start a business, all the business owners take a close look at the process of marketing. They check if the market is unexplored or not, analyses the adaptability of the product they are going to offer, and various other decisions are taken with the help of marketing only.
- **It is a process:** Marketing takes place when a buyer and seller agrees to exchange something of value, as transactions go on it leads to building relationships as well, these relationships gives something of value or benefit to customers in every transaction and reaps benefits for the organization from customers. Also, marketing is the process of environmental scanning and dealing with uncontrollable factors of environment by using its marketing mix variables.
- **Complex, pervasive and ever changing:** There can be different point of views of looking at marketing, it can be of business', suppliers', customers' and other stakeholders. Also, it is not easy to control all the internal and external factors of business environment, which might impact business in positive or negative way. It is a continuous process through different departments of a business which makes it a wholesome activity known as "marketing". It keeps on changing with time as it is evident from past 100 years of evolution of marketing.

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Marketing has developed as a significant business capability and is a pervasive activity and its scope can be grasped concerning application of marketing (I) in different horizons, as non-profit organizations, service organizations, and public service organizations like power, education, medical, (ii) with respect to what is being promoted, and (iii) as to customer market.

Marketing idea now a days is applied to non-profit organizations as marketing is done for business organizations. A wide range of public and private non-profit association going from government organizations, medical care organizations, educational foundations, and religious organizations to charities and political groups apply marketing ideas to have the option to reach out to their target audiences more readily. Very much like business firm, a non-profit association needs assets and support to make do and accomplish its goals. They additionally face competition for the assets they need. An educational institution might fail if supporters focus on something else than education.

Marketing give recognition to four major customer markets, first one is known as consumer market, these markets offer consumer goods like food items, clothes, transport facility etc. second one is business markets where raw material to process finish products is offered to sale or sometimes business buy products to resell for an additional profit. Third one is known as global market, where in there is integration of economies, there is no restriction by the company's management to sell product in a specific boundary, companies decide about entering other countries and make strategy accordingly, here in company's product must be customized as per the requirements and standards of that country where the company enters for marketing. The fourth and the last type of customer market is non-for- profit or governmental market, here in these markets' companies dealing with non-profit organizations and government agencies must be very cautious while making marketing strategy, marketing mix is used in different proportion as compared to normal products, especially prices has to be set very cautiously for such markets.

As discussed earlier, not only physical products are being marketed, but Product also has different meaning for different type of companies, some companies for example might be offering services as their core product such as doctor services, education by private institutes, banking, hotel and legal services etc. some might be facilitating events such as trade shows, concerts, sports event etc. Some businesses might be offering experiences such as water parks, amusement parks, movies etc., business also do marketing for people for example public relation agencies for celebrities, or

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sometimes single individuals also become managers for such people, ultimately called person or people marketing. Similarly, marketing can be done for places as in tourism destination marketing, organizations are also marketed and even ideas can be marketed for example "Swach Bharat Abhiyan". So, Marketing has a huge scope and is still unexplored, it has got potential to tap the untapped, untouched markets, also it can influence the attitude of customer by making them aware by providing cognitive learning and ultimately motivating them to buy a product offering.

1.3.3 Importance of Marketing:

- **Marketing helps in engaging consumer effectively:** Organizations should engage customers, and thus, marketing ends up being a successful instrument. Customers can be engaged by letting them know what they don't have and creating great substance around your products and services. Customers like to have as much information as they can access for the product they are searching, marketing just let them get that information with a lot of engagement.
- **Creates goodwill:** Goodwill of a company or a business is built gradually with the kind of product and services they have offered for a long period of time, also it depends on how your business has grown with the time, the better you serve to the market with the most effective quality of your product, the better will be the goodwill of the business.
- **Helps in creation of customer relationship and its management:** Marketing helps you access the information about the needs and wants of customers and when you serve to those needs and wants by developing and creating a product which is customer centric, it will give a sense of attachment to customers with the business, and once the customer feels an attachment with the business due to the activities a customer relationship is formed and such customers stay for longer duration with the business, longer they stay maximum will be the customer equity. There are various factors like demographic, psychographic and consumer behavior which gives marketing management a sense of how to deal with those customers, which will last in fruitful and long-lasting relationship with customers.
- **Helps in increasing sales:** Since marketing uses various ways of promoting products or services, it helps in improving the probability of better sales. Cheerful customers convert into an organization's brand endorsers naturally.

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- **Expands reach globally:** Many of the big brands like TATA, Reliance, BOAT, Apple, Tesla, Mc Donald's etc. can reach their customer now in any country, earlier these were mainly domestic brands in their home country, but if you observe the current scenario, these brands are available globally now, with the help of technology upgradation, digitization has helped many brands to reach their potential customers. Through internet and social media like Facebook, Instagram and twitter even customers can share their choices or preferences, with the help of marketing only companies now can observe these feedbacks and customize the products according to country's specification where company is about to operate or is operational.

- **Helps in management of supply chain:** Any business does not work separately from their other stakeholders like suppliers, creditors, logistic companies which delivers the product etc. with the help of customer requirement analysis business order raw material from their supplier to process and make finished products which are ultimately sent to retailers through logistics to make goods available to needy customers, and timely delivery of goods means better serving to customers which leads to long term fruitful relationships. And happy customers mean better revenues and ultimately better profits, all the stakeholders also enjoy fruitful business.

- **Helps customers in ease of life:** Today's customers are rationale customers, and they search for information which helps them take purchase decisions, marketing provides that information through various platforms, also, customers like to have better choices available for their needs, marketing helps them provide better choices as well. Even pricing is done in such a manner which is friendly to the pockets of customer so that it does not hinder purchase decision due to pricing, various assurances in the form of guarantee and warranty are also provided to customer to create reliability of a product and ultimately customers can withdraw some value due to these factors.

- **Helps in economic growth:** Marketing has the potential to uplift an economy and take it to the path of growth, marketing creates better revenues and even creates global presence of firm, ultimately leading to creation of big brands, these big brands create value for nation by providing employment, has major share in GDP formation, helps in growth of the firms and business leading to growth of economy.

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- **Helps in making society better:** companies now a days promotes their employees to be involved in societal activities, which impacts society at large, major big brands have recognized that the more they remain society friendly, better will be the brand image and brand value as it attracts more customer to a business if it is socially responsible, for example big eating joints have started using green marketing by using eco-friendly packaging, restaurants like Mc Donald's have gone this far that they started giving paper straw pipes instead of plastic ones to their customers, which clearly portrays a message to the society that they are eco-friendly. Activities done by companies socially inspires people of society as well to grow in a socially responsible manner.
- **Raises living standard:** Imagine the world without marketing and think would you be able to know about brands specific to clothing or availability of platforms which provides you your consumables or supplies on a daily basis? Answer would be a big 'NO'. It is because of marketing that we as customers are provided with quicker delivery services, we rely on brands which are communicated to us through advertising, we feel informed because we are bombarded with lot of information, so when we need a product or service we clearly know from where to get it, how to get it and at what price maximum value will be delivered, all thanks to marketing.

IN-TEXT QUESTIONS

Which of the following is defined as a state of felt deprivation of some basic satisfaction?

a. Need b. Want c. Demand d. Utility

1.4 PHILOSOPHIES OF MARKETING

We depict marketing as completing tasks to accomplish wanted business results with target markets. What philosophy ought to direct these marketing strategies framed by marketers? What weight ought to be given to the interests of the business, customers, and society? Regularly these interests sometimes are to be addressed simultaneously. Perpetually, the businesses 'marketing philosophy impacts the manner in which it moves toward its customers. There are five philosophies which have evolved with the time under which organizations lead their marketing exercises: the production, the product, selling, marketing

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and societal marketing concepts. Companies can use these concepts individually or they can use more than one concept to make marketing strategy or sometimes all concepts can be used to make a strategy, pertaining to the situation, product, brand etc.

Source- https://www.invitereferrals.com/blog/marketing-concepts/

The Production Concept

The production concept holds that shoppers will incline toward items that are accessible and exceptionally reasonable, and that administration should pay attention further on increasing production and efficiency of distribution. This concept is one of the most reliable and oldest philosophy of reasoning that guides sellers.

It will prompt economies of scale and decrease in cost per unit. The philosophy holds that high production proficiency and wide distribution inclusion would sell the item offered to the market. This direction of the business is generally rehearsed in circumstances where demand surpasses supply or item cost is high that can be reduced by large scale manufacturing. The market circumstance in most of the developing nations is that while demand for product exists, they are not accessible in the market.

The Product Concept

The organizations following this philosophy trust that by making enhanced products and working on their quality after some time, they will actually be able to bring in more customers. The hidden supposition is that customer favours quality, execution, quick delivery, new elements, and so forth the purchaser will respect such products and brands which works regularly on their quality. Given the product concept, better products always create excitement amongst customers are consistently invited by the customer. However, product is just a single component of the aggregate marketing-mix. In this manner even if customer is offered better product even at high price, they won't consider it expensive as such

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products deliver greater value (since progress in quality maybe at an expense). Nonetheless, as we will see, pricing is one of the factors of segmentation. The division of segment on monetary grounds, would come in that approach to executing such better-quality products at high prices.

For example, some marketers believe that if they can develop a better mosquito replant, all the customers would reach them in search for a solution." But they are mostly surprised by the fact that. Customers might be searching for a better solution to a mosquito problem, but not necessarily for a better smoky coil. The solution may be a body lotion which is harmless, an oil or spray, a service or something that works better than a coil. Also, an improvised fragrance-based coil will not sell unless the marketer uses the right product mix to create a better-quality product, designs, packages and prices it attractively; places it in accessible distribution channels; and communicate it to people who need it and motivates them that it is a better product. According to (Theodore Levitt, 1960) giving much emphasis on product only and not being aware about customer needs and wants might land marketer in trouble, it is called marketing myopia, he also stated this as short sightedness of business.

The Selling Concept

Many businesses have a practice of putting all their efforts in selling as their management's perception is that the customers won't buy their product until and unless we reach and try to sell our product to customers, they even bring on plate everything and anything and do not consider if customer wants certain product or not, sometimes customers feel offended and even breach to their privacy when sellers barge into their homes, cars or even at private places. The problem with this strategy is that the seller is not concerned about the customer satisfaction but are worried about selling only, which in normal scenario makes a customer offended at times.

For example, credit card sellers, they just find out the contact details by buying data of people unethically and then cold call them to offer credit card, the selling executives are trained so well that they will try their level best to sell the card, but now customers also mark these calls as spam and report these calls as well. Another example if you consider is of politician trying to sell themselves just before the election, they work so very hard for selling themselves, even their associated party boast a lot about them and even lie about them that their candidate is the most deserving person for the seat they are contesting the election, and later they are not even concerned if people who voted for them are satisfied or not. There is a lot of expenditure made on advertising through television, radio and newspapers in this concept.

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There are hidden facts about the product as well while making a sale which are not usually disclosed by the seller at the time of sale.

Most firms practice the selling idea when they have overcapacity. Their point is to sell what they make as opposed to make what the market needs. Along these lines showcasing in light of hard selling conveys high risk. It canters around momentary outcomes -making sales - as opposed to on building long, productive relationship with customers. It expects that customers who are persuaded to buying the item will like it. Or on the other hand, on the off chance that they could do without it, they might fail to remember their mistake and get it once more at a later time. These are normally unfortunate presumptions to make about purchasers. Most examinations show that disappointed customers don't buy once more.

The Marketing Concept

The marketing concept holds that accomplishing business objectives relies upon deciding the needs and wants of target markets and conveying the ideal satisfaction more effectively and proficiently than competitors do. Shockingly, this concept is a somewhat very recent business philosophy. The selling concept and the marketing concept are often misunderstood as one thing only. An inside-out approach is followed for selling, it starts from factory and ends on profit making through sales volume by selling and promoting heavily, whereas, marketing concept follows outside-in approach, it usually starts with market analysis through knowing the needs and wants of customers and then designing and developing something of value to those customers, here marketers earn profit through customer satisfaction. Many established brands like Tata, Jio, P&G, Patanjali, Kalyan jewellers etc. have built the brand image following this very concept, they put their customer first always.

Before we go ahead with societal marketing concept, please have a look at key differences between marketing and selling in table 1.1 given on the next page.

The Societal Marketing Concept

Humanistic or societal marketing concept holds that the businesses' objective is to decide the requirements, needs and interests of target markets and to address wanted value satisfaction in such a way that sustains or improves the purchaser's and the general public's prosperity. Subsequently, each firm ought to deal with social and moral contemplations while fostering their marketing strategies. This would assist the business in developing a nice public image. It is one of the latest and trending marketing philosophy to strategies upon.

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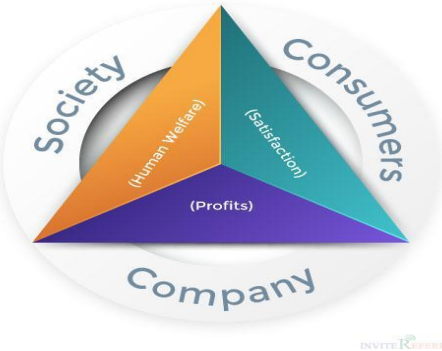

Source- https://www.invitereferrals.com/blog/societal-marketing-concept/

The societal marketing concept questions whether the core marketing concept is sufficient during a time of resource scarcity, environmental degradation age, slogging economies and ignored social services. It inquires as to whether the firm that detects, serves and fulfils individual needs is continuously giving what's required and best for customers and society over the long period of time. As per the societal marketing concept, the core marketing concept ignores potential dissents between short-run customer needs and long-run customer welfare. Businesses have realized that they have taken a lot from society in the form of natural hazard they are causing to environment, and they know if there is a positive image about them in society that they are concerned about society too, it will create a good image amongst people of society, also a business gets competitive edge over its rivals when they work for society because society supports back the business in that scenario.

Table 1.1: Comparison of Selling and Marketing concept

Basis	Selling Concept	Marketing Concept
Definition	• The selling concept considers that in the event that organizations and customers are isolated, the customers won't buy an adequate number of products created by the business.	• The marketing concept is a strategy, which certifies that the firm's benefit lies in developing more proficient than the competitors, in manufacturing, delivering and giving remarkable value to the customer in target marketplace.

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Related to...	• Positively impacting customers' mind regarding the product attributes and giving them the motivation to buy the product even if they do not have the need.	• Customizing the products and services according to the customers' needs, wants and specifications and leading the product towards customers' perception.
Starting point	• Starting point is factory where manufacturing takes place for the purpose of selling.	• Starting point is market from where customer feedback is withdrawn to customize product according to customer need.
Perspective	• Inside-out	• Outside-in
Longevity of planning	• Short-term	• Long-term
Objective	• Is revenue generation through selling volume	• Profit maximization through long term relationship building.
Cost involved	• Cost of production is ascertained, and profit margin is finalized	• Market feedback is ascertained and that's how product is developed, and profit is earned through making long-lasting relationship

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Marketers do have found out and are working on new marketing concepts as well in 21st century to gain market share as well as public attention. In totality it is called holistic marketing concept. Explanation to the same is as follows:

Source- https://www.marketing91.com/holistic-marketing-concept/

Holistic Marketing Concept

Holistic marketing concept is a piece of the series on concepts of marketing and it tends to be characterized as a marketing methodology which thinks about the business in general and not as an element with different various parts.

As per holistic marketing concept, regardless of whether a business is made of different divisions, the offices need to meet up to project a positive and joined business picture in the perception of customers. Holistic marketing concept includes interconnected marketing exercises to guarantee that the customer is probably going to buy their product as opposed to competitor's product.

For example, A business will have various departments like marketing, sales, accounting and finance, R&D and product development lastly HR and operations. In this manner, if you need to carry out a holistic marketing concept in your business, you really want to guarantee that R&D and product development take the inputs from marketing and sales to bring the product to market which is probably going to draw in customers.

Then again, they need to work intimately with accounting and finance to figure out the specific spending plan for the project. Sales and marketing need to impart to the HR the right sort of individuals that they need, lastly, administrator and operations need to devise an arrangement to hold these individuals.

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Major elements which are important for holistic marketing approach

Internal marketing - Marketing between every one of the divisions in an association.

Relationship marketing - Building a superior relationship with your customers, internal as well as end customers is helpful for holistic marketing.

Performance marketing - Driving the sales and income development of a business holistically by lessening costs and expanding sales.

Integrated marketing - Products, services and marketing ought to work connected towards the development of business.

In this manner Holistic marketing is a concept which is pervasive to whole of business functions and assists the development of the enterprise with the right marketing of the product. With the increase in competition and the limitations put on customers with limited monetary assets, decisions will be rational and as an enterprise we need to execute holistic marketing, so choices are made by customers in support of ourselves.

In text question

2. The concept holds that consumers and businesses, if left alone, will ordinarily not by enough of an organization's products. The organization must, therefore, undertake aggressive selling and promotion. Which concept is discussed above?

a. Production concept
b. Product concept
c. marketing concept
d. Selling concept

1.5 MARKETING MIX EXPLAINED

The marketing mix is characterized by the utilization of a marketing elements that joins various factors to become what it takes to be a marketing strategy, also to build a product's image and to help in selling the product or service. Product based businesses need to make good marketing strategies to sell their products and thinking of a marketing mix is one of them.

Any business in the market will always want to become market leader if they have sufficient resources, major objective of any business is to earn profit by delivering value, businesses need to create a good mix of ingredients of marketing to develop a good

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marketing strategy to achieve their primary as well as secondary goals. According to (Kotler. P, Armstrong, G, Agnihotri, P.Y, and Haque, E., 2010) "Marketing mix is the set of controllable, tactical marketing tools that the firm blends to produce the response it wants in the target market". (Mc Carthy, J. William, P.Jr., Joseph, C.E., 2006) explained the term marketing mix for the first time in terms of 4 Ps. The 4 Ps stands for Product, Place, price and Promotion. Marketers should know and it is their duty to use these 4 Ps like ingredients and make an effective marketing mix strategy. Customers withdraw value out of all the 4 Ps, as if product's value is not up to the mark customer won't buy it again, if price is marked too high or too low which may make a customer switch to some other brand, if product is not available easily and not accessible to customers then there is no point in having a good pricing or product mix, and promotion is the only medium which creates buzz in the market, it helps in increasing sale as well provides information to potential customers.

Source- https://www.business2community.com/marketing/the-marketing-mix-is-it-still-relevant-today-02298017

A brief introduction about marketing mix's 4 Ps as well as the additional 3 Ps and its multiple factors are explained below, detailed explanation you will study in forthcoming chapters: -

Product in Marketing Mix

A product is a good, manufactured or resold to satisfy the need of an individual or a gathering. The product can be touched or felt sometimes for example, idea, service, experience, place etc. It is critical to do broad examination prior to developing and offering a

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product as it has various life cycle stages, from the growth stage to the development stage to the decline stage.

Marketers really must re-examine their products to stimulate more demand once it arrives at the decline stage. It ought to make an effect in the psyche of the customers, which is selective and not the same as the competitor's product. There is a well-known saying about marketers, "how might I offer a superior product to this target market than my rivals". This procedure likewise assists the organization with building brand value.

Product mix strategy also consider about the right product or service to be offered and marketed by a business, factors relevant to product mix like quality, quantity, packaging, choices, design, size, features etc. can be manipulated as per the customization and specification of customers or target market. Decisions relevant to packaging and labelling, branding and customer care services are matters of product regulation and are to be dealt by marketing administration.

Price in Marketing Mix

The money worth, time and energy given by a customer in search of a value-based product is all together price of that product. Marketers need to certainly find out perception about the product's value in target customer's mind and then move ahead for pricing the product carefully so that it balances with the perception of customer, while pricing marketer also need to consider about the life cycle stage of particular product, they also need to look into the competitive pricing done by other players in the market. There is an issue regarding cost of other marketing mix elements which is very important to consider, or marketer might run out of budget as well with low generation of revenue due to wrong pricing. There are variables like interest on credit, payment period, promotional discounts, basic pricing, transportation and logistics charges etc. are to be considered while pricing, which will ultimately lead the marketer to nearly price accurately.

Place in Marketing Mix

The place is where your product or service is sold, and how it is sold. It could be a physical location or online. If you have a physical location, then it needs to be well thought out to be as convenient as possible for customers. If your business is based online, then your website and sales process should be professional, well-structured and easy. You want to make the process as pleasant as possible, to increase your chance of a sale. There are so many alternatives online, you do not want frustrated customers going elsewhere. For example, in current scenario car selling companies have long waiting periods for the delivery of cars and

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in many cases after a customer books a car, wait for a while, say for a month or two and if their mind changes or their choice shift to some other brand, they might cancel the booking and go to some other brand.

The sales channels your company uses is another aspect of the place. Are you using salespeople, intermediaries or selling directly to the customer? Wholesale or retail? Are you selling through Facebook ads, telemarketing or catalogues? Your business should try different methods to work out what really works best for customers. An effective channel of distribution is required to reach to customers on time, in this distribution channel, there are number of parties involved those helps the product to get delivered on time from manufacturer to customer. A channel of distribution might be short or sometime might be long depending on the criteria of the market and there are numerous factors to decide about number of parties to be involved in channel of distribution by marketers. Also, marketers need to keep a focus on cost reduction as well because budgets for each department in an organization are limited, so while choosing logistic partners or warehousing partners marketers need to keep an eye over the cost of such procurements.

Promotion in Marketing Mix

Promotion is all the way that you communicate with your target audience/customers about your products/services. It is important to use different forms of promotion and communication channels to find the best way to reach your customers and make sales.

Promotion includes advertising, content marketing, sponsorship, sales staff, product placement, direct mail, social media, and influencers. The way we promote our brands in 2020 has changed drastically in just ten to twenty years. What is working today will not necessarily work next week. Businesses need to update their marketing communication consistently and stay up to date with what is relevant and the most cost-effective way to reach and convert prospects into customers.

The major variables of promotion strategy are advertising to inform, personal selling, sales promotion for example discounts, direct marketing and customer relationship management etc. In the good old days, just huge companies could profit of the emotional impact of TV advertisements, boards, and magazines. However, with current opportunity arrives present day measures and digital marketing is assuming control over the stage. This doesn't mean, however, that advertisers ought to consequently forego the advantages of traditional advertising. Twenty-to-thirty-year old's might be assuming control over the commercial center yet the purchasing force of the gen X-errs actually counts. Furthermore, the quickest

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method for arriving at the non-educated people is through the traditional method for publicizing.

Thus, with regards to the promotional part of the business, marketers need to compare the advantages and disadvantages of their modes. Whether it's starting a viral marketing effort or facilitating a business show; these will all have an impact in the organization's publicity.

4 Ps gives you a marketer's view point not the customers', and whole of the marketing now a days revolve around customers only, value delivery to them etc. 4 Cs suggested by (Coster, H., 2007), which are Customer solution, Customer cost, Convenience, communication explains marketing decisions that hover around 4 Ps. While a marketer is selling a product a customer is seeking a solution to a need or a problem, customers not only consider the price of the product alone, they also see the cost of keeping the product for a time period which includes buying, selling and maintaining cost, 4 Cs are important to build 4 Ps of marketing strategy as it will give an idea about customer's perspective.

The other 3 Ps explained

The 7Ps model is a marketing model that changes the 4Ps model. As Marketing mix 4P is turning into an old pattern, and these days, marketing business needs profound comprehension of the ascent in new innovation and concept. In this way, 3 all the newer Ps were included in the old 4Ps model to give a profound comprehension of the concept of the marketing mix. The 4Ps were designed at a time where businesses were more likely to sell products, rather than services and the role of customer service in helping brand development wasn't so well known.

Source- https://www.ventureharbour.com/marketing-mix/

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People

The organization's representatives are significant in marketing since they are the ones who provides service to the customers. It means a lot to recruit and prepare the right individuals to serve better, whether they run a help desk, client support, publicists, software engineers… and so forth. It is vital to find individuals who really trust in your products or services that the specific business makes, as there is an enormous possibility giving their best performance. Adding to it, the association ought to acknowledge the legit criticism from the workers about the business and ought to enter their own considerations and interests which can scale and develop the business. Customers prefer those brands whose employees are well behaved and talk nicely and humbly. Training is an important part as in training only they will learn customer or people skills. And ultimately employees are the representative of your business.

Process

We should always make sure that the business process is well structured and verified regularly to avoid mistakes and minimize costs. To maximize the profit, it is important to tighten up the enhancement process. A complete guide or process should be available to customer before buying any product from a marketer, they should know how a product is made and then sold to customers, the delivery process and if there is any grievance then redressal process should also be known to customer, customers rely on any brand when they know about the quality and hygiene maintained to manufacture a product. Customer needs to know the complete schedule from manufacturer to them and vice versa in case of any problem with the product.

Physical evidence

Physical evidence incorporates aspects that demonstrates your brand exists and that a purchase occurred.

Examples of confirmation that your brand exists can incorporate things like a physical store or office for your business, a site assuming that your business operates exclusively on the web, and printed business cards that you exchange while meeting individuals. Examples of confirmation of purchases can incorporate physical or digital receipts, invoices, or follow-up email that you wrote to customers as a retaining activity.

Your marketing mix should also take into consideration all the things your client sees, hears - once in a while even smells - in relation to your product or service. This, obviously, incorporates packaging and branding, however ought to also acquire the ways products are

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displayed in stores, where they are placed, and the setting wherein they sit, as well as digital placement, remembering for your site and social media.

In the above explained 7 Ps of marketing mix, the marketer has to choose wisely amongst the 7 Ps in ratio as per the market conditions prevailing and as per the brand you are, life cycle stage also will impact the way you formulate your marketing mix using these 7 Ps or sometimes 4 Ps. Marketing department's only task is to develop an effective marketing strategy which suits businesses' current needs, actually it is not just marketing task, it is the complete marketing, the planning, the framing of marketing mix plan and then effectively utilizing it.

Marketers sometimes might find contradicting themselves against the profit motive in order to serve the customer better, some decisions might shun the profit margin, but still it is the duty of marketer and marketing both to satisfy customer in all the ways they can, marketers need to choose the right combination in the right ratio to suit to the situation their business is in, which will ultimately satisfy and delight customers as well as help to achieve greater market share with businesses' and marketing objectives.

IN-TEXT QUESTIONS

3. Which of these is not a part of 4 Cs?

a. Customer b. Customer solution c. communication d. customer cost

1.6 SUMMARY

Marketing is the process of creating, pricing, distribution, promoting goods, services, individuals, places or ideas. It facilitates exchange, that is exchanging a product in return for something of value. Marketing creates utilities like from utility, place utility, time utility and possession utility. Marketing has developed through four stages, namely the product era, the sales era, the marketing era and the societal marketing era. In most of the business the major purpose of marketing department is to generate revenue for the business by selling want satisfying goods and services to the customers.

Importance of marketing

The product satisfy customer needs and wants and also remove hindrances between the marketers and customers by creating utilities for them by adding value to the product. By

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removing these hindrances, marketing ensures free and smooth exchange of goods and services from marketers to customers. Some of them are –

Marketing helps in engaging consumer effectively

Creates goodwill

Helps in creation of customer relationship and its management

Helps in increasing sales

MARKETING Philosophies There are various concepts and philosophies which acts as a guideline and holds good when the various decision is to be made in marketing. According to Phillip Kottler there are five concepts in marketing. The production concepts. The product Concept. The selling Concept. The marketing concepts. The societal Marketing Concept.

At last, but not the least we discussed about 4 Ps- Product, price, place and Promotion, with 4 Ps we discussed 4 Cs and after that we discussed the other 3 Ps- People, process and Physical evidence.

1.7 ANSWERS TO IN-TEXT QUESTIONS

1. a 2. d	3. a

1.8 SELF-ASSESSMENT QUESTIONS

1. "Marketing is customer-driven". Elucidate this statement and discuss the characteristics and scope for future of marketing?
2. How marketing has evolved during the last few years, please explain with the help of philosophies of marketing?
3. What are the core concepts of marketing?
4. Discuss at least five differences between selling and marketing?
5. What is holistic marketing? What are the elements of holistic marketing?
6. How marketers use marketing mix? When does extension of marketing mix helps marketers?

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LESSON 2

MARKETING ENVIRONMENT

STRUCTURE

2.1 Learning Objectives

2.2 Introduction: Marketing Environment

2.3 Components of Marketing Environment

- 2.3.1 Internal Environment
- 2.3.2 External Environment
  - a. Microenvironment
  - b. Macro Environment
- 2.3.3 Difference between Micro & Macro Environment.

2.4 Features of the Marketing Environment

2.5 Environmental Monitoring

2.6 Global marketing

- 2.6.1 Elements (4Ps) of the Global Marketing
- 2.6.2 Advantages and Disadvantages of Global Marketing

2.7 Identifying Market Segments and Selecting Target Markets

- 2.7.1 Factors affecting Market Segmentation and Target Market.

2.8 Consumer Buying Behavior

- 2.8.1 Type of consumer buying behavior.
- 2.8.2 Consumer Buying Process
- 2.8.3 Factors affecting consumer behavior.

2.9. Organizational Buying Behavior

- 2.9.1 Nature of Organizational Buying
- 2.9.2 Features of Organizational Buying

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2.9.3 Factors affecting Organizational Buyers Decision

2.9.4 Process or stages of Organizational Buying Behavior.

2.10 Summary

2.11 Self-Assessment Questions

2.12 References

2.13 Suggested Readings

2.1 LEARNING OBJECTIVES

After completing this lesson, you will be able to:

- Explain the marketing environment.
- State the meaning of marketing environment.
- Gain knowledge about Environmental Monitoring
- Classify both microenvironment and macro environment.
- Understand new marketing scenario in Global Marketing.
- Explain the influences on organizational buying behaviour.
- Differentiate between organizational and consumer buying behaviour.

2.2 INTRODUCTION

The environment is considered as the internal and external surroundings, circumstances, or factors that influence any individual, business, or economy.

Understanding the environment for any individual or business helps to plan, formulate and apply strategies and plans of action. The environment includes both micro & macro forces that influence the business or organization. So, understanding the environment is one of the important aspects, and it influences any business or organization in many ways.

The marketing environment is the sum of both internal factors (customers, shareholders, retailers, employees, and distributors) and external factors (demographic, cultural, social, legal, economic, natural, and technological environment) as well as forces outside marketing that affect top-level management's capacity to establish and uphold successful relationships with its target customers.

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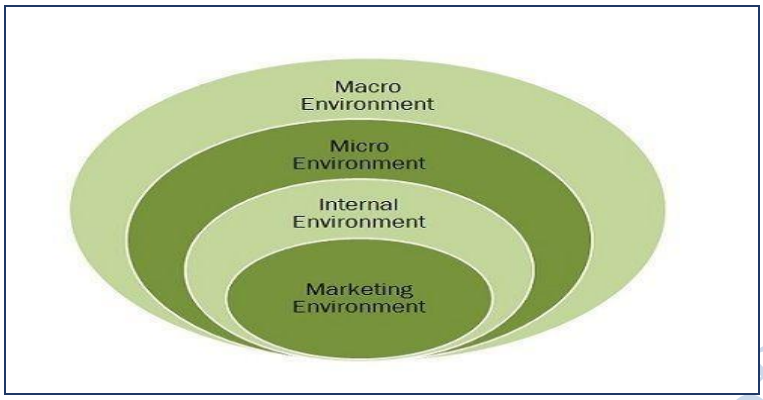

Fig 1.1: (*Source: https://businessjargons.com/marketing-environment.html*)

2.3 COMPONENTS OF MARKETING ENVIRONMENT

The marketing environment is made up of the internal and external environments of the company. The corporation has some control over its own environment (internal environment), but little to no control over the external environment (external environment).

There are two components of the Marketing Environment:

2.3.1 Internal Environment

2.3.2 External Environment

a. Micro Environment.

b. Marco Environment.

2.31 Internal Environment

The internal environment of a firm includes all internal forces and components that have an impact on its marketing operations. These elements can be categorized using the following:

Men: All of the company's workers, both skilled and unskilled.

Machines: The tools a company uses to speed up or complete processes are referred to as machines.

Materials: The supplies or manufacturing parts that the business needs to complete the production procedures.

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2.3.2 External Environment

The factors and influences in the organization's external environment are those over which the marketer has little or no control. The external environment can be divided into two categories: ***Macro Environment and Microenvironment.***

A. Micro environment.

The value delivery system of the company is made up of the forces and elements that are close to it and that affect its ability to serve its consumers, such as the firm, market channel companies, client marketplaces, competitors, and the general public.

- **Corporate:** When establishing a marketing plan, the marketing division must take into account the needs of other company divisions.
- **Suppliers:** Companies that supply the raw materials needed by a company or its competitors to produce goods or deliver services are known as suppliers.
- **Marketing intermediaries:** Organizations that help a company market, sell and distribute its goods to customers. These corporations include companies that do physical distribution, marketing service providers, and financial intermediaries.
- **Customers:** The target market for the business is consumers. An organization should be aware of the constantly changing needs of its customers and should keep on top of these needs by developing and implementing an effective information gathering system.
- **Competition:** The marketing theory states that in order to succeed, a business must outperform its competitors in terms of customer value and satisfaction.
- **Public:** The organization's microenvironment has a range of publics. The public is defined as any group that could really or hypothetically have an impact on how well a corporation can achieve its objectives.

B. Macro environment:

The larger social trends that affect the organization as a whole, in addition to its competitors and specific micro environmental elements. It is also known as the environment in general.

Since a marketing manager has no real control over these external, unpredictable effects, decisions are made with the macro environment in mind. He must therefore monitor the outside environment and make efforts to reduce the impact of these other events on his business.

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The following macro environment variables are categorized:

- **Demographical**
- **Social and Cultural**
- **Legal**
- **Political**
- **Economic**
- **Technological**
- **Demographic Environment**

- **Demographic Environment:** It is the study of human populations in terms of size, density, location, age, gender, race, occupation, and other statistics and characteristics. Marketers are always interested in population-related growth indices because the eventual market growth rate in the long run largely depends on the growth of the population.

- **Social and Cultural Environment:** The social and cultural environment factors may be the most challenging for the marketing organization to assess out of all the components of the macro environment because these consumer preferences, buying habits, and priorities alter as a result of social and cultural development, and marketers need to comprehend and spot these shifting patterns.

- ***Legal Environment***

  The legal climate has an impact on marketing choices as well. The legal system and how current laws are applied change frequently as a result of changes in the political climate. The legal setting determines how a company must behave in accordance with the law.

- ***Political Environment***

  Political Environment is one of the aspects of the marketing environment that is less predictable is the political climate. Political change can have an impact on a company's marketing; thus organizations need to regularly examine the shifting political landscape.

  The laws, institutions of government, etc. that have an impact on, constrain and restrict various groups and individuals within a given society make up the political environment.

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- ***Economic Environment***

  The economic environment, which primarily refers to the level of demand in the economy and is the most obvious feature in the macro environment, has the greatest impact on marketing decisions. It comprises factors that influence consumer purchasing power and spending patterns.

- ***Technological Environment***

  The forces that produce new technologies, opening new markets and potential for products, are probably most spectacular in the technological environment.

  Two processes influence technological change. It takes time for certain changes to develop. But certain technical developments are so significant and upsetting that they create a new pattern of consumption.

2.3.3. Macro and Microenvironment on Marketing

COMPONENT	MICRO ENVIRONMENT	MACRO ENVIRONMENT
Definition	The microenvironment of a corporation is essentially its immediate surroundings or internal environment.	The macro-environment is regarded as the company's external or general environment that has the potential to have an impact on how its entire operation is conducted.
Elements of factors	Customers, suppliers, media, or the general public, employees, shareholders, and competitors make up the microenvironment's primary components.	Demographic, economic, natural, social-cultural, technical, political, and legal elements are the key macro environmental influences.
Element's nature	The microenvironment's component has a simpler, more specialised nature. Usually factors that are industry specific.	There is a greater emphasis on regional, national, and international elements.
Influence on Organization	Direct and regular impact on marketing decisions and also remains independent.	Influence marketing choices directly and frequently while maintaining independence.

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Activities of Marketers	Interaction of marketer with different functions within the organization.	Interaction between marketers and other departments inside the company.
Marketing Control	Controllable factors by the marketers.	Variables that the marketers can control.
Functioning	A factor may affect an organization's strengths and weaknesses.	Factors may function in the form of opportunities and threats to the external market.

2.4 Features of the Marketing Environment:

There are several features that define the marketing environment of today. These features are as follows:

- **Specific and General Forces:** It refers to several elements affecting the marketing landscape. There are certain factors, such as those that directly affect the operations of an organization. Customers and investors are two examples of specialized forces. The forces that have an organization-wide impact are referred to as general forces. Technology, social, political, and legal issues are some examples of common forces.
- **Complexity:** It suggests that there are a variety of factors, circumstances, and implications in the marketing environment. The interaction between each of these components makes the marketing environment.
- **Vibrancy:** Liveliness indicates that the marketing environment is dynamic. The marketing environment is defined by a multitude of forces that are dynamic and change over time. While marketers may be able to influence some forces, they are unable to influence all. However, understanding the dynamic nature of the marketing environment can give marketers a chance to outperform competitors.
- **Uncertainty:** It suggests that market dynamics are inherently unpredictable. In order to strategize and update their plans, every marketer strives to anticipate market forces. Because changes are common, it might be difficult to predict some of them. To illustrate, shoppers' fashion preferences are constantly changing. The fashion industry is very insecure as a result. Depending on the trend, it can take a few days or years
- **Relativity:** It explains the causes of the differences in demand between nations. Depending on the nation, location, or culture, the demand for a particular industry,

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organization, or product can change. For example, sarees are in high demand because they are the traditional women's clothing of India. However, the demand for saris can be nil in any other western nation.

2.5 Environmental Monitoring

The marketing landscape is dynamic and constantly changing. The dynamics that shape the marketing environment, whether changing gradually or rapidly, create uncertainty, challenges, and opportunities. To be ready to seize opportunities and mitigate adverse circumstances, marketers must constantly monitor the marketing environment. Marketing managers need to conduct environmental scans and analyses to efficiently track changes in the marketing environment.

The endeavor to monitor changes in external variables that may affect markets and demand for a company's goods and services. Economic, social, demographic, political, legal, cultural, and technological pressures are some of the external forces typically considered. The fundamental objective of environmental monitoring is to control and reduce the impact of an organization's actions on the environment, either to ensure compliance with laws and regulations or to limit risks of adverse impacts on the natural environment and to preserve human health.

2.6 Global Marketing

"The capacity of a company to market to nearly every nation on the earth is known as global marketing".

A company's products or services are in high demand throughout a wide range of markets. The international corporation still has the capacity, reach, expertise, personnel, staff, skills, and knowledge to offer value to clients everywhere. The business understands the necessity of providing global standard solutions or products to local customers and localizes those products as required to maintain an ideal balance between cost, effectiveness, versatility, and localization in a regulated full spectrum in order to best satisfy the community, national, and global requirements to position itself against or with competitors, partners, alliances, substitutes, and defend against new global and local market entrants per country.

2.6.1 Elements (4 Ps) of the Global Marketing

Global marketing is associated with global competitiveness, exporting, joint ventures, foreign direct investments, government relations, global human capital management, resource allocation, distributed technology development and management, global business logic, as well as the standard marketing approaches, strategies, tactics, and processes.

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The standard ***"Four P's" of marketing: product, price, placement, and promotion*** are all affected as a company moves through the five evolutionary phases to become a global company.

The Four P's" of Global Marketing

- **Product:** A worldwide corporation can develop a single product and just need to make minor adjustments for several regions. Coca-Cola, as an illustration, employs two formulas—one with sugar and the other with corn syrup—for all markets. Every nation uses the dynamic ribbon and contour bottle design in some capacity in their product packaging. The bottle is the same size as other beverage bottles or cans in that nation, but it may also incorporate the native tongue of that nation.
- **Price:** Markets will always have different prices. The cost of product development (whether domestically manufactured or imported), the cost of ingredients, the cost of delivery (due to transportation, customs, etc.), and many other factors all have an impact on price. The final profit margin is also influenced by the product's position in comparison to the competitors. The price point of a product is influenced by whether it is viewed as the high-end, pricey option, the cheap, affordable option, or something in-between.
- **Place:** The target market's access to the competition affects each country's decision on the distribution of the product. Not all cultures employ vending machines, to use Coca-Cola as an example once more. Beverages are offered for sale by the pallet in warehouse stores in the US. This is not a choice in India. The position of the product in the market must be taken into account when making placement selections.
- **Promotion:** In a multinational company's marketing budget, promotion is typically the biggest line item after product research, development, and production. A company's goal at this point in its development is integrated marketing. The multinational corporation aims to cut expenses, minimize work and human duplication, accelerate implementation, and speak with a single voice. If a multinational corporation wants to communicate the same message to all of its customers, the problem is to do it in a way that is timely, interesting, and economical.

2.6.2 Advantages and Disadvantages of Global Marketing

❖ Advantages**:**

- Global Marketers has reduced marketing expenses

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- Global Marketing companies are more strength and range in their products.
- Global market includes the ability to use advertising to introduce its product.
- Global Marketing companies have consistent marketing techniques and brands.
- Global Marketers have Economies of Scale in the manufacturing and distribution of its product.
- Global Marketing encourages the establishment of ancillary industries to meet the needs of the global player.

❖ Disadvantages

- Variations in consumer reaction to marketing mix components.
- Product placement varies depending on administrative practices.
- Global Marketing policies may contradict domestic market laws.
- There may be variations in the administrative processes and product placement.
- Differences in product usage patterns and consumer demands wants, and needs
- Differences in the competitive environment, brand and product development, and legal climate.

2.7 Identifying Market Segments and Selecting Target Markets

The size and diversity of the product market make it challenging for businesses to please every customer. Companies must define a specific consumer base within a market and endeavor to fulfil them. Market segment identification is this collection. Additionally, companies must comprehend the complexity of how this market behaves and functions.

Target marketing is a strategy that is gaining popularity in which businesses identify market segments with comparable needs and wants, choose one of the market segments, and then concentrate on developing products and marketing strategies.

The market segmentation task has to follow a scientific process.

1. The first task is to classify customers based on the goods and services they desire.
2. To define a market segment, the second stage is to assess the client by summarising their demographic, lifestyle, and usage patterns.

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3. The third duty is to do market research to assess growth potential, competition, and other elements.
4. Assessing the profitability of a market segment is the fourth task.
5. Positioning work for pricing and marketing initiatives is the fifth task.
6. To investigate various positioning and marketing tactics to fully examine the market.

2.7.1. Factors affecting Market Segmentation and Target Market.

Market segmentation and target market are affected by a number of variables.

- **Location factors:** One such aspect is geography, which divides a nation into regions based on city, urban, rural, and climate.
- **Population Factor:** Age, family size, gender, household income, life stage, occupation, education, religion, race, generation, and social class are used to segment the market demographically.
- **Lifestyle and personality.** Markets can be divided at the individual level according to attitudes, beliefs, and perceptions of products, as well as product awareness and consumption patterns.
- **Operational segmentation:** It is based on the type of technology, consumer preferences, and customer needs.

2.8 CONSUMER BUYING BEHAVIOR

Consumer buying behavior is the popular term, it is the actions and behaviors of the consumers when he/she engage when making purchases and consuming goods. It is the term for the ultimate consumer's purchasing habits.

<u>Marketers must examine consumer behavior -</u>

- To develop the marketing concept (marketing mix).
- To anticipate consumer reactions to marketing tactics.
- To influenced by how customers respond to its marketing approach
- To examine the what, where, when, and how consumers make purchases.

2.8.1 Type of consumer buying behavior.

Consumer behavior largely depends on what type of goods the consumer would like to buy. As a result, of the bigger risk, customers are more inclined to go and do research on luxury items.

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However, when buying a cheap item, consumers behave very differently but it's often a more hands-off purchase. Businesses should carry out consumer research to discover the purchasing habits of their customer.

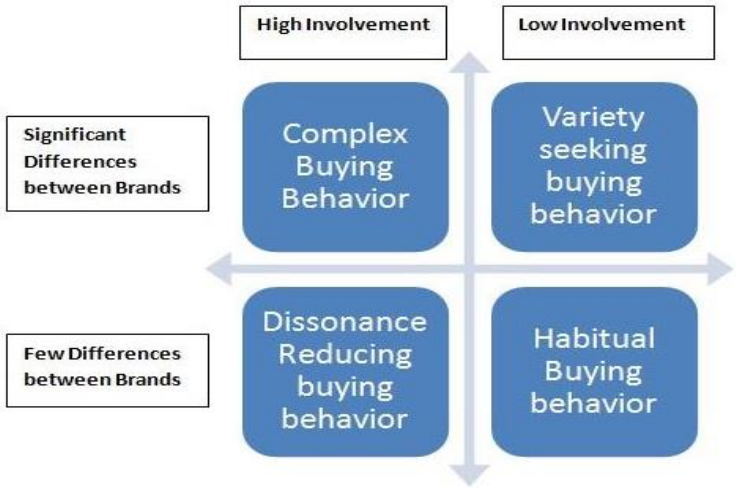

Fig 2.8.1 (Source: https://www.clootrack.com/knowledge_base/types-of-consumer-behavior)

Fig.1 Type of consumer buying behavior.

Type of consumer buying behavior.

a) **Complex Buying Behavior**

b) **Dissonance Reducing Buying Behavior**

c) **Variety Seeking Buying Behavior**

d) **Habitual Buying Behavior**

a) **Complex Buying Behavior:** Complex buying alludes to a purchase situation in which the consumer is extensively involved in decision - making process and needs to weigh a number of different factors before taking a good selection. These factors include price, investment return, longevity, usefulness, reviews, and referrals. Customers must display complex buying behavior while making a highly involved purchase of a good for which there are numerous alternatives, alternatives with different features, and high differences in the market. It is difficult since there is a great deal of risk. Additionally, the stark distinctions across brands necessitate a high level of customer interaction. Giving customer knowledge is the key to assisting them in this type of purchasing.

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Consider purchasing a home or a car; these are examples of complex purchasing behaviors.

For instance, purchasing a home can include a considerable financial risk for the buyer. As a result, they will do the extensive market study before making a decision.

To have an impact on consumers' purchasing behavior, marketers must assist in educating them throughout the discovery phase.

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b) **Dissonance-Reducing Buying Behavior:** Dissonance is defined as "a disagreement of people's beliefs, acts, or characters" in the dictionary. When a consumer makes a purchase, they are heavily involved in the decision-making process and are unable to distinguish between the various options and brands on the market that can meet their needs.

In a similar vein, worry after purchases can be understood as dissonance-reducing buying. When there are little variations between brands and the purchase involves significant levels of involvement, this typically occurs. This sets it apart from complicated purchasing scenarios where there are several variations in the available options.

The buyer is confused of the similarities between the various brands on the market that seem to be available for the same demand in this purchase situation. Even if the marketer chooses to differentiate on the basis of positioning, brand perception, consumer trust, or pricing, it is crucial to do so. Even after a purchase, the dissonance may persist, which is bad for the brand's reputation and its ability to elicit feedback or repeat business

c) **Variety Seeking Buying Behavior:** Even when consumers say they are happy with their current brand, they nevertheless switch. Variety seeking is the motivation, and it is most prevalent when there are lots of options that are similar, when brand loyalty is significant, and when purchases are made frequently. It can happen purely out of boredom with one's current brand of choice, or it can be sparked by outside cues like retail running out of stock or discounts that promote switching. Take chocolates as an example. The consumer selects a brand of chocolates without giving it much thought and reviews it as they eat it based on their beliefs about chocolate. The customer may choose a different brand the next time in an attempt to satisfy a different taste.

In this scenario, brand switching is undertaken for variety's benefit instead of out of disappointment.

d) **Habitual Buying Behavior:** The term "habitual buying" refers to a customer's tendency to make several repeat purchases of a well-known brand without exerting much thought or effort. The product is viewed as a commodity and offers little differentiation from its competitors. Customers who engage in habitual purchasing behavior choose items they frequently purchase and don't give much thought to.

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Consumer's buying behaviors may also be explained by the fact that customers stick with the goods they use the most and also don't search for alternatives. And it doesn't imply that the customer has fewer options and must make a decision regardless. Because the product doesn't differ much from others, the buyer consistently chooses it without thinking about it. Habit purchasing is the term for repeated purchases. Additionally, the things they buy are inexpensive and safe to acquire.

2.8.2 Consumer Buying Process

Fig 2.8.2 (Source: https://www.professionalacademy.com/blogs/marketing-theories-explaining-the-consumer-decision-making-process/)

In the standard consumer buying process, the buyer goes through five separate stages:

i. **Stage of Recognition of Need:** (Emphasizes the necessity for a goods and services): Understanding the need for a service or product is the first stage in the decision-making process for consumers. Whether motivated internally or externally, need recognition yields the same outcome: a want. Consumers must first identify their wants before they can learn how to satisfy them, which brings us to step two.

   But how can you inspire customers at this point? Focus your sales and marketing efforts on outward stimuli instead of internal stimulus, which originates from within and includes basic urges like hunger or a change in lifestyle.

ii. **Stage of Information Search :**(Collecting information about the product): Following the arousal of a need, the consumer's behavior directs them to gather information about various stimuli, or in this example, items and services, from a variety of sources (individual, community, professional, interpersonal) for later processing and decision-making.

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Consumers once more rely on internal and external influences, as well as previous contacts with a product or brand, both favorable and unfavorable, while evaluating **their options.** They may explore possibilities in person or check online sources like Google or customer reviews during the information stage.

iii. **Stage of Evaluation of Alternative:** (Compares choices to equivalent alternatives): A consumer moves on to the next step of evaluating alternatives once their interest in a product or products has been stimulated.

Cognitive evaluation: When a customer makes a decision based on facts.

Affective evaluation: Using affective factors to evaluate the options is known as affective assessment

iv. **Stage of Purchase Decision:** (Makes final purchase decision): The consumer ultimately decides to make a purchase. Purchase decisions can fall into one of three categories: don't buy, buy later, or buy now.

Consumers who choose not to purchase reach the stage of problem recognition. Purchases may be delayed because of diminished motivation or changes in one's personal and financial circumstances. The consumer will buy if favorable sentiments are developed toward the selected option.

v. **Stage of Post Purchase Evaluation:** (Observes the purchase they had made): After committing to a product, a consumer's behavior is referred to as post-purchase behavior. Customer satisfaction, customer joy, and customer dissatisfaction are the three outcomes of post-purchase behavior. Buyer discomfort brought on by post-purchase conflict is known as cognitive dissonance.

2.8.3 Factors affecting consumer behavior.

a. **Advertising & Marketing Initiatives:** Purchase decisions are significantly influenced by marketing initiatives. They can even encourage customers to switch brands or choose more expensive alternatives if done well, consistently, and with the right marketing message.

b. **Economic Situation:** Economic situations play a significant role, especially when it comes to pricey goods (like houses or cars). Regardless of their financial obligations, customers are known to become more self-assured and prepared to indulge in purchases in a healthy economic environment.

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c. **Individual Choice and Preferences:** Personal characteristics, like as preferences, values, morals, and priorities, can also have an impact on how consumers behave. Personal views are extremely potent in sectors like fashion or food.

d. **Group influence:** Additionally, peer pressure affects customer behavior. Our decisions may be significantly influenced by what our friends, neighbors, immediate family members, classmates, and acquaintances believe or do.

e. **Purchasing Power:** Not to mention, our ability to buy things has a big impact on how we behave. You will think about your budget before making a purchase decision unless you are a billionaire.

2.9 ORGANIZATIONAL BUYING BEHAVIOR.

According to Pette D. Bennett: "Organizational buying behavior is a process by which a buying group evaluates the needs for products and services and identifies, evaluates, and selects among alternative brands and suppliers."

According to W. M. Pride and O. C. Ferrel, ***"The term "organisational buying behavior" refers to how producers, institutions, and government agencies buy things.***

Organization buying is the process through which formal organisations determine the demand for acquired goods and services, as well as the identification, assessment, and selection of alternative suppliers and brands. It is a series of intricate occurrences that are dependent on the firm's level of purchasing expertise

Organizational behavior describes the purchasing habits of businesses that purchase goods for internal use, resale, or to create additional goods. Businesses, industries, retailers, governmental bodies, and non-governmental groups are examples of organizations.

Organizational buying behavior is also called business or industrial behavior or B2B buying behavior.

Some Examples of Organizational Buying:

- Flour by the bakery.
- Chip by computer manufacturers.
- Large grocery chains routinely purchase goods directly from producers and resell them to final customers.

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2.9.1 Nature of Organizational Buying

Every organization is unique – Organizational structures, cultures, beliefs, and resources vary among various organizations, as do their goals and resources. They consequently possess a different set of requirements and desires, as well as different purchasing behavior.

There is a long-time lag between efforts and results – Individual purchases require less time than commercial purchases to complete from the point of decision to the point of sale. This is a result of the additional formalities and procedures required during the organizational purchase decision. For instance, requesting quotes, assessing bids, creating bulk orders, etc.

It is a rational as well as emotional activity – The involvement of humans in the purchasing process causes the emotional component of purchasing to arise. The amount and quality of a product may be chosen by an industrial buyer based on established organizational rules, but the dealer may be chosen based on the buyer's political or personal connection or prior interactions with the dealer.

It is a formal activity – When purchasing from an organization, there is a formal contract between the parties. Making a purchase choice is a formal activity that calls for the buyer to adhere to policies and guidelines established by the business regarding the type, quality, quantity, conditions of payment, delivery date, etc.

It is a multi-person activity – In a company, purchasing choices are typically made by a group of qualified employees, sometimes known as a buying center, where each person has a certain duty to play.

2.9.2 Features of Organizational Buying Behavior

The primary characteristics of organizational buying behavior are few buyers, close relationships between buyers and suppliers, rational buyers, direct channels, the adaption of specific purchase policies created by business organizations, etc.

1. **Few buyers:** Organizational buyers are limited in number because they are the organization themselves. However, they make massive purchases. Buyers from organizations are dispersed throughout the country.
2. **Close relationship:** Suppliers and buyers within organizations interact frequently. It might last for a while. Future purchases will benefit from such a relationship. In general, buyers and suppliers in organizations maintain close relationships.

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3. **Rational buyers:** When buying for an organization, the buyer rationalizes. The buying process involves trained and experienced buyers. Thus, making a purchase becomes logical.
4. **Direct channel:** Organizational purchasers purchase items from producers directly because they purchase in large quantities. Thus, the marketing route is now direct. But some businesses use middlemen or agencies to purchase their items.
5. **Purchase policy:** Both organizations and individuals now use different purchasing strategies. An organization creates a certain purchasing policy and purchases products in accordance with the policy. The main purchasing strategies used by businesses include purchasing by quotation, buying through tender, buying through contract, etc.

2.9.3 Factors affecting Organizational Buyers Decision

Factors affecting institutional buying decision are as follows:

- **Environmental factors**
- **Organizational factors**
- **Interpersonal factors**
- **Personal factors**
- **Environmental Factors**

- **Environmental Factors:** Environmental factors have a direct or indirect impact on the institutional elements that influence purchasing decisions. This covers obligations in the areas of economics, technology, politics, and the law, among others.
  - **Economic Factors:** Demand intensity, the state of the economy, competitiveness, technological advancements, the trade cycle, etc. are all included. The demand for organizational products, which is linked to the demand for consumer goods, is impacted by changes in a market's overall economic conditions. Consequently, the demand for organizational products is likely to be impacted by any change in the economic situation of a nation that affects consumer demand.
  - **Technological factors:** Institutional purchasing and inventory management, the production process, distribution management, and other areas have changed as a result of technological factors including the development of e-commerce, the development of information, and the development of the internet.

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- **Political and legal factors:** Political and legal variables may have an impact on institutions. Every corporation must function in accordance with national laws and regulations, therefore before purchasing goods and services, businesses should research the political system, political climate, political ideologies, and government policies.
- **Social responsibilities:** Social responsibility influences organisational purchasing decisions as well. Institutions must take into account issues like environmental protection and addressing community needs. The business must take social welfare into account while purchasing goods and services.

❖ **Organizational factors:** Organizational purchasing behavior is also influenced by organizational characteristics. The organizational buying is significantly influenced by the buying aim, policies, procedure, and organization.

- **Buying Objective:** Different organizations have various purchasing goals. Some businesses priorities cheap prices above great quality and other businesses priorities high prices over high quality.
- **Buying Policies:** Some organizations have centralized purchasing policies, while others have decentralized purchasing policies. The selection of suppliers will be limited by the organization's purchasing practices that promote the fairness principle.
- **Buying process:** Each organisation has a different organisational market purchasing method. Every major acquisition in the government market is subject to sealed bids and tenders. The majority of commercial purchasing is guided by previous interactions with suppliers.
- **Buying organizations:** The organisational buying can vary greatly as a result of centralized and decentralized buying methods. The purchasing process will become complicated if sizable purchase committees are engaged.

❖ **Interpersonal Factors:** Various persons take part in organisational purchasing. They have an impact on the purchasing process because so many people are involved. Authority, interest, and prestige are examples of interpersonal factors.

- **Authority**: There are various levels of authority among the organization's staff. The manner in which the organization's staff exercises their authority affects the purchase process and determines whether it is simple, quick, or difficult.

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- **Interest:** The interests of the individuals participating in the organisational purchasing process vary. While the finance manager may be interested in cheaper prices, the production manager may be more concerned with the quality and consistency of the supply of production input.
- **Status:** The interests of the individuals participating in the organisational purchasing process vary. While the finance manager may be interested in cheaper prices, the production manager may be more concerned with the quality and consistency of the supply of production input.

❖ **Personal factors:** Individual characteristics including age, education, employment status, risk-taking, and personality can have an impact on the purchasing behavior of organizations.

- **Age:** Age has a direct impact on an organization's purchasing decisions. Younger buyers appreciate establishing relationships with new suppliers, whereas older buyers value keeping those relationships with long-standing suppliers.
- **Education:** The informed consumer may assess the available options and maintain the buying process. However, an inexperienced buyer is unable to carefully choose the source. As a result, organisational buying is also influenced by buyer education.
- **Job position:** How much a person is likely to have an impact on the choice of suppliers depends on where they are in the organisational hierarchy. Both high-level and low-level buyers may be involved in the transaction.
- **Risk-taking:** Each person approaches risk differently. In this situation, low-risk consumers favours working with reputable suppliers whereas high-risk consumers are continuously looking for new sources of supply.
- **Personality:** The degree of impact in purchasing decisions is determined by the buyer's personality. It is expected of those with difficult personalities to adapt their brand over time. Some of the consumers also show a lot of brand loyalty.

2.9.4. PROCESS OR STAGES OF ORGANIZATIONAL BUYING BEHAVIOR.

Stage 1 - Problem Recognition: The first step, problem recognition, begins with the identification or recognition of a need that can be satisfied by the purchase of an item or service. During this phase of the business purchasing process, a team member identifies a problem that could be solved by purchasing goods or services.

Stage 2 - General Need Description: The processing organisation defines the general characteristics and quantity of the important items required in this stage of the organisational

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procurement process after determining a demand. After determining the necessity, buyers should explain it. Once the needs are agreed upon, the buying team develops a detailed specification that describes the quantity, performance, and technical specifications for a product.

Stage 3 - Supplier Search: The buyer is currently attempting to locate the ideal supplier (also called the vendor). To choose providers who meet their needs and have a solid reputation for high quality, dependable partnerships, and reasonable prices, the buyer does a conventional search. The phase of the purchasing process for businesses during which the buyer attempts to identify the best suppliers or providers.

Stage 4 - Proposal Solution: The buyer asks suitable suppliers to submit proposals at this stage of the business procurement process. The fifth stage of the organisational purchasing process is the proposal solution. The buyer now contacts the top providers to get a proposal. Some people respond by sending the organisation records or agents. The buyer requires a comprehensive proposal for expensive and sophisticated goods, and the business organisation mandates presenting the product itself for technical goods.

Stage 5 - Supplier Selection: The buyer evaluates the proposals at this point and makes a decision. This selection process includes analysing the vendors under consideration as a crucial component. The selection procedure entails a careful examination of the presented proposals as well as taking into account vendor capabilities, reputation, client references, warranties, and other factors. A standard set of criteria may be used by various decision makers to evaluate proposals. The buyer evaluates the proposal at this step of the business procurement process before choosing a provider or suppliers.

Stage 6 - Order-Routine Specification: At this point in the company purchasing process, the buyer writes a final order to one or more chosen suppliers, outlining technical requirements, quantity needed, anticipated delivery date, return policies, and warranties. The client makes the decisive purchase after choosing the best suppliers. All of the items, such as the qualities of the goods, the specification, the guarantee, the quantity, the time for supply, the mode of payment, the after-sale service, etc., should be clearly specified in this order.

Stage 7 - Performance Review: The buyer evaluates his satisfaction with suppliers in this final step of the organisational buying process before deciding whether to keep working with them or find a new one. The buyer assesses suppliers' performance at this point. Making a decision about whether to change, maintain, or end the relationship with the supplier is aided by this kind of analysis. The partnership may continue if the supplier's performance is adequate; if it is only moderately subpar, the relationship may still be maintained with a partial rectification. However, it is flawed if the performance is offensive.

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2.10 SUMMARY

In any business or marketing activity all internal and external elements that directly or indirectly affect any business organization. While external influences are out of an organization's control, internal elements are under its control. The external elements include government, technological, economic, social, and competitive forces; however, an organization's strengths, shortcomings, and abilities form the component of internal factors.

So, the combination of all components that directly or indirectly, internally or externally affect any business organization is called a Marketing Environment.

Whereas, by keeping an eye on the marketing environment, marketers attempt to foresee potential future developments. Marketers are continuing to adjust their strategies and plans in response to these changes.

In this chapter, we also discussed about consumer buying behavior and organizational buying behaviors, where consumer buying behaviors are influenced by many factors like Individual Choice and Preferences, economic conditions, group influence, Advertising & Marketing Initiatives, and purchasing power, etc.

Although there may be some similarities to household buying when more than one individual is involved in the decision-making process. Organisational buying differs from consumer buying since the context in which the decisions are made is considerably different. The buying process at an organization might be more formal and drawn out depending on the sort of purchase being made.

The decision-making process typically incorporates more rational than emotional considerations, but because decision-makers are human, not all decisions are as reasonable as they may seem. Due to the interdependence of buyers and sellers, long-term relationships that are both advantageous and strategically significant might form.

2.11 SELF-ASSESSMENT QUESTIONS

- What do you mean by marketing environment?
- Explain the various components of marketing environment that any businessman analyse.
- How do environmental factors affect marketing policies and strategies?
- What is marketing mix? Explain the 4 Ps of Global Marketing.

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- Discuss the importance of Marketing Environmental Analysis.
- Differentiate between Micro and Macro environment of Marketing
- What do you understand by Dissonance Reducing Buying Behavior?

IN-TEXT QUESTIONS

1. Which of the following doesn't fall within the umbrella of the external marketing environment?
   a) Economical b) Political
   c) Personal d) Legal
2. The gathering and analysis of data regarding the forces, occasions, and connections that could have an impact on the organisation is known as --
   a) Environmental Analysis b) Environmental Scanning
   c) Environmental Monitoring d Environmental Searching
3. The environmental factors that affect how people's values, lifestyles, and family structures change are known as ___ factors.
   a) Economic b) Political
   c) Demographic d) Socio-cultural
4. The purchase process begins when a customer recognises a ----------
   a) Economic Condition b) Money Availability
   c) Need or Problem d) Product or Services
5. What are the ideal flow of the consumer purchase process?

   Information Search-Recognition of Need-Evaluation of Alternative- Purchase Decision- Post Purchase Evaluation

   Recognition of Need- Information Search-Evaluation of Alternative- Purchase Decision- Post Purchase Evaluation

   Information Search-Recognition of Need-Purchase Decision-Evaluation of Alternative-Post Purchase Evaluation
   Information Search- Purchase Decision- Recognition of Need- Evaluation of Alternative- Post Purchase Evaluation.

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2.12 ANSWERS TO IN-TEXT QUESTIONS

Answers:

1-C-Personal

2-B- Environmental Scanning

3-D-Socio-cultural

4-C- Need or Problem

5-B- Recognition of Need- Information Search- Evaluation of Alternative- Purchase Decision- Post Purchase Evaluation

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LESSON 3

SEGMENTATION, TARGETING & POSITIONING

STRUCTURE

3.1 Learning Objectives

3.2 Introduction: STP Marketing Model

3.3 Components of S.T.P (Segmentation, Targeting, and Positioning) Marketing Model

3.4 Segmentation.

- 3.4.1 Meaning of Segmentation.
- 3.4.2 Need of Segmentation.
- 3.4.3 Characteristics of Market Segmentation.
- 3.4.4 Bases for Segmentation.
- 3.4.5 Advantages & Limitations of Segmenting Markets

3.5 Targeting

- 3.5.1 Meaning & Definition of Targeting
- 3.5.2 Approaches of Targeting
- 3.5.3 Advantages & Limitations of Targeting

3.6 Positioning

- 3.6.1 Meaning & Definition of Positioning
- 3.6.2 Variables of Positioning in Market
- 3.6.3 Types of Positioning
- 3.6.4 Types of Positioning Strategies
- 3.6.5 Factors of Positioning Strategy
- 3.6.6 Benefits of Positioning Strategies.

3.7 Marketing Research

- 3.7.1 Definition of Marketing Research

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3.7.2 Aims and Objectives of Marketing Research
3.7.3 Application of Marketing Research
3.7.4 Methods of marketing research
3.8 Steps in Marketing Research Process
3.8.1 Marketing Information
3.8.2 Components of Marketing Information System
3.8.3 Benefits of Marketing Information System (MIS)
3.8.4 Case Study on Segmentation.
3.9 Summary
3.10 Self-Assessment Questions
3.11 References
3.12 Suggested Readings

3.1 LEARNING OBJECTIVES

After reading this chapter, student will be able to:

- ✓ Why is the market segmentation needed?
- ✓ Describe the market segmentation in detail.
- ✓ Bases of market segmentation done by company.
- ✓ Explain the major reasons of market segmentation.
- ✓ Understand requirement of the market segmentation?
- ✓ Understand the Marketing Research Process.
- ✓ Know about the market information.

3.2 INTRODUCTION

The segmentation, targeting, and positioning (STP) marketing model is a well-known strategic marketing method today. It is one of the marketing models that is used in practice the most frequently, and marketing leaders credit it for effective, streamlined communications.

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With an emphasis on commercial effectiveness, STP marketing identifies a company's most lucrative market segments before creating a marketing mix and product positioning strategy for each one.

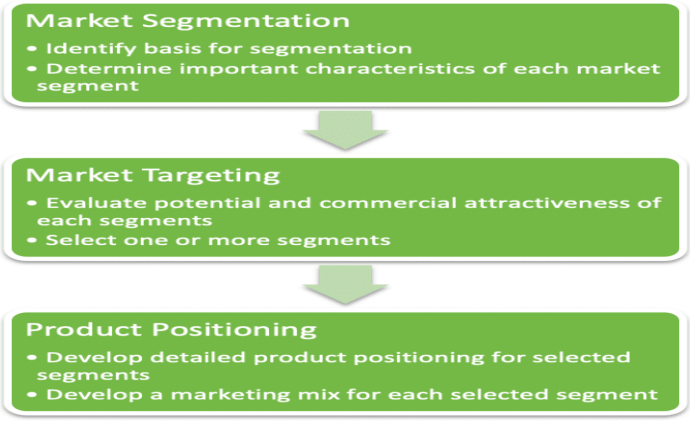

Figure 1: STP Marketing Model (Segmentation, Targeting, Positioning)

(Source: https://www.smartinsights.com/wp-content/uploads/2021/01/STP-marketing-funnel.png)

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3.3 COMPONENTS OF S.T.P. MARKETING MODEL

When designing marketing communications plans, the STP model is helpful since it enables marketers to prioritise propositions before developing and delivering individualised and pertinent messages to engage with various audiences. Market segmentation, market targeting, and product positioning make up the three steps of the funnel.

- **Segmentation:** The process of employing one or more attributes to divide the heterogeneous market into homogenous segments.
- **Targeting:** Selecting the number of market categories to target.
- **Positioning:** Giving customers a memorable impression of a product or brand.

Figure 2: Components of S.T.P. Marketing Model

https://www.smartinsights.com/wp-content/uploads/2021/01/STP-model.png

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3.4 SEGMENTATION

Segmentation is the process of assembling people into groups based on how closely they resemble one or more product categories. To segment a market, one must first identify the various consumer types and their varying needs. The selection of the segments to be kept in a target is the marketer's next step after market segmentation is complete.

3.4.1 Meaning of Segmentation

Market segmentation is the practice of breaking a market into discrete subgroups of consumers with various demands, features, or behaviors who may require separate products or marketing mixes. **"Market segmentation" is the process of breaking down large, diverse markets into smaller, more homogeneous groups of customers that the company can serve.** According to the definitions given above, market segmentation is a marketing approach that divides consumers into a number of homogeneous groups based on factors like income, age, sex, education, profession, religion, and location. In order to satisfy the clients, the primary goal of marketing segmentation is to create unique marketing strategies for each category.

3.4.2 Need for Segmentation

Market segmentation was required to persuade target customers to purchase the goods. In the past, before market segmentation, businesses used to sell their products independently. It was accomplished by mass marketing, in which the product was promoted uniformly to all consumers. Henry Ford was the first to see the necessity for market segmentation when he offered the public the Ford Motor Company Model T in any colour they chose, as opposed to the model T's previous availability in only one colour, black.

In the same manner when the Coca-Cola Company used to sell its product only in one standard size of bottle, then they used to sell its product through mass marketing only. Similar to how the Coca-Cola Company only ever sold its product through mass marketing when it was packaged in a single standard size bottle. Nokia has a large selection of phones for both men and women. When compared to male, durable handsets, the female counterpart would be slimmer and more colourful. In general, men do not favour fashionable phones. The businesses cannot offer identical things to everyone. Whereas female deodorants and perfumes have a sweet scent, whilst male fragrances have a powerful scent. So, a marketer cannot employ the same tactics with every buyer.

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Let's go over the following instances:

- Market segmentation enables marketers to create promotional plans and marketing tactics that are fit for the tastes of members of a certain market segment.
- Market segmentation enables advertisers to comprehend the requirements of their target market and develop targeted marketing strategies appropriately.
- Additionally, market segmentation helps clients make informed decisions about what to buy and what not to buy.
- Market segmentation enables businesses to deliver the ideal product to the ideal clientele at the ideal moment.
- Organizations can better know and understand their clients with the use of segmentation. Businesses may now reach a larger audience and market their goods more successfully.

3.4.3 Characteristics of Market Segmentation

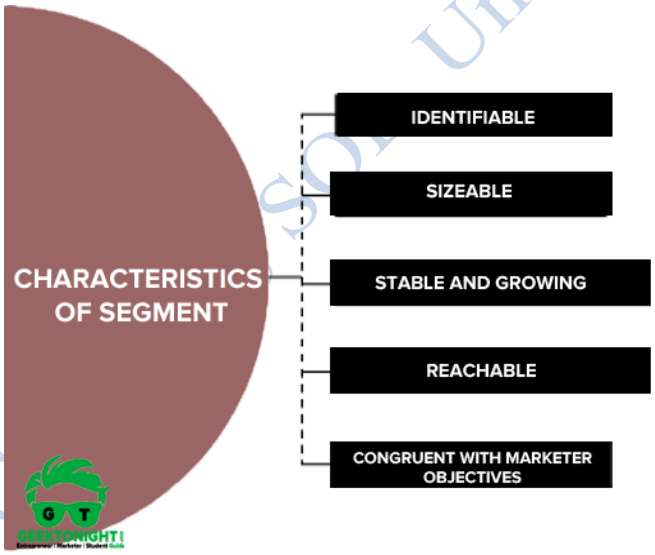

Figure 3: Characteristics of Market Segmentation

Source: https://www.geektonight.com/segmentation-targeting-positioning/

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- ***Identifiable:*** *Marketers divide the market into discrete segments based on shared demands using demographic, lifestyle, and other characteristics. Segmentation bases are the name given to these components.*
- ***Sizeable:*** *A profitable market should have a sufficient number of customers. A piece can still be identified even if it is small.*
- ***Stable and growing:*** *Marketers look for sectors that are both consistent and growing.*
- ***Reachable:*** *A segment is not a target segment if it cannot be reached, regardless of how recognizable, substantial, stable, or growing it may be. Reachable describes a marketer's ability to communicate with customers in an effective and economical manner.*
- ***Congruent with marketer objective and resources:*** *Even if a sector meets the aforementioned criteria, marketers might not be willing to target it.*

3.4.4 Bases for Segmentation

The marketer must choose the format for market segmentation, in which different market bases or market variables are taken into accounts, or even a combination of both.

Market segmentation is done using a variety of bases.

- Professor Cundiff and Still provided a very straightforward assessment of the product market i.e., Consumer Market & Industrial Market.

Whereas Philip Kotler has categorized the market into different categories based on:

Geographical basis, Demographic base, psychological foundation, Marketing basis, Profit basis, Quantitative basis, Loyalty basis, etc.

As well as the market for industrial products can be segmented on the basis of:

Business type, Customary purchasing practices, User population and Geographical market segmentation

The following constitute the main pillars of market segmentation:

Geographic Segmentation: Market division into various geographical units, such as countries, regions, states, and cities.

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Demographic Segmentation: Using factors like age, gender, family size, family life cycle, income, occupation, education, race, generation, and nationality, the market is segmented into groups.

Income: Since it is a privacy issue to disclose one's income, marketers typically segment the market based on social class.

Sex: The division of the gender market into male and female is another obvious basis for market segmentation because it makes it very simple to segment the market for personal products.

Age: Age-based market segmentation aids in accurate market segmentation. This is typically done in the apparel industry, when clothing is separated based on age.

Social class: In India, social class is recognized as the most important segmentation factor. Upper middle class, middle class, lower middle class, skilled workers, and working class make up the majority of the population.

Family size: Family size is a segmentation-based variable that aids marketers in understanding the volume and scale of purchases that customers will make.

Family life cycle: A family goes through several stages, including the bachelor stage, newlywed stage, full nest stage, where a married couple has children under their care at home, and the empty nest stage.

Occupation: White collar and blue-collar groups are the two fundamental divisions of occupation groups.

Psychographic Segmentation: This method divides the market into various categories based on socioeconomic status, way of life, and personality traits.

3.4.5 Advantages & Limitations of Segmenting Markets

Advantages:

- Increases sales volume
- Improved growth rate
- Greater return and profit
- Build a new clientele base
- Give sellers a competitive edge.
- Helps with finding and targeting

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- Market share and market expansion
- Provide the necessary marketing advice for the goods.
- Helping marketers choose the best marketing channels and building sales strategies

Limitations

- Costs rise when a corporation enters many market niches.

  Spending on marketing when the business utilized several initiatives.

3.5 TARGETING

After segmentation, you have to do target marketing. We can say that target marketing is niche-specific marketing. The niche is not based on products but customers. You have to identify your potential customers who will purchase your product based on their needs. There are around billions of people on earth. You can't sell your product to all people because they are not interested in purchasing from you. That's where target marketing works. So Targeting the Second step of STP Marketing.

Targeting, also known as multisegmented marketing is a marketing strategy that involves identifying specific personas or markets for specific content. Companies use target marketing to learn more about their consumers and thus create advertisements for specified groups to maximize response.

This strategy is much more effective than mass marketing, as it targets the consumers most likely to interact with the brand or product, based on a buyer persona. There are many key targets, these are the most common.

3.5.1 Meaning & Definition of Targeting

Meaning:

Targeting is considered as Second Step of STP Model. Target marketing must come after segmentation. Target marketing can be referred to as niche marketing. The focus of the

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specialty is on consumers rather than items. You must determine which potential clients, depending on their requirements, will buy your product. On earth, there are a few billion individuals. Because they are not interested in buying from you, you cannot market your goods to everyone. That is how target marketing functions.

Definition: *A marketing approach that divides a market into segments before focusing your marketing efforts on one or a small number of important segments made up of people whose wants and preferences most closely match your product or service offerings.*

3.5.2 Approaches of Targeting

The firm must decide which strategy for target marketing it will use. Basically, there are four differing approaches for it.

I. **Undifferentiated**
II. **Differentiated**
III. **Concentrated**
IV. **Customized Target Marketing**

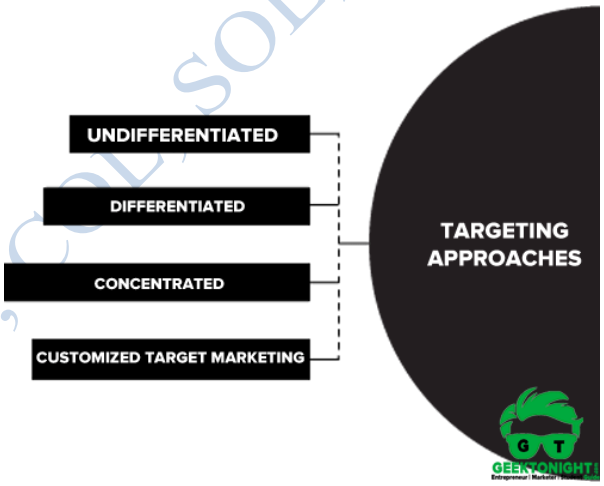

Figure 4: Approaches of Targeting

https://www.geektonight.com/segmentation-targeting-positioning/

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I. ***Undifferentiated***

An undifferentiated approach treats the market as a single mass market with a single marketing plan, with no distinction made between the various market groups.

II. Differentiated

A differentiated targeting strategy acknowledges that there are various market segments to target, each of which the marketing organization finds appealing. As a result, marketing strategies are created for each market group in order to capitalize on them.

III. Concentrated

Market segments are acknowledged in a concentrated or niche-marketing strategy, which still implements a concentrated strategy by concentrating on a small number of market segments. These are frequently used by businesses that either have few means to fund their marketing strategies or are using a very restricted marketing approach.

IV. Customized Target Marketing

The final strategy is a targeted marketing plan that is specifically created for each customer rather than a market segment. This strategy is more common in consumer markets with high-value, highly tailored items or B2B industries (such as marketing research or advertising services). E.g. Purchase of a custom-made car.

3.5.3 Advantages & Limitations of Target Marketing

Advantages

- The target market is promoted for business.
- Understanding current customers is useful.
- It raises brand recognition among the various target demographics.
- Customizing products to satisfy the needs of specific consumer groups.
- The sale of goods in locations best suited for attracting the targeted markets.
- Pricing will be determined based on what a target market is willing to spend on a given good or service.

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Limitations

- The incorrect target. When you just concentrate on a target market, you must ensure that it is appropriate for your good or service.
- Comparatively small Market Share.
- Ethical considerations.

Having a shared market with rivals.

3.6 POSITIONING

Positioning is the process of establishing a unique mental position or picture of a good or service in the eyes of the consumer in comparison to other brands on the market. When compared to other brands or items that are currently on the market, positioning aids in helping consumers form a distinctive impression of the brand and the product.

Product positioning refers to how customers view the product in comparison to rival products based on a variety of criteria. Therefore, in order to gain a competitive advantage throughout the life of a product or offer, every organisation must be able to distinguish between bids and evaluate their position effectively (Kotler et. al: 2003).

3.6.1 Meaning & Definition of Positioning

Meaning: Product positioning refers to how customers view the product in comparison to rival products based on a variety of criteria. Therefore, in order to gain a competitive advantage throughout the life of a product or offer, every organisation must be able to distinguish between bids and evaluate their position effectively (Kotler et. al: 2003).

A successful positioning strategy distinguishes a product and encourages customers to see the clear advantages of utilising it. A strong location provides the item a USP (Unique selling proposition). A strong positioning distinguishes a brand or product from the competition in a crowded market. A good position is one that gives the brand or product flexibility in additions, modifications, distribution, and promotion.

Definition: Every marketer view brand positioning as one of the most crucial elements of brand creation overall. Depending on how a brand was positioned in the market, various people may have varying perceptions of the brand**.** Positioning describes how your product (item or service) compares to competing goods and services on the market as well as in the minds of customers.

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Positioning is the process of choosing a suitable market niche for a brand, product, or service and establishing it there.

Examples of marketing positioning:

- Starbucks offers itself as a reliable supplier of high-end coffee and beverages.
- Tesla and Audi pitch themselves as luxury status symbols.
- McDonald's positions itself as a location to acquire quick and inexpensive meals.
- Both Microsoft and Apple present themselves as cutting-edge IT companies with user-friendly products.

3.6.2 Variables of Positioning in Market

i. Pricing

Most buyers base their selections in part on pricing. In many product categories, companies with the lowest prices and acceptable levels of quality typically prevail.

ii. Quality

Most price wars can be stopped by quality. Quality can determine who the rivals are in some industries, such as those for high-end cosmetics or automobiles.

iii. Differentiation

What distinguishes your products or service from the competition is differentiation. Competitors may not be as dangerous if your product or service is very different from theirs.

Take the Toyota vs. Tesla comparison. Tesla quickly overcame entry-level vehicles like the Toyota Prius by entering the electric vehicle industry with a high-end sports variant. With the Model S, Tesla genuinely went for the high-end market.

iv. *Convenience*

Customers' lives are made simpler through convenience. Convenience might include anything from accessibility to location, including easy returns and online shopping.

v. Customer service

Customer service places a strong emphasis on developing positive, cordial relationships. This can be especially important in some sectors of the economy, including the restaurant and banking sectors.

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vi. User group

This kind of positioning focuses on a certain user demographic and explains why the company's products are pertinent and directly related to this demographic.

Take the Johnson's vs. Axe comparison. Axe body spray targets men, but Johnson's baby shampoo pitches itself as being kind for kids.

3.6.3 Types of Positioning

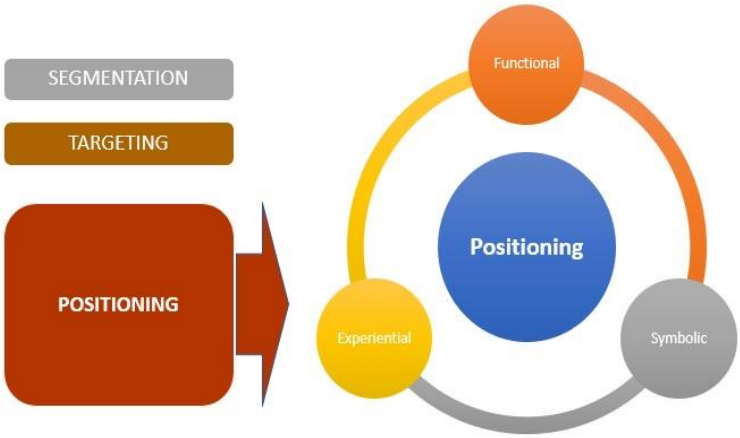

Figure 5: Types of Positioning

Source: https://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/2762-positioning.html

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Positioning is broadly classified into three types:

1. **Functional:** This is utilized when a company's name or products offer clients benefits and answers to difficulties. It emphasizes the role, advantage, or value that it serves the client.
2. **Symbolic:** This is beneficial for developing a brand image that contributes to the development of brand equity, a sense of social affiliation, and ego-identification. It occurs when a customer feels a connection to the product on a personal, social, or ego level.
3. **Experiential:** In the customer's head, this generates sensory and cognitive simulation. It forms the foundation of the experiences that a client can identify with. Companies employ a positioning process, which is a step-by-step approach, to position the good or service in the consumer's mind in the appropriate way. A corporation will redesign a brand's logo,

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tagline, etc. if it decides to alter how consumers perceive it. Repositioning the brand is the process involved in changing how people perceive it.

3.6.4 Types of Positioning Strategies

The following are some examples of positioning strategies used by businesses:

1. ***Umbrella positioning***
2. ***Premier positioning***
3. ***Positioning against competition***
4. ***Un-owned positioning***
5. ***Repositioning***

Figure 6: Types of Positioning Strategies

Source: https://www.geektonight.com/segmentation-targeting-positioning/

- **Umbrella positioning**

An umbrella positioning is a claim that highlights the many benefits of a company's products. Umbrella positioning does not draw attention to the benefits of using a particular product. It outlines the benefits of using every product from a specific brand. As an illustration, LG promotes all of its products under the positioning and tagline "Life's Goods."

- **Premier positioning**

It is one of the strategies that is exclusively directed at a certain business, product line, or group of services. For instance, TATA simultaneously sells its air conditioners under the TATA brand and the exclusive brand VOLTAS.

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- **Positioning against competition**

  Companies use this technique to recognize their competitors. For instance, AAJ TAK asserts that they are the top Hindi news channel in India.

- **Un-owned positioning**

  Positioning is not a physical thing that anyone may own; rather, it is the perception that customers have of you. Competitors in the market, for instance, look for positioning holes and try to fill them if they are beneficial.

- **Repositioning**

  Repositioning is the process through which a company strategically modifies the distinctive image and identity that its product or brand occupy in consumers' minds.

3.6.5 Factors of Positioning Strategy

For any brand, product, or service to leave an imprint on the consumer's mind, positioning is essential.

A marketer's primary considerations when developing a strategy for a brand or product are:

- **Features of the Products:** Positioning might be based on a product's appearance, feel, appearance, etc. To emphasize the value and develop positioning around it, one might leverage the key characteristics of the products.
- **Utility and Advantages:** It considers the benefits a product offers and the needs that are met. It should clearly demonstrate the benefit in terms of money or quantity. Saving 50% on electricity costs, for instance, can be clearly advantageous to a consumer.
- **Use Categories:** This outlines the possible applications for the good. You can use each and every scenario and use case to develop an effective posture.
- **Situation:** The period, occasion, or situation in which the product may be used. Association with a New Year's can lead to strong positioning in the minds of customer.
- **Competitive Comparison:** Comparing your offering to one of your competitors allows for positioning. Many businesses do this in order to take their current competitive standing and improve it utilizing points of parity or points of differentiation. To get a competitive edge, the product is differentiated based on two factors during positioning:

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- ***Points of Parity (POPs):*** Positioning is done using largely comparable factors to those of a competition.
- ***Points of Difference (PODs):*** The product offers in this instance clearly differ from those of the competitors. The laptop, iPod, netbook, and Kindle product placement graph above illustrates the advantages in terms of several parameters. Perceptual mapping and brand mapping are other terms used to describe this approach to understanding positioning.

3.6.6 Benefits of Positioning Strategies

- **Build a powerful competitive position:** Customers' perceptions of your product or service in relation to the competition are influenced by your positioning. Your capacity to stay one step ahead of the competition is tremendously aided by being able to assert your position in the competitive environment.
- **Improve sales:** One of a business's main goals is to boost sales and revenue. By having a more relevant offering and presenting it more persuasively, your company may be able to penetrate a new market. Greater clients and more revenues can follow from this.
- **Define a clearer target market:** By emphasising a specific quality or benefit of your goods or services, you can create the idea that you are an authority in the field by using positioning in marketing. Prospects will consider you to be considerably more valuable as a result.
- **Make more effective decisions:** Once you understand the fundamental thesis behind effective positioning strategies, you'll be in a better position to make decisions along the route. Additionally, clear positioning in marketing drives effective communication and better, stronger consumer ties.
- **Connect to consumer needs:** Through positioning in marketing, businesses have the option to outline the key benefits that their product or service offers. It connects the product to the specific client who needs it while also giving it energy.

3.7 MARKETING RESEARCH

Research is a methodical attempt to both accept and reject or modify previously held beliefs. Young (1988) contrasts this with the idea that social science research is "the systematic

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procedure of discovering new facts or validating old facts, their sequence in the relationship, causal explanation, and the natural rule that controls them."

Marketing research, also referred to as consumer research, is a component of business research. A rigorous, objective investigation of issues pertaining to the advertising of goods and services is known as marketing research.

It can be used in any facet of marketing. Research is the only tool accessible to an organisation for keeping up with its external operational environment.

Since marketing research is a well-organized, methodical process, planning is necessary at every stage. It makes use of science. Given that it makes an effort to deliver correct, reliable information, it is an objective procedure.

3.7.1 Definition of Marketing Research

Marketing research helps marketers to understand the possible need, want and desire of the consumers and it also helps to forecast the probable future demands of the particular products or brand. Marketing research considered as one of the important aspects to get feedback and opinion of the customer as well as their interest in the particular goods and services.

Some definitions of marketing research include the use of the scientific approach to address issues with marketing. In simple terms *"Marketing Research is a systematic process of determining and collecting information related to target market and future prospects about the sales."*

3.7.2 Aims and Objectives of Marketing Research

- To specify a business concept.
- To gain access to market circumstances.
- To predict the state of the economy.
- To Understanding the distribution pattern
- To understand the results of marketing initiatives.
- To learn about a product's target market's preferences.
- To assess the competitiveness of different company policies.
- To choose the distribution strategy that will best serve the product.
- To pick the best course of action from a list of commercial decisions.
- To research the specifications for the features of goods and services.

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3.7.3 Application of Marketing Research

Advertising testing research, branding research, customer satisfaction research, price research, product positioning research, and new product assessment research are the key uses of marketing research. Here is a succinct explanation of each of these ideas:

1. **Research on testing advertisements:** This study assesses the advertising concepts, themes, and concept potency.
2. **Branding Research:** The main objective of this research is to provide clients with branding research material that will assist them better understand their brand position and then strengthen that position in the market. In other words, branding research is driven by corporate branding decisions.
3. **Customer Satisfaction Research:** This type of marketing research aids a business in determining its degree of customer satisfaction as well as the elements that will enable them to do so.
4. **Pricing Research:** This type of research has numerous purposes, including market validation, product evaluation, and the design of new items. A product research design is driven by the goal, the client's overall positioning, and market tactics.
5. **New Product Development Research: For** this type of marketing research, the challenge is to find the appropriate creative or product market research methodology for the various stages of new product development. The methodologies and instruments used for product development market research may change depending on the type of product, the significance of incremental and risk factors, and the price associated with launching a new product.
6. **Sales analysis:** Marketing research is used to examine the sales trend and, as necessary, develop effective tactics. It serves to
   - Examine the market's possibilities.
   - Prediction of a product's demand.
   - An estimate of market share.
   - Study a product's seasonal variation.
   - Research on market segmentation.
   - An estimated market size.
   - Need study to see how the product fits into the market.

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3.7.4 Methods of Marketing Research

According to its methodology, marketing research employs four different study designs, namely:

a) **Qualitative marketing research –** Typically, this is done for experimental purposes. The qualitative data gathered focuses on consumers' perceptions and sentiments toward a good or service. Because there were typically few respondents, the results cannot be applied to the entire population. In general, no statistical techniques are used. Ex: Projective approaches, in-depth interviews, and focus groups.

b) **Quantitative marketing research –** This is typically done to reach conclusions on a certain issue. It use procedures for random sampling to test a specific hypothesis and extrapolate population data from the sample. Statistics are used to conduct the analysis, which involves a sizable number of respondents. Example: Questionnaires and surveys.

c) **Observational techniques** - The researcher gathers data by observing social processes in their natural environment. Cross-sectional (all observations taken at once) or longitudinal observations are both possible for the observations (observations occur over several time-periods) Examples include computer cookie tracing and product use analysis.

d) **Experimental techniques –** In this scenario, the researcher constructs a quasi-artificial environment to attempt to control erroneous components, then manipulates at least one of the variables to obtain a study answer. Ex: Purchase laboratories and test marketing

3.8 Steps in Marketing Research Process

To ensure that the proper data is acquired, the many elements of the marketing research process must be carefully considered. Good researchers take these procedures to make sure the data they gather to address the issue and resolve. Research might be done internally or via a third party organisation.

I. Determine the problem and approach

The research issue and challenges must be defined as the initial step in marketing. A research problem is a particular topic, challenge, paradox, or knowledge gap that you intend to solve in your study. You might search for theoretical or practical issues that aim to further knowledge or bring about change.

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II. Research Design

The framework of the research methodologies and procedures a researcher selects to carry out a study is known as the research design. The layout enables researchers to focus on developing research techniques appropriate for the topic and set up their investigations for success.

A research design is only a structural framework for the many research methodologies and approaches that a researcher uses. In marketing research, mainly 3 types of research design are used by the market researchers i.e.

- Descriptive Research
- Exploratory Research
- Causal analysis

The classification is determined based on the objective of the investigation. In some cases, the research will fall into one of these categories, while in other cases, separate components of the same study endeavour will fall into several categories.

III. Data Collection.

Data collection and choosing the data sources is the one of the important aspects in marketing research. The researcher must choose between using primary and secondary data. Both approaches are occasionally used in combination.

One should look for secondary data that may have already been obtained for other purposes but that can be used in the current study before investing the time and money in gathering primary data. Secondary data can come from sources both inside and outside of the company, including published data and commercially available data, as well as internal sources like sales invoices and warranty cards. The official census is a great source of secondary information.

IV. Data analysis and Result Interpretation

It is the process of studying the structured information to find underlying truths. To uncover new information, the data are examined from as numerous viewpoints to explore the new fact about the issue and problems.

The process of analyzing data and presenting appropriate implications by applying a variety of analytical techniques is known as data interpretation. Researchers can categories,

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manipulate, and summaries data with the aid of interpretation in order to find answers to important issues.

V. Report and Present Findings.

The report must be written objectively, coherently, clearly when presenting the concepts, and with the appropriate use of charts and diagrams. The study may occasionally identify one or more topics that need for deeper research.

The contents should be divided into smaller chunks and structured under heading and sub-headings. The purpose is to present a logical and graded arrangement of subject matter. The language should be simple and easy to understand. It should not be bookish and full of jargon. The language used should be appropriate to the level of the learner.

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Recommendations and conclusions

Annexes that include duplicates of the surveys, etc.

3.8 MARKETING INFORMATION

The systematic process of gathering, analysis, interpretation, storage, and presentation of market information to the marketers on a regular, ongoing basis from both internal and external sources is referred to as the marketing information system.

There are numerous sources (including internal, marketing intelligence and marketing research via which the pertinent knowledge about the market can be collected because every marketing operation works in harmony with the conditions existing both inside and outside the firm.

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Definition of Marketing Information System

"The marketing information system provides marketers with pertinent information so they may effectively decide on matters such as pricing, packaging, new product development, distribution, media, promotion, etc."

3.8.1 Components of Marketing Information System

Source: https://businessjargons.com/marketing-information-system.html

1. **Internal Records:** The report must be written objectively, rationally, clearly, and with the appropriate use of charts and diagrams when presenting the concepts. The Marketing Information System should be helped by regularly maintaining the most recent sales data.

The information can be obtained from the documents the company has generated, such as invoices, transmission copies, and billing documents, once it receives an order for goods and services from a client, a dealer, or a sales representative. Marketers can utilize this information to develop their future sales plan.

The Companies maintain several databases such as:

Database for customers that contains all pertinent information on a customer, such as name, address, phone number, frequency of purchases, financial situation, etc.

Product Database: This is where all the details on a product's features, pricing, and variants are kept.

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Salesperson database: It stores all of the salesperson's personal data, including name, address, phone number, and sales target. The data can be obtained whenever necessary from the data warehouse where the corporations store their data. After the data is stored, statistical professionals mine it is using a variety of computer programs and methodologies to transform it into information that provides facts and figures.

0. **Marketing Intelligence System:** The marketing intelligence system offers information on market developments, or information about the marketing environment outside of the company. It contains information on shifting market trends, price strategies used by competitors, shifts in consumer tastes and preferences, new items introduced to the market, rival advertising strategies, etc.

The following actions should be taken by the businesses in order to improve the marketing intelligence system in order to have an effective marketing information system:

- Giving the sales staff the appropriate training and encouraging them to monitor market developments, such as changes in client tastes and preferences, and to provide ideas for improvements.
- By learning more about their rivals, businesses can also enhance their marketing intelligence system.
- By including the devoted customers in the customer advisory panel, who can share their experiences and offer guidance to the new potential customers, the businesses can have an effective marketing information system.
- The businesses might use the public data to enhance their marketing information system. Data on population trends, demographics, agricultural production, and other topics can be used by a company to design its marketing strategies.
- By using online feedback forms, the Marketing Intelligence system can be further enhanced by directly asking clients about their experiences with the good or service.

0. **Marketing Research:** The systematic gathering, organizing, analysis, and interpretation of primary or secondary data for the purpose of identifying solutions to marketing issues is known as marketing research. Many businesses do marketing research to apply various statistical methods to the marketing environment, which includes changes in client tastes and preferences, competition strategies, the scope of new product launches, etc. Data must be gathered in order to perform market research. Marketing research makes a significant contribution to the marketing information system since it offers true information that has been thoroughly examined by the researchers.

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1. **Marketing Decision Support System:** It has a number of software tools that marketers can utilize to examine the data already gathered and make smarter marketing decisions. The marking managers can use computers to save the massive amounts of data in tabular form, evaluate the data using statistical tools, and then make decisions based on the results.

3.8.3 Benefits of Marketing Information System (MIS)

i. **Prediction of Consumer Demand:** Predicting consumer demand helps businesses grow their markets by laying the groundwork for mass production and distribution of goods and services. Using an organizational marketing strategy makes it easier to gather the most recent data about customer preferences.

ii. **Identification of Marketing Complexity:** The outcome of the modern marketing concept process is complexity and a deeper marketing strategy. The usage of pertinent market knowledge and a well-structured information system are required due to the rapid expansion of global market expansions and marketing operations. Understanding the multifaceted market's makeup and demand is consequently essential.

iii. **Facilitates up-to-date Economic Information or Condition:** The cost and market circumstances are determined by the dynamics of supply and demand, which are constantly changing. In a large and complex economy, demand, supply, and price fluctuations are quite intense. People who work in marketing need up-to-date, sophisticated information on shifting economic conditions relating to supply, demand, and costs. They rely on market research and market-related intelligence services for this. The prediction or forecasting of the future is based on economic variables such as the population, income, GDP, price, etc.

iv. **Competitor Analysis:** Organizations operate in a highly competitive environment where several rivals develop tactics to outdo one another. It is necessary to use the services of the marketing information system and marketing intelligence to anticipate competitive activity and outperform it. Marketing professionals must have access to the most recent market data regarding the type and scope of the competition in order to survive.

v. **Up-to-date Information on Technology:** Growth in the market results in technological advancements. The most recent knowledge on technological issues or advances is needed by marketing professionals. New products, technology, processes, etc. should be supported by facts. Such is provided by the marketing information system.

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vi. **Proper flow of Information for better Customer Service:** There may be a communication chasm between customers and marketers throughout the market expansion phase. Due to this mismatch, marketing initiatives and plans may be exaggerated. Dissatisfaction in consumers is a result of different marketers who are not regularly involved in marketing activities. An increase in consumer complaints demonstrates how poorly items meet consumers' requirements and desires.

3.8.4 CASE STUDY

Segmentation

Vijay was starving while studying late at night. He didn't want to go outside to buy food when he was away from home, so he asked someone to prepare something for him to eat. The time was 3 a.m. Finally, he ventured outside and purchased a snack from a roadside seller. He learned of a business possibility as a result of this encounter. He considered entering the food industry after completing his education with the idea of nighttime deliveries. As a student, he frequently felt the desire for a midnight snack and discovered that many other kids shared his issue. Finally, he launched "Night Cravings," a company that would bring food all night.

Questions1. Which segment should Rahul consider first?

Questions 2. Can he divide the market according to income?

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IN-TEXT QUESTIONS

Marketers should pay particular attention to:

a) Segmentation
b) Targeting
c) Positioning
d) All of the above

Which segments of the population are represented by age, gender, income, race, and family life cycle?

Geographic
Demographic
Psychographic
Psychology

A business is engaging in _____ when it determines the segments of the market that it can service most effectively and profitably.

Concentrated marketing
Mass marketing
Market targeting
Segmenting

Your business has made the decision to adapt its goods and services to the needs of the regional market. Segmentation would be a wise strategy to utilise in this situation.

Geographic
Benefit
End-use
Customer

Which method of segmentation is most likely being used by Positive Image, Inc. when it targets the clothes, cosmetics, and toiletry markets?

Age and life cycle
Gender

3.9 SUMMARY

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In this chapter we have studied about the segmentation, targeting, and positioning (STP) marketing model which is a well-known strategic marketing method today. It is one of the marketing models that is used in practice the most frequently, and marketing leaders.

In brief we can say that Segmentation is the process of employing one or more attributes to divide the heterogeneous market into homogenous segments whereas Targeting is related to selecting the number of market categories to target as well as positioning is concerns with giving customers a memorable impression of a product or brand. We also studied about the marketing research that is a well-organized, methodical process, which gives reliable information to the marketers predict their market circumstances, understanding sales and demand pattern. Finally we discussed about the marketing information which is a systematic gathering, analysis, interpretation, storage, and presentation of market information to the marketers on a regular, ongoing basis from both internal and external sources.

3.10 ANSWERS TO IN-TEXT QUESTIONS

1. Answer: B
2. Answer: B
3. Answer: D
4. Answer: A
5. Answer: B

3.11 SELF-ASSESSMENT QUESTIONS

1. What are components of the S.T.P Marketing Model?
2. What are the bases to segment any market?
3. Briefly explain the Approaches of Targeting.
4. Points out the Variables of Positioning in Market.
5. What are the types of positioning strategies?
6. What do you understand by Marketing Research?
7. Define Marketing Information System.

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LESSON 4

STRATEGIC MARKETING PLANNING PROCESS

STRUCTURE

4.1 Learning Objectives
4.2 Introduction
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4.1 LEARNING OBJECTIVES

A written document that outlines your company's future course is a strategic plan. It outlines the objectives of your business and justifies their significance. By knowing the environment, you may increase performance by using the strategic planning process.
The student should be able to:

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- ✓ Describe the process of strategic marketing planning and its significance after finishing this session.
- ✓ The capacity to create and apply marketing strategies by analyzing competitors.
- ✓ To design precise plans for achieving marketing objectives.
- ✓ The ability to employ marketing warfare techniques through analysis of the external environment.

4.2 INTRODUCTION

To adapt to the continually changing markets and strengthen their competitive advantage, businesses adopt strategic marketing planning. A company's strategic marketing planning outlines how it will change to seize opportunities in a continually shifting environment. The design and duration of the marketing strategy vary from company to company, but it is typical to have a yearly plan in place for the strategic and planning tasks. Making the proper decisions in your marketing planning will help you get the outcomes you want, whether you're redesigning your website or trying to create a completely integrated campaign. What justifies the significance of strategic marketing planning? There are a variety of reasons why businesses should think about strategic marketing planning, from managing initiatives to creating campaigns and gauging success.

Every company needs to set goals to maintain a healthy work atmosphere and increase levels of sales and profits. An organization that has a strategy in place and a plan in place achieves its goals and objectives before its competitors in the market, giving it a competitive edge. Studying the market environment, learning about the competitors' next movements, developing novel product concepts, and maintaining customer satisfaction through a variety of ways and measurements are all part of strategic planning.

A solid marketing strategy is outlined in a plan that takes into account your practice's needs as well as those of the local community. However, the effectiveness of the strategy depends on your dedication to putting it into action, allocating enough resources to the project, involving your personnel, and maintaining open lines of communication with them. The marketing strategy shouldn't only be prepared, examined, and stored on a shelf. Your practice marketing strategy should be an ever-evolving road map that directs your efforts and tracks your progress. When commitment is present, marketing is effective. You are in charge!

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4.3 STRATEGIC MARKETING PLANNING

4.3.1 Strategic Marketing Planning: - Meaning and Objectives

Strategic marketing planning is developing a marketing plan that specifies your goals, the programs you'll use to reach them, who will be in charge of tracking the metrics, and when you'll be doing them. Companies can succeed in a highly competitive market by providing superior value to their target customers and knowing how to adapt to a constantly changing environment. Therefore, businesses need to be farsighted and visionary and must build long-term strategies in order to adapt to changing conditions in their industry.

The process of strategic planning includes creating a plan to face competition and guarantee long-term survival and growth. The marketing function contributes information and other inputs to aid in the creation of the organization's strategic plan, playing a significant part in the process.

The two main goals of strategic planning are as follows:

(i) To successfully lead the business through all environmental changes.

(ii) To establish a competitive advantage that will allow the business to outperform its rivals and gain market domination.

4.3.2 Strategic Marketing Planning: Characteristics

Strategic marketing planning is a comprehensive framework for all upcoming organizational operations. Therefore, strategic planning is crucial for any organization and must be done prudently.

Characteristics:

1. **Top Management Involvement** - Strategic planning or strategy creation directly contributes to the development of the company's future. Making strategic decisions largely entails creating long-term goals and formulating organizational policies. The top-level management of an organization must thus make these decisions since they call for a great deal of wisdom and insight from the decision-makers.
2. **Requires Significant Resource Allocation** - Strategic choices necessitate the firm's commitment over a lengthy period and on key challenges affecting the broader organization. As a result, massive resources in the form of workers, materials, money, machinery, and time must be deployed.

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3. **Long-Term Survival and Performance of the Firm -** Strategic planning, with a long-term commitment in terms of organizational objectives, is commonly regarded to have a significant influence on the firm's success. A strong strategy formulation may propel a firm to new heights, but a poor strategy formation might destroy it.
4. **Future-Oriented** – Strategic planning is done in preparation for future implementation. It is now molding the future. Strategies are proactive plans of action created for future implementation. Strategic planning tries to reduce the entire uncertainty of the future by developing goals, objectives, and methods for achieving them.
5. **Irreversible -** Strategic planning is typically regarded to be irreversible owing to its complexity, large financial participation, and long-term commitment. Such judgments, if they must be overturned or amended, come at a high cost. That is why strategic planning is irreversible.
6. **Sensitive to the Environment** – To be effective, strategic planning must maintain a balance between an organization's internal strengths and weaknesses and external possibilities and risks posed by the environment. The primary need for strategic planning is that it be responsive to environmental influences and capable of responding to changes.

4.3.3 Need for Strategic Marketing Plan-

A solid strategic marketing strategy is an excellent instrument for assessing the company's position and doing a situation analysis. Thus, the necessity and significance of a strategic marketing plan are-

1. **Competitive advantage in the market**: An organization with a plan in place and a strategy in mind achieves its goals and objectives ahead of its rivals, giving it a competitive edge. Studying the market environment, learning about the rivals' future movements, developing novel product concepts, and maintaining customer satisfaction through a variety of ways and measurements are all part of strategic planning.
2. **Maintains employee motivation**: As previously noted, adopting a strategic planning approach gives the company a sense of direction and ensures that all employees are aware of how to achieve the given short- and long-term objectives. And they become extremely driven and work their hardest to complete the duties in the most effective

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way when they are given the tasks and responsibilities that correspond to their knowledge and professional qualifications, along with the appropriate wards.

3. **Innovation:** As was mentioned in the previous point, by recognizing the importance of strategic planning and implementing it, the company develops goods and services that score well in terms of uniqueness and innovation. The company prepares and strategizes its next line of offerings, which are unique and exclusive in the market and are guaranteed to increase sales, profit margins, and brand value, in the same way as with strategic planning and feedback from the internal team, external parties, and experts.
4. **The organization becomes more proactive as a result: -** Understanding the value of strategic planning enables a company to be more proactively as opposed to reactively responding to impending concerns and challenges in achieving its goals and objectives. The organization becomes more proactive as it anticipates and foresees the challenges arriving when it adheres to the foundations of strategic planning. Problems and issues are bound to develop when attaining all the short term and long-term objectives. Therefore, the management and the team's key players take corrective action ahead of schedule to resolve problems before they threaten the company's brand value and bottom line.
5. **Increased sales and profits:** The Company is quickly achieving its goal of higher sales and profits when it adheres to the Importance of Strategic Planning in all areas of its business operations. Since it is a universal truth that all strategic planning and actions are taken by the company to not only increase the value of its brand in the market but also to boost sales and profits to keep the cash registers ringing and stay relevant in the market despite fierce competition, carving a niche for itself.

IN-TEXT QUESTIONS

- Strategic marketing planning helps to successfully lead the business through all environmental changes. True/ False.
- Competitive advantage doesnot allow the business to outperform its rivals and gain market domination. True / False
- To be effective, strategic planning must maintain a balance between an organization's internal ------ and ------ and external ------ and ------- posed by the environment

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4.4 STRATEGIC MARKETING PLANNING PROCESS & COMPETITOR ANALYSIS

1.4.1 **Key Elements of Strategic Marketing Planning Process**

Setting your marketing goals, conducting a marketing audit, conducting market research, analysing the research, identifying your target audience, deciding on a budget, developing specific marketing strategies, scheduling the strategies' implementation, and developing an evaluation process are the nine main steps needed to develop a well-crafted, strategic marketing plan.

Figure1: Elements of Strategic Marketing Planning Process

Source:

1. Setting your marketing goals. Once you've made the decision to advertise your practice, you need to establish attainable objectives for the following 18 to 24 months. You may schedule activities around neighborhood events that support your marketing objectives within

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this time frame. We advise against scheduling particular activities more than two years in advance due to the fast changes taking place in the healthcare industry.

2. Conducting a marketing audit-A marketing audit is an assessment of all marketing activity in your practice over the last three years. Be as comprehensive as possible, reviewing every announcement, advertisement, phonebook ad, open house, booklet, and seminar to determine its success.

3. Conduct market research. Market research is used to provide a realistic image of your profession, the community in which you practice, and your present standing in that community. With this study, you may create reasonably accurate estimates about future community growth, identify competitive variables, and investigate unorthodox prospects.

Market research is frequently the most time-consuming element in this process. It is, nevertheless, one of the most crucial phases. This study allows you to determine what your practice does well and where you need to improve, what the needs of your community are, who your practice should target, and how you should go about it.

4. Analyzing the research.

The raw data you acquire must then be analyzed and summarized into relevant conclusions that will serve as the foundation for choosing which marketing techniques make the most sense and will yield the best outcomes for your practice. The study will help you define your target audience by identifying the demands and requirements of your present and future patients. This is also a wonderful moment to reflect on the objectives you've set for yourself. You may need to revise some of your objectives based on the results of your investigation.

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A strategic marketing plan necessitates the definition of your practice in terms of what it accomplishes for consumers. The research study will show the strategic benefits of your practice. After extensively examining your own and your rivals' practices, you may ask yourself three critical questions: What are the distinctions and similarities between your practice and those of your competitors? What distinguishes your practice from the competition? Is your technology more appealing than that of your competitors? Do you provide a greater range of services than your competitors? Is there a service that you offer that no one else in the business does? Your competitive advantage might be in your practice style, the breadth of services you provide, the simplicity of scheduling an appointment, or the way you communicate.

MARKET RESEARCH GUIDE

Conduct market research on your business, your competitors, and your neighborhood to obtain the information you need to establish a comprehensive marketing plan for your clinic. Your profession cannot rely on intuition, judgement, or experience; it requires real evidence. Although gathering this information will take some time, there are a lot of tools accessible to help you.

Your expertise

Much of the information you want regarding your own practice may be obtained through talks with employees and consumers, as well as through a study of your past consumers. You may also learn about your company and if it is serving the requirements of your present customers by having them complete a business survey. Here are some of the questions you should have concerned your business:

• What is your organization's background and history? Is it a recent addition to the present community?

• What are the strengths and shortcomings of your organization?

• Who are your present customers in terms of age, gender, ethnic origin, education etc?

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• What services does your business offer? Who requires these services? Are these requirements changing?

Your competitor

You must learn about your competition and what they are offering to their customer base. Check with your executives and intermediaries to see how many other substitutes and new entrants have move in the segment in the last five years.

After you've discovered who your competitors are, you must evaluate them. This information may be more difficult to obtain, but you may try to acquire as much as you can by simply asking other stakeholders and analyzing rivals' strengths. To evaluate your competitors, ask the following questions:

• Who are your rivals' target markets and target audiences?
• What makes specific consumers or groups of people like or dislike your competitors?
• How does your rivals rank in the community?
• What marketing strategies have your rivals employed?

Your neighborhood

- In addition to learning about your profession and your rivals' practices, you should study everything you can about the people in your neighborhood. Answers to the following questions can be obtained by contacting your local Chamber of Commerce, your state vital statistics bureau, or by consulting the (www.census.gov). Every state, county, city, ZIP code, neighborhood, and so on may access census data:
- What is the population density in your service area? Is the population anticipated to increase or decrease?
- What are the demographic features of your local population?

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5. Identifying your target audience. You should be able to determine your organization's "target audience" with the help of your market research analysis, which is the exact group of people to whom you'd like to aim your marketing efforts. Your target audience might include people of a given age, education, lifestyle, culture, gender, and so on. Remember that your target audience should include not just the customers you wish to attract, but also other stakeholders that may influence and expose that sector of the population.

6. Determine a budget. Before you can select which exact marketing methods to use to reach your goals, you must first review your financial data and create a marketing budget. Marketing budgets differ depending on the sort of market a business is in, the age of the business, and if the organization has previously advertised. There is no set amount that a business should spend. However, in our experience, practitioners in open marketplaces spend 3–5% of their yearly gross income on marketing. If your practice is new, in a highly competitive market, or has never been promoted before, or if you plan to launch an ambitious new program or service, expect to spend 10% or more of your revenue on marketing.

7. Develop marketing strategies. With your budget in place, you can start defining marketing tactics that will meet your objectives, reach your target demographic, and grow your client base. Remember to concentrate your efforts on the aspects of your organization that may be leveraged to generate a unique value in the minds of your clients and referral sources. Each strategy should be linked to a specific objective and comprised of several steps. One technique connected to the objective of attracting customers, for example, is to make the workplace and employees more customer pleasant. The following activities may be necessary for such strategy:

Improve the reception area's décor; Provide name tags for employees; require staff to identify themselves to each new customer; provide staff with training sessions on customer satisfaction; create a method for consumers to self-schedule appointments on the business website.

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8. Developing an implementation schedule-An implementation schedule is a timetable that outlines which marketing activities will be carried out when and by whom. The calendar should also contain the cost of each marketing action and how it fits within the 24-month budget predictions. Consider how the activities will influence present practice operations and if there are enough resources (such as employees, time, and money) to complete the essential tasks while designing the timetable. It may be required in some circumstances to reduce the list or postpone some activities. In other circumstances, it may be better to proceed with your plan's full implementation.

If you want to fully implement the strategy but lack the necessary personnel resources, you can think about hiring a consultant to manage the marketing efforts or hiring a part-time employee to take care of the bulk of the marketing duties. You may use the implementation timetable as a foundation for tracking the development of your marketing strategy.

9. Create an evaluation process-The efficacy of a marketing plan determines its worth, which calls for thoughtful and timely implementation as well as monitoring and outcomes evaluation. It's crucial to compare your performance to the benchmarks you established while setting your goals. By comparing your progress to the implementation timetable, review your strategy on a regular basis (we suggest quarterly). You may assess your success in a number of ways, including customer satisfaction survey results, reference sources, improved revenue, more new clients, and a decline in complaints.

If at any point you discover that your development falls short of what you had hoped, you must figure out why? Maybe no new customers have responded to the advertisement for the new service you are promoting. If the advertising campaign has been implemented as instructed without yielding any results, stop and attempt another course of action. Perhaps you might consider holding a series of seminars, running a campaign that is especially aimed at the demographic you want to attract, or creating a new section on your website only for customers that highlights the advantages of the new service. In other words, the marketing

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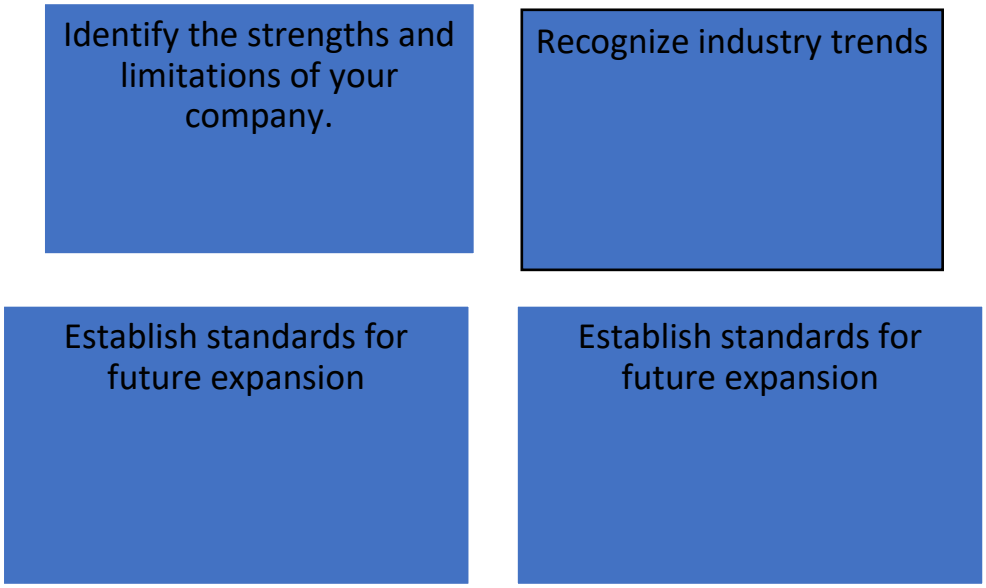
plan's activities, and even its strategies and objectives, are not set in stone. You can always make changes by consistently keeping track of and analyzing each activity.

4.4.2 Competitor Analysis

A competitor analysis, also known as a competitive analysis, is the process of identifying and analyzing rivals in your industry's various marketing techniques. You may use this information to assess your company's strengths and shortcomings in relation to each competition. You may do a high-level competition study or delve into a specific component of your competitors' company. This article will focus on how to do a generic competitive analysis, but you should personalize this method to your company's requirements and goals.

Small company entrepreneurs sometimes find themselves juggling many jobs at once. But even with a hectic schedule, it's worthwhile to undertake a competition study. By supporting you, it can boost your business by:



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Identify the strengths and limitations of your company.

You may learn about the benefits and drawbacks of your own brand by examining how your rivals are seen. Knowing your company's advantages might help you position your business in the market or create the mental image of your product or service that you want people in your target market to have. It's crucial to explain to potential clients why your service or product is the greatest option out of all those offered.

Knowing your company's vulnerabilities is just as crucial to advancing your enterprise. You may find places where you might wish to put time and money to use by understanding where you fall short of your consumers' expectations.

You could discover, for instance, that clients favor the customer service provided by your rivals. Investigate your rivals to learn what they're doing well and what you might adapt for your own firm.

- Recognize industry trends-

Knowing how the industry is changing as a whole may also be determined by studying the competitors. However, you shouldn't follow your rivals' lead in accomplishing anything. It's seldom, if ever, successful to copy the competitors without carefully analyzing your own position in the market. Don't immediately copy what your rivals are giving if you notice them doing something that you aren't. Instead, consider your consumers' wants and ways to add value for them.

- Recognize your market

You can discover businesses while identifying your rivals that you were unaware of or that you had not previously considered to be in your industry. To outperform your competition, start by identifying who they are.

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You might be able to find areas where your market is underserved by conducting an in-depth analysis of what your rivals have to offer. You can take the initiative and increase your own products to meet any unmet consumer demands if you discover discrepancies between what your rivals are giving and what customers desire.

Establish standards for future expansion- You should consider businesses that are both bigger and smaller than your own while doing a competition study. Studying existing companies in your field may help you create a vision of success and a benchmark for measuring your future expansion. On the other hand, the firms that could challenge your market share in the future might be identified by investigating new competitors in your sector.

4.4.2.1 When should you analyze your competitors?

When launching a new firm, it is usually a good idea to do a comprehensive competition study. A competition analysis is useful for businesses other than startups. It is a tool that may be applied at every step of the company life cycle and ought to be. You may uncover new market trends and keep a competitive edge over other businesses in your field by periodically evaluating and updating your competition study, or by starting one from fresh.

4.4.2.2 Competitor analysis techniques

It might be challenging to decide what to emphasize while performing a competitive analysis. Here are six steps to get you started: Think on the purpose of your competitor analysis before you start. Include any additional research fields that support these objectives.

1.Identify your rivals.

Consider where your clients would go if they didn't buy from your firm while compiling a list of possible rivals. Searching for your product or its category on Google or another search

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engine and browsing the results is a simple method to get started. You may also conduct a poll or conduct an interview with current clients to learn more about the alternatives they looked at before choosing your goods or services.

So that you can devote adequate time and effort to investigating each rival, limit your list to 10 or less. To acquire a thorough understanding of the market, when you finish your list, try to include a variety of businesses. Additionally, take into account companies that compete in each of the three categories

Direct Rivals

Direct rivals cater to comparable target markets by offering comparable goods or services. When you consider your competitors, these are probably the businesses that immediately spring to mind. McDonald's, for instance, probably sees Wendy's and Burger King as direct rivals in the fast-food burger industry or Coke vs Pepsi in beverage industry.

Indirect Rivals

Although they target a similar demographic to yours, indirect rivals provide a different good or service in the same market. For instance, McDonald's faces off against pizza delivery services like Domino's and Papa John's.

Replacement rivals-

Although they compete with you outside of your product category, replacement rivals meet comparable consumer needs. Any option individuals choose when they're hungry, including goods like frozen dinners, might be a replacement rival for McDonald's. Replacement competitors are the most difficult of the three categories of rivals to recognize. You should

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pay close attention to both direct and indirect rivals while doing a competitor analysis. Even so, it's vital to quickly assess any prospective substitute rivals that can jeopardize your company's future.

2.Make a matrix of competitors

Take some time to arrange yourself before you get into your competitor analysis. You may organise your research using a table or spreadsheet called a competitor matrix, sometimes referred to as a rival grid. It will be simpler to compare your results to those of rivals and see wider patterns as a result.

Start by giving each rival you've identified a row or column to itself. List the data points or categories of information you want to know about each rival on the opposite axis. If you're unsure of what to search for at this stage, don't worry. As your study progresses, you may always add new categories.

3.Assemble background data

Start researching your rivals' companies after you have a list of them. Start by looking for the most fundamental details, then work your way up from there. Start by checking out any news items that have been written about the firm as well as its websites and social media profiles. Here are some fundamental details that you might wish to look for. History of the company- This covers details like its inception date, financial sources, and any mergers or acquisitions it has taken part in. The "About" section of their website or previous news releases from the business are frequently good places to look for this information. You may gain a deeper knowledge of your rivals' company by researching how they came to be where they are.

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4.**Size of Business**

How many individuals are employed by your rivals? For this type of information, Glassdoor and LinkedIn are also good sources. Additionally, you should research the number of clients and income that your rivals have. For larger organisations, this information will probably be readily available online. You may have to settle for approximations for smaller, privately held businesses. You may better contextualise the remaining data you get if you are aware of the size of your competition.

5. **Concentrate on the 4 Ps**

It's important to investigate how each competitor approaches that market segment now that you have determined who their target market is. A thorough examination of their marketing tactics will be necessary.

The four Ps—product, pricing, promotion, and place—that make up the marketing mix are the prerequisites for bringing a product to market. For each competitor you've chosen, ask yourself the following questions as part of your investigation.

Product

- What do they market?
- What characteristics does their good or service have?
- What features of the product or service appeal to customers the most?
- What are the product's or service's flaws?

Price

• What sort of pricing structure do they employ? Is it a yearly subscription or a one-time purchase?

• What are their prices for their goods or services? Do they provide discounts or sales?

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• How does the price of a product or service relate to its actual or perceived quality?

Promotion

• How do they disseminate information about their good or service? What mediums do they utilise for advertising, such as social media, email marketing, print ads, etc.?

• What features of their goods or services do they highlight? What makes them stand out from the competition?

• What is their business's history? How do they describe their company's brand?

Place

• Where are their products sold? Do they do their business online or offline?

• Do they collaborate with merchants or third-party marketplaces, or do they sell to customers directly?

These inquiries are supposed to provide a place to start. Feel free to elaborate and modify them to fit your industry and the objectives of your study.

There is probably a tonne of information available. Make an effort to summarize your results into brief bullet points that you can later readily refer to. If you can find it, make sure to incorporate quantitative data where it is suitable.

6.**Analyse** strengths and weaknesses—yours and your competitors'

Think about each of your chosen rivals' advantages and disadvantages based on the data you've gathered. Consider the reasons why customers pick a certain brand's goods or services over competing ones. In your spreadsheet, note your conclusions.

Finally, think about the strengths and shortcomings of your own business. How does your company stack up against the rivals you've studied? You can better serve your target clients by being aware of what makes your company stand out from the competition and where it falls short of expectations.

4.5 Marketing Warfare strategies

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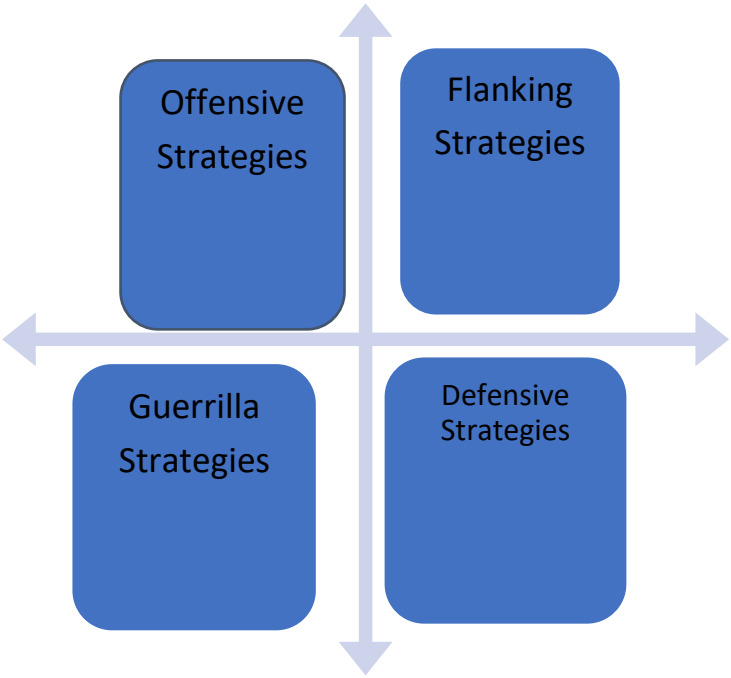
Marketing warfare strategies are a type of business and marketing strategy that attempts to make comparisons between business and warfare before applying military strategy to business situations. Competing firms are compared to sides in a military conflict, and market share is compared to territory that is in contention.

For instance, in a game of football between two teams, each team will attempt to advance the ball toward the goal line, and most likely, their rival team will stop them. Teams must create counter-competition plans that enable them to outmaneuver and outflank opponents if they want to win the game. The same principles are used everywhere to win, whether it be in sports, business, or warfare.

Depending on the conditions in the environment and the strategic move of rivals, commercial enterprises might employ one of four different marketing warfare techniques.



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Offensive marketing warfare strategies - To gain a competitive edge, offensive marketing warfare tactics are deployed; often, market leaders, runners-up, or failing rivals are targeted. By using offensive marketing, you may directly confront the competition with your greatest deals and promos. It's also how many businesses compete with one another for customers' attention by offering bargains, promotions, product upgrades, and the like. For instance, if company A is selling ice cream this week for Rs. 10 per piece, company B can run a counter campaign advertising ice cream on sale for Rs. 9.50. Although the transaction wasn't anticipated or planned, an aggressive marketing campaign made it happen. You may not make as much money from a particular transaction if you go on the offensive, but you will gain ground through more sales and customers in the long run. The primary objective of offensive strategies is to improve sales, increase market share by increasing customer base and destabilize the current market leader.

Defensive marketing warfare strategies – Defensive tactics are managerial instruments that may be employed to repel a prospective competitor's attack. Consider it a battleground. To keep your consumers satisfied and your profitability constant, you must defend your market share. Defensive tactics are managerial methods that may be used to repel a prospective competitor's attack. The purpose of these techniques is to keep your position as the market leader while battling against competitors that want to steal your market share. As a result, it is characterized as a marketing technique that assists businesses in retaining important clients who may be stolen away by competitors. The goals of this approach are to maintain current market share while increasing profitability, to maintain current levels of competitive advantage and top position in local and existing markets.

Flanking marketing warfare strategies – A Flanking Attack tactic focuses on a competitor's weak spots. You assault them to remove them and acquire market share. The term derives from a military tactic in which an adversary is assaulted from the side, assuming that the majority of might is concentrated in the front. It is an attack on the area where the

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opponent gives little importance for example Close-Up brought first gel toothpaste in the market by changing product form, similarly Sony brought portable electronics or Volkswagen with smaller size cars.

Guerrilla marketing warfare I strategies – Guerrilla marketing is the employment of creative or unusual ways to increase sales or generate interest in a brand or business. These tactics are frequently low-cost or free, and they entail the broad usage of more human connections or viral social media messaging. Business organizations employ tactics such as assault, conceal, and retreat until the competition exits the market. For example, a local store tailoring a strategy to attract local customers versus a national product, or a locally customized business magazine by a local vendor that a national publisher such as the Times of India or the Hindustan Times cannot accomplish.

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CASE STUDY

Ries and Trout utilise the burger war to show a flanking manoeuvre in the fast food business. McDonald's was the market leader, and Burger King attempted aggressive strategies. The moves that failed were those that expanded the product line and imitated McDonald's. The successful campaigns distinguished Burger King from McDonald's. Have it your way, for example, targeted a flaw in McDonald's consistent product line procedure, which had the unintended consequence of being rigid. The campaign highlighting the fact that Burger King's burgers were flame-broiled whereas McDonald's were fried was even more popular. Wendy's effectively countered McDonald's by focusing on adults rather than children, giving adult-sized portions, and creating the hugely popular Where is the beef? campaign.

Finally, White Castle was the low-end Guerrilla, limiting their geographic spread, without adding a bewildering array of other goods, and maintaining a high level of sales at each establishment. White Castle followed the guerrilla philosophy of never acting like the leaders and was able to coexist peacefully as a consequence.

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Activity- Identify the type of warfare strategy

4. The businessmen competed with Facebook by concentrating on the photo sharing aspect of their service. While the Facebook team spread themselves thin over a wide range of features and functions, Instagram narrowed its attention to just photographs and effectively established itself as a household name in the social media space. Of course, Facebook eventually bought them.
5. The traditional "exit man" signs that are so prevalent in places all around the world are customized with stickers for Axe Body Spray. The additional stickers tell a tale about the recognizable departure guy; to think we had believed he was fleeing from a fire!-
6. The two market leaders in the soft drink beverage sector are Coca-Cola and Pepsi. They both possess resources and money. They've used frontal assaults frequently in the past. Pepsi began selling diet Pepsi after Coca-Cola introduced its diet coke.
7. A price competition in which a business commits to equal or outbid its rivals, increasing the features in order to stay ahead of a rival, offering warranties that testify to having superior products or better service.

4.5 MAIN BODY SECTION 3

IN-TEXT QUESTIONS

- ---------- strategy is used to attack competitors on the area where the opponent is weak to penetrate and gain market share.
- The ---------- type of warfare strategy has the goal to maintain current levels of competitive advantage and top position in local and existing market.
- The strategic marketing planning process consist of detailed steps and no of steps are ----------

4.9 SUMMARY

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Strategic marketing planning is a comprehensive framework for all upcoming organizational operations. Key Elements of Strategic Marketing Planning Process are: Setting your marketing goals, conducting a marketing audit, conducting market research, analyzing the research, identifying your target audience, deciding on a budget, developing specific marketing strategies, scheduling the strategies' implementation, and developing an evaluation process are the nine main steps needed to develop a well-crafted, strategic marketing plan..

A competitor analysis, also known as a competitive analysis, is the process of identifying and analyzing rivals in your industry's various marketing techniques.

- Identify the strengths and limitations of your company
- Recognize industry trends
- Establish standards for future expansion
- Establish standards for future expansion

Marketing warfare strategies are a type of business and marketing strategy that attempts to make comparisons between business and warfare before applying military strategy to business situations. The types are:

- Offensive marketing warfare strategies
- Defensive marketing warfare strategies
- Flanking marketing warfare strategies
- Guerrilla marketing warfare strategies

4.10 ANSWERS TO IN-TEXT QUESTIONS

1. True 2. False 3. Strength and Weakness, Opportunities and Threats. 4. Flanking 5. Guirella 6. Offensive 7. Defensive	9. Defensive 10. Nine

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8. Flanking	

4.11 SELF-ASSESSMENT QUESTIONS

1. Explain the type of marketing warfare strategies the company can use with suitable examples.?
2. Discuss strategic marketing planning process in detail with relevant examples?
3. What are the measures you will take to analyses competitors?

4.12 REFERENCES AND SUGGESTED READINGS

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LESSON 5

PRODUCT MIX

STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 Product Meaning
5.3.1 Definition
5.3.2 Five Product Levels
5.3.3 Classification of Goods or Products
5.4 Product Mix Meaning
5.4.1 Definition
5.4.2 Dimensions of Product Mix
5.5 Introduction to New Product Development
5.5.1 Definition of Product Development
5.5.2 Meaning of Product Development
5.5.3 New Product Planning
5.5.4 Role of New Product Development
5.5.5 New Product Development Process
5.6 Product Lifecycle
5.6.1 Product Lifecycle Stages
5.6.2 Marketing Decisions
5.7 Glossary
5.8 Answers to In-text Questions
5.9 Self-Assessment Questions
5.10 References
5.11 Suggested Readings

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5.1 LEARNING OBJECTIVES

After studying this unit, you should be able to:

- ✓ Analyze how products are classified
- ✓ Explain the product line and product mix strategies
- ✓ Describe the product lifecycle
- ✓ Discuss the stages involved in the new product development

5.2 INTRODUCTION

To begin with, let us understand the term product. We may define the product as a collection of physical, psychological, service, and symbolic, attributes that collectively yield satisfaction, or benefit, to a buyer or user. The marketing identified a product as anything presented to a market to satisfy a want or need. This chapter helps you to get familiarized with the significant concepts concerning product management.

Product management is an organizational lifecycle function within a company involving the planning or marketing of a product or products at every stage of product lifecycle. We shall be discussing the levels and classifications of products, and the strategies of product line and product mix. We will also analyze the important steps to be considered in the new product development process.

5.3 PRODUCT MEANING

In a general usage, a product is any object which has an identifiable physical existence. The marketing identified a product as anything presented to a market to satisfy a want or need. We may define product as a collection of physical, psychological, service, and symbolic attributes that collectively yield satisfaction, or benefit, to a buyer or user.

5.3.1 Definition:

According to Philip Kotler," A product is anything that can be offered to a market for attention, acquisition, use or consumption that might satisfy a want or need. It includes physical objectives, services, persons, places, organizations and ideas."

According to W. Anderson," A product should be considered as a bundle of utilities consisting of various product features and accompanying services."

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A product has different layers like an onion and each layer contributes to the making of the product. It uses five product levels in which a product is located or seen from the perception of the consumer. These 5 Product Levels indicate the value that consumers attach to a product. The customer will only be satisfied when the specified value is identical or higher than the expected value.

ACTIVITY

One caution to be observed by any lesson writer is the amount of time a learner needs to spend on any activity/exercise etc. As these activities/exercises are given along with the material; the learner should not be diverted for a longer duration by giving longer/difficult questions/activities/exercises etc. At best, learners may spend a few minutes (5-10) and come back to the material for reading so that focus and rhythm of study would not be lost.

5.3.2 Five Product Levels:

1. **Core Product:** This is the basic product, and the focus is on the purpose for which the product is intended. This layer explains the 'why' of buying the product. For example, a warm coat will protect you from the cold and the rain. The more important benefits the product provides, the more that customers need the product. This will benefit the product positioning within a market and effect the possible competition.
2. **Basic Product:** This represents all the qualities of the product. The consumer looks at the basic utilities, like physical features and tangible elements of the product. For a raincoat this is about fit, material, rain repellent ability, high-quality fasteners, etc.
3. **Expected Product:** This is about all aspects the consumer expects to get when they purchase a product. The expected layer is a set of attributes and conditions that buyers normally expect out of the product. The basic product is the 'given thing' in the product.
4. **Augmented Product:** The Augmented Product refers to all additional factors which sets the product apart from that of the competition. And this particularly involves brand identity and image. Is that product in style, its color trendy and made by a well-known fashion brand? But also factors like service, warranty and good value for money play a major role in this. The goal is to deliver something that is beyond an expected product. It's the translation of the desire that is converted into reality.

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5. **Potential Product:** This is about augmentations and transformations that the product may undergo in the future. Here the marketer is always on constant search for new methods and processes to differentiate the offer on the basis of product features and services that will satisfy the customer and create the desired differentiation.

5.3.3 CLASSIFICATION OF GOODS OR PRODUCT:

Classification of Products		
↓		
I. Durability and Tangibility	**II. Consumer Goods**	**III. Industrial Goods**
(a) Non-durable goods	(a) Convenience goods	(a) Equipment and Physical Facilities
(b) Durable Goods	(b) Shopping goods	(b) Materials entering into the Product
(c) Services	(c) Specialty goods	(c) Manufacturing or Service Supplies
	(d) Unsought goods	(d) Management Materials

Table 1:Classification of Products

I. DURABLITY AND TANGIBILITY

Products can be classified on the basis of durability and tangibility. On the basis of durability, they can be grouped as non-durable and durable products.

(a) Non-Durable Goods: These are goods which get depleted on consumption. For example a bottle of soft drink is consumed at once on one occasion within a matter of minutes. Soap obviously takes a little longer. However, in both these cases, the goods are consumed very fast

(b) Durable Goods: These are goods which are `durable' or which last for some time. Examples of such goods would be electric irons, refrigerators, television sets, etc. This type of product requires more selling effort from the salesman. The question of after sales service and repairs is also of importance as `selling points' or `benefits' which the customer would like to have.

(c) Services: Services are specially mentioned here (although they do not constitute products) because it is generally thought that marketing is related to products alone. Products are classified as physical products or tangible whereas services are intangible, inseparable, variable and perishable in nature.

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II. CONSUMER GOODS

Consumer goods are those goods which are designed for final consumption by individuals and households. Television, radio, cigarettes etc., are the examples of consumer goods.

TYPES OF CONSUMER GOODS

(a) **Convenience Goods:** Goods which consumer buys frequently, immediately and with minimum shopping effort are classified as convenience goods. Examples: Cigarettes, newspapers, magazines etc.

(b) **Shopping Goods:** Goods which consumer selects and buy only after making comparisons on such bases as suitability, quality, price and style are called as shopping goods. Examples: furniture, readymade garments etc.

(c) **Specialty Goods:** Goods for which significant numbers of buyers are habitually willing to make a special purchasing effort are known as specialty goods. They should possess unique features or have a high degree of brand identification or both.

(d) **Unsought Goods:** These are goods that the consumer does not know about or does not normally think of buying. These goods need advertising and more personal selling efforts for making a sale. These include life insurance products, coffins, and fire alarms.

II INDUSTRIAL GOODS

Goods which are for use in the commercial production or other goods or for use in connection with carrying on of some business or institutional activity are known as industrial goods.

TYPES OF INDUSTRIAL GOODS

1. **Equipment and Physical Facilities**: Major capital assets such as plant, machinery, building etc., come under this category.
2. **Materials entering the Product:** This category of industrial goods includes raw materials, semi- manufactured goods and fabrication parts.
3. **Manufacturing or Service Supplies:** These are products that are essential to the business operations of the industrial users but do not become part of the finished goods. Example: Fuel, oil etc.
4. **Management Materials:** This category covers both office equipment's and office supplies. Example: Stationery, typewriters, calculators.

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5.4 PRODUCT MIX MEANING

The term product mix refers to the collection of products dealt with by a business firm. The product mix is one of the elements in the product policy.

5.4.1 DEFINITION

According to Philip Kotler," Product mix (also called as product assortment) is the set of all product lines and items that a particular seller offers for sale to buyers."

According to William J. Stanton," The product mix is the full list of all products offered for sale by a company."

CASE STUDY

The impact of distance education on higher education: A Case Study of the United States

In 2013, Gail D. Caruth and his team of Texas University have studied the impact of distance education on higher education. Distance education has been credited for bringing education to students who would not otherwise have educational opportunities. This study used a qualitative case study approach to examine the research to determine the impact of distance education on higher education in the United States. They found that the impact of distance education is significant to higher education because informed knowledge of the impact will provide insight into the effects of overall education in the United States. The researchers asked the following two exploratory questions: What happened during the evolution of distance education in the United States? What themes emerged over time? Their findings suggested that the impact of distance education on higher education in the United States has been change. They also anticipated that, in the future changes will continue to occur. Researchers concluded that the higher education has to be prepared to teach about change and teach students how to handle change.

5.4.2 DIMENSIONS OF PRODUCT MIX

The relationship between the items and lines that form a given product mix may be described in terms of three dimensions, namely, width, depth and consistency.

1. **Length of the Product Mix:** The length of the product mix refers to the total number of items in its product mix.
2. **Width of the Product Mix:** The width of the product mix refers to the number of different product lines the company carries.

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3. **Depth of the Product Mix:** Depth refers to how many varieties are offered in each product line. In other words, the depth is measured by assortment of sizes, colours, models, prices and quantity offered within each product line.

4. **Consistency of the Product Mix:** The consistency of product mix is a measure of how closely related its various product lines are to one another. The relationship may be due to the use, production requirements, distribution channels, consumer behavior and other characteristics.

5.5 PRODUCT DEVELOPMENT

5.5.1 Definition of Product Development

To serve the needs of its end-users, product development is generally characterized as "making, innovating, or developing totally a new product, or presenting an existing product with expanded utility, improved features, more appealing design, better quality, and reliability."

5.5.2 Meaning of Product Development

Product refers to a good, service, concept, or object made by a process and made available to fulfill a need or a want. Development is the process or act of expanding, advancing, or developing.

There are two parallel paths involved in the new product development process. The first involves the idea generation, product design and detail engineering whereas the other involves market research and marketing analysis. Basically, Companies typically see new product development as the first stage in generating and commercializing new products within the overall strategic process of product life cycle management where it is used to maintain or grow their market share. It is important the new product which is based on current market trends should be launched so that it can gives greater benefit to the customers. At the same time, it can also help them to understand what the needs of their customers are helps to increase the sales of their business in terms of maximizing the profits.

5.5.3 New Product Planning

New product planning has been defined by the American Marketing Association as *"the act of making out and supervising the search, screening, development and commercialization of new products; the modification of existing lines; and the discontinuance of marginal or unprofitable items".* Simply stated, product planning decides the nature and other related

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aspects of the articles produced and sold. Product development is a more limited term but includes the technical activities of product research, engineering, and design. Product planning and development is the result of the coordinated efforts of large number of specialists – engineers, scientists, marketers, etc. Product planning is usually described as 'Merchandising' and it covers both, the existing and potential products. This activity, therefore, must deal with the proper balance between the old and the new products. New product planning is a very long and complex process, and it deals with changes in:

The kinds of goods or services offered by a marketer for various segments. The number or kinds of products, or different lines, that the company offers in various segments. The width of product line offered.

The quality levels or levels acceptable to various classes of consumers in various target markets. The degree of distinctiveness. Increased societal and governmental constraints. The growing shortage of new product ideas in certain areas. Shorter time spans between the emergence of the idea and the physical launch of the product. The costliness of the new product development process.

The following decisions are important in new product planning:

- Improving the existing product lines and services,
- Weeding out unprofitable items in the product line (simplification),
- Expansion of the current product line (diversification),
- New product development for the present customers, and
- New product development for new customers (diversified products).

5.5.4 Role of New Product Development

Whatever may be the size and nature of operations of a firm, product planning and development is necessary for its survival and growth in the long-run. Every product has a life cycle and it becomes obsolete after the completion of its life-cycle. Therefore, it is essential to develop new products and alter or improve the existing ones to meet the often-changing requirements of customers. The role of new product development can be stated in terms of:

1. Ensuring that the product mix, matches changing environmental conditions and that product obsolescence is avoided.
2. Enabling the marketer to compete in new and developing segments of the market.
3. Reducing the marketer's dependence upon particular elements of the product range or vulnerable market segments.
4. Filling excess capacity.
5. Achieving greater long-term growth and profit.

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Introducing new product is rather difficult as it involves long-range planning. Customers' need should be identified, competing and substitute products should be evaluated and, above all, the strength of the company should be examined before deciding to produce a new product. Product failure defeats the very objectives of a firm. In a survey conducted by Booze, Allen and Hamilton, it was revealed that firms with well-organized product planning programs have only 40-50 percent product failures. When this percentage is compared with the overall industry product failures (80 percent), one could easily be convinced of the need for product planning.

5.5.5 New Product Development Process

As you must have realized by now, it is very important to have a strategy for developing new products. Many products fail and in order to keep expanding company sales, we must have new products. Some products of Hindustan Lever have failed, but still they remain leading manufacturers because they have continuously added to their lines and added product lines to their product mix. Their "Hima" peas introduced in the 60s flopped, because, in the words of the Chairman of Hindustan Lever, 'India is not yet ready for convenience foods, neatly done up in packages'. The product 'concept' requires testing before one goes into product designing and it is very necessary to have an adequate strategy for developing new products and introducing them.

New product development involves marking out and supervising the search, screening, development and commercialization. It therefore embraces decisions regarding the type of product idea to be taken in hand, its development and reaching the ultimate consumer to satisfy his demand. Such a philosophy of marketing would ensure the introduction of logical, well designed and individually justified products.

This will enable the company to face the competition from a position of strength.

New product development, therefore, starts with the conception of a product idea, its due screening for its commercial and technical viability, probing its market potential and consumer acceptance, matching it with company facilities and constraints, developing the product with due thought and care, and its ultimate offering to the largest market segment. This sequence can well be described as a customer-oriented approach to new product planning.

From the above discussion you will appreciate that introduction of a new product is a highly sophisticated and difficult task and involves a long-term planning effort. It has a high-cost component. Even after a product **is** finally developed, its marketing costs are exceedingly

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high and yet there is no certainty that it will succeed. It is for this reason that a company should move from stage to stage in a careful and systematic manner. The approach is composed of seven steps as demonstrated in Figure 1: New Product Development Process.

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Figure 1: New Product Development Process

1. Idea Generation

The new product approach starts with the generation of a product idea. It means matching a perceived need with the recognition of a technical opportunity. The said need may be new or old one. The first stage of new product's evolution begins with an idea for the product. Hence, this stage is called as Idea Generation. Ideas may originate from the following sources:

- Sales personnel
- Marketing personnel
- Research and Development Department
- Top management executives
- Production department
- Customer Service Decisions
- Employee suggestion system
- Customers
- Competitive products
- Foreign products

2. Idea Screening

The second step in the process of product development is Idea Screening. At this stage, the ideas collected are scrutinized to eliminate those inconsistent with the product policies and objectives of the firm. Most promising idea is kept for the next stage.

3. Concept Development and Testing

The concept formulation happens in the laboratory. During this stage, the 'idea on the paper' is turned into a 'product-on-hand'. In other words, the idea is converted into a product concept that can be produced and demonstrated. Concept testing calls for testing product concepts with an appropriate group of target consumers, then getting those consumers reactions.

4. Marketing Strategy

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This stage requires a close co-ordination between Engineering and Marketing Divisions. Along with the process of product development, the marketing division of the company develops a tentative marketing strategy. A blue print is designed about the price structure, promotion and distribution strategy for the proposed product. The marketing team identifies the need of sales force needs, advertising program and sales promotion tools for the new products. After developing tentative marketing strategy, the prototype is released for testing.

5. Business Analysis

After management develops the product concept and marketing strategy; it can evaluate the proposals business attractiveness. Management needs to estimate whether sales will be high enough to yield satisfactory profit. At this step business analysis for the new product is done. Business analysis includes - estimation of sales, frequency of purchases, nature of business, production and distribution related costs and expenses, and estimation of profit.

6. Product Development

During this stage, the idea-on-the-paper is turned into a 'product-on-hand'. The idea is converted into a product that can be produced and demonstrated. The product passes the business test it moves to R&D and engineering to be developed into physical product. The R&D department will develop one or more physical versions of the product concept. This stage is also termed as technical development. Its goal is to find a prototype that consumers see as embodying the key attributes described in the product statement and can be produced within the budgeted manufacturing costs.

7. Testing the Product

In this stage of product testing, the new product manager can check the feasibility and accuracy of product performance. Thus, commercial experiments are necessary to verify earlier business judgments. The objective of this stage is to assess whether the product meets the technical and commercial specifications developed at various levels of concept development for ascertaining product acceptability.

8. Commercialization and final launch

In this stage, the product is submitted to the market and thus commences its lifecycle. Commercialization is also the phase where marketing is most active in connection with the new product. This stage is considered to be a critical one for any new product and should therefore be handled carefully. The following activities are usually undertaken during this stage:

a. Completing final plans for production and marketing

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b. Initiating coordinated production and selling programs

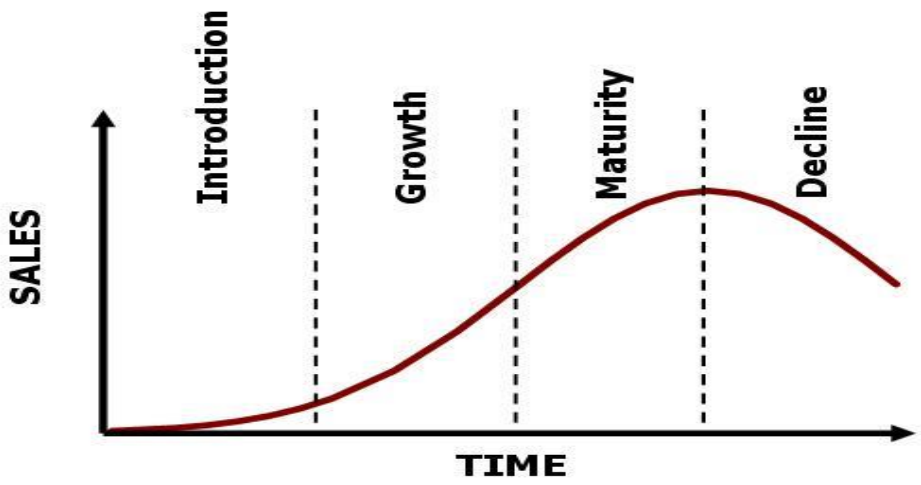
c. Checking the outcomes at regular intervals

Case Study
Amazon is an example of a customer-oriented approach to product development strategy. Their product strategy is focused entirely around customer needs. Amazon likes to work backwards from the target market. They write the press release for the product first, and hone it until its language is simple enough for anyone to understand. The press release has no technical jargon about technologies or UIs. They then work backward from the press release to the product. This is a product development strategy that focuses on Amazon's internal process, in engaging with customers to create a specific product that meets an identified need.

5.6 PRODUCT LIFECYCLE

Products have a life cycle just like anything else. Professor Raymond Vernon of Harvard University first proposed and shaped the product life cycle (PLC) idea in 1966. PLC designates the time frame from the beginning of a product's development (R&D) until the time it is taken off the market. The four phases of a typical PLC are introduction, growth, maturity, and decline.

5.6.1 Product Lifecycle Stages



(Fig. Product Life Cycle)

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(Source: MBAknol.com)

1. **Introduction Stage:** The "commercialization" stage of new product development is from where the idea of a product lifecycle comes into existence. Product adoption and awareness among potential buyers are still quite low at this point. Due of the poor sales, promotional expenses are significant. The company must spend money on advertising, sales promotion, and other types of marketing in order to survive in the market.

   At this point, a low level distribution strategy is the main barrier to quick market penetration. Many retailers tend to wait until they hear favorable things about the brand before supporting the new product. This method of introducing new products frequently brings physical distribution and logistics issues to the core.

2. **Growth Stage:** Due to the combined effects of initial promotion, distribution, and word-of-mouth influence, the product starts to make quick sales. Profits at this stage significantly increased. At this point, customer satisfaction must be guaranteed in order to achieve and sustain ongoing growth. Then demand starts quickly increasing. Only innovators at this point go in transition from the trial stage to the adoption stage whenever a repeat purchase occurs. If the creators are pleased with the products, word-of-mouth and referral marketing are used to encourage additional consumers.

3. **Maturity Stage:** Sales growth at this stage continues but at a diminishing rate, because of the declining number of potential customers who remain unaware of the product or who have taken no action. The last of the unsuccessful competing brands will tend to withdraw from the market. Due to this, sales are likely to continue to rise.

4. **Decline Stage:** Sales begin to decline at the final stage for a variety of reasons. Sales fall as a result of shifting consumer preferences, market competition, technological advancements, and other environmental factors. Sales at this point drastically decline as the buyer starts to prefer other products. If a product category is experiencing a decline, the marketer may choose to trim the product portfolio, drop the declining brands, or plan to reintroduce brands with certain product modifications.

   In reality very few products follow such a prescriptive cycle. The length of each stage varies enormously. For example Fashion products tend to have a short life cycle i.e. the time between the launch of a product and the point at which the product is mature is very quick.

5.6.2 Marketing Decisions

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The decisions of marketers can change the stage, for example from maturity to decline by price-cutting.

1. **Competition** – At the introductory stage, competition is given no importance. At the growth stage, it is given a little importance while at the maturity stage; there are many rivals in the market. Slowly, however, the number of competitors or rivals gets reduced with the declining stage.
2. **Overall Strategic Focus** – At the first stage, emphasis is laid on market establishment. At the growth stage, market penetration and persuasion of mass market are emphasized. Creation of brand loyalty and brand preferences is focused at the maturity stage. At the decline stage, the strategy aims at overall preparation for renewal.
3. **Profit** – At the introductory stage, profits are negligible but at the growth stage, they reach the peak levels as a result of growing demand. At the maturity stage, they decline due to the increasing competition. At the last stage, the declining volume pushes costs up and eliminates profits.
4. **Distribution Strategies** – At the introductory stage, distribution is selective. However, at the growth and maturity stages, it is intensive. At the decline stage, it becomes selective and hence low-end strategies are used.
5. **Advertising Strategies** – At the introduction stage, advertising strategies aim at the needs of early adopters; at the growth stage, an attempt is made to make the mass market aware of brand benefits. At maturity stage, advertising is used as a vehicle for differentiating among otherwise similar brands. At the last stage, however, it emphasizes on low price of the product and minimum advertising expenditure.

5.6 SUMMARY

- A product is the offer that the consumer ultimately owns in the exchange process. Each product offers some level of core, tangible, and augmented benefit to consumers.
- A product has different layers or levels like an opinion and each layer contributes to the make of the product. The identified levels are: core layer, basic product layer, expected product layer, augmented product layer and potential product layer.

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- Products can be classified on the basis of three essential characteristics – durability, tangibility and user type.
- Product mix is an assortment of all related and unrelated products that the company offers in the marketplace. Product mix has got four important elements like width, depth, length and consistency.
- Product line decisions are related to the length and depth of each product line and the decisions that the marketer should take for each product's segment.
- Many companies follow different types of new product development system which are concept generation and market structure identification, advertising development, product formulation and testing, commercialization and final launch.
- Products follow certain kinds of lifecycle patterns. The stages of product lifecycle are introduction stage, growth stage, maturity stage and decline stage.

5.7 GLOSSARY

- **Convenience products:** These products satisfy the needs but one isn't willing to spend time or effort to shop for them.
- **Durable goods:** These are the goods that survive many uses by consumers.
- **Industrial products:** Products that are used in producing other products.
- **Non-durable goods:** These are the goods, which are consumed in one instance or a few uses.
- **Product:** A product is anything which is offered to the market to satisfy consumer needs and wants.
- **Product line:** A set of individual products that are closely related.
- **Product width:** It explains how many different product lines a company carries.
- **Product depth:** It explains the number of products that a product line has in its overall product mix.

5.8 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of learning. Discuss personal factors that influence learning, with suitable examples.

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2. Discuss some effective methods of learning that you would like your students to practice in class and at home. Illustrate your answer with relevant examples.

5.9 REFERENCES

As per APA style (*APA Manual 6th Edition to be referred*)

1. https://www.tcgen.com/product-development/product-development-strategy/#gettools

2. https://www.mbaknol.com/wp-content/uploads/2020/07/Product-life-cycle-strategy-mbaknol.jpeg

5.10 SUGGESTED READINGS

As per APA style (*APA Manual 6th Edition to be referred*)

1. Marek, M. W., Chew, C. S., & Wu, W. C. V. (2021). Teacher experiences in converting classes to distance learning in the COVID-19 pandemic. *International Journal of Distance Education Technologies (IJDET)*, 19(1), 89-109.

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LESSON 6

BRANDS, PACKAGING AND LABELLING

STRUCTURE

6.1 Learning Objectives
6.2 Introduction
6.3 Branding
6.3.1 Meaning and Importance
6.3.2 Benefits of Brand Building
6.3.3 Brand Strategy Decisions
6.4 Packaging
6.4.1 Functions of Packaging
6.4.2 Types of Packaging
6.4.3 Requisites of Good Packaging
6.4.4 Criticism of Packaging
6.5 Labelling
6.5.1 Meaning
6.5.2 Functions of Labelling
6.5.3 Types of Labels
6.6 Summary
6.7 Answers to In-text Questions
6.8 Self-Assessment Questions
6.9 References
6.10 Suggested Readings

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6.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- ✓ explain the terms branding, packaging and labelling
- ✓ describe significance of branding
- ✓ outline brand strategy decisions
- ✓ construct a good brand name
- ✓ describe functions and types of packaging
- ✓ relate criticism of packaging
- ✓ identify types and functions of labelling

6.2 INTRODUCTION

In the previous lesson you have studied new product development, product life cycle and product mix strategies. In addition to product development and design, it is very important to understand how a product is presented to prospective customers. Branding, packaging and labelling are the three major components which are associated with presentation of a product.

In this lesson we will discuss in detail about branding, packaging and labelling. It is very important to understand significance of branding and how brand strategy decisions are made by the companies. We will discuss functions and types of packaging along with its requirement and criticism. You will also study labelling, its legal requirement, its functions and types of labels.

This lesson has many real-life examples so that it will be easy for you to understand these topics and you will be able to relate this to your real-life experiences. This will aid in understanding the three marketing terms namely: branding, packaging, and labelling from a whole new perspective.

6.3 BRANDING

6.3.1 Meaning and Importance

Brand is an asset for any firm and needs to be managed carefully. A product that is unbranded is termed as commodity, and at the time of purchasing a commodity a person takes into

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consideration its physical characteristics and benefits. In contrast, a brand is a lens through which a product is viewed with additional feature. that make it different from its counterpart. Brand is a strategic tool which empowers the firm to bargain with suppliers, creditors and customers. When you go to the market and purchase Reebok or Nike footwear, you are assured that the shoe which you are buying has specific standards. This underlines the fact that a brand name differentiated the product of one company from another which satisfies the same needs and wants of the customer. Brands have been used by the producers to identify and differentiate one's own products from those of the others. Brands are considered units of meaning in the language of the consumer market culture Pennington (2000).

Marketers can leverage brand name when consumers have to make choice while purchasing a product. Brand is about making emotional connections. It is a powerful yet intangible asset. People trust brands, develop strong loyalties, buy them and believe in their supremacy." Brand recall refers to the ability of a consumer to retrieve the brand from the memory (Keller 1993). The success of brands depends on the degree of their significance to consumers and how they use them. They provide consumers with a level of quality and a name that can be trusted. Since brands provide additional value, they are priced higher.

Brand: A brand can be a sign symbol, term, name or design or a combination of them. When firms develop good reputation and gain confidence of customers about quality, then brands help them enjoy greater control over customer and develop brand loyalty. Brand is viewed as the promise, the reputation and the expectations that dwell into customer's mind about the product and/ or the company. Branding is the process of identifying a particular product among various products available in the market. Branding is not only done to identify a product or seller, but also to make a product superior to the competitor's product.

In the rapidly changing business environment of today due to globalization and cut throat competition a company's brand can be a feature that distinguishes it product from that of its competitor. When a new product is introduced in the market, the manufacturer decides whether it should be known on the behalf of generic name or brand name. Generic name refers to collective name for a whole class of product. EG: - Soaps, jeans, tea leaves etc. Whereas brand name refers to the specific name by which the product is to be known in the market.

Brand Name: Brand name or a trade name is the name given by a producer or manufacturer to his specific product or service. Mostly it is the name of founder members of the company. The purpose of giving a brand name is identification and differentiating a company's product or service from other related brands, for example: Apple, Nike, BMW, Dunkin Donuts etc.

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GENERIC NAME	BRAND NAME
Soap	Lux, Santoor, Dove, Dettol
Jeans	Adidas, Calvin Klein, Levies
Tea leaves	Red label, Taj Mahal, Tata

ACTIVITY

Think of some more products and prepare the list of popular brand names by which they are available to you in the market.

6.3.2 Benefits of Brand Building

A strong brand name is an asset for any company. It helps the consumers and firms in many ways.

Benefits of Brand Building to consumers

1. Guarantee of Product Quality: When products are sold under a brand name, the manufacturer try hard to produce good quality product to enhance its brand image.
2. Easy Recognition: Branding aids in simplifying shopping experience for the consumers as the marketed product enables the buyers to pinpoint instantly and efficiently what they want. It significantly reduces wastes of time and money on unknown products.
3. Emotional Attachment: The objective of branding is to build a brand that adds value to the features and functions of the product. This value comes from a brand personality and image to which the consumers feel emotionally attached.
4. Easy Decision Making: With experience and search of information the buyers can make decisions swiftly and easily for deciding about the purchase of the brand.
5. Uniform Price: The price of the branded products is almost similar throughout the marketplace, hence there is no exploitation of consumer on price point.
6. Fine Packaging: The branded goods come with fine and safe packaging with all the details of usage of that product as labelling.

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7. Reduces the risk of wrong product choice: Customers may identify different types of risk involved in buying and utilizing product, such as functional risk -when the product underperforms and does not meet the expectations, physical risk- when the product possesses threat to the bodily well-being of the users or others, financial risk- when the product is not worth the amount spent, social risk when the product results in social embarrassment, time risk -when the failure of the product results in an opportunity cost of finding another product that meets the needs.

Benefits of Brand Building to the firms

1. **Legal Protection:** A brand name offers legal protection for the branded products. It does so through trademarks patents and copyrights. Trademarks protect the brand name registered; patents protect the manufacturing process of the firm. Similarly, copyrights of unique designs protect packaging.
2. **Acts as an entry barrier to other brands:** A strong brand that meets customer needs efficiently creates a barrier to the entry of other brands into the market. Branding helps customers to take decision whether to switch to another brand or not.
3. **Brands build financial value:** Brands can be measured in financial terms and can be found in the asset side of the balance sheet. Strong and successful brands can be bought and sold by the organization. Example: WhatsApp acquisition by Facebook.
4. **Branding amplify recognition:** A logo is one of the significant components for the company's brand name. Professional logo design is simple to remember and catchy enough to give the desired recognition to the company.
5. **Customer Loyalty:** When customer has a positive experience with a brand, he/she is more likely to repurchase it, than the product or service competitor is offering. There are favourable chances that customer will buy related items of the same brand or recommend that brand to other people in family and friends.
6. **Dominance at marketplace for the product:** When the product of same company under a brand name is sold continuously in the market, there develops a dominant position for such a product or service. The customer has not to think much before making a choice to buy the product of that brand.
7. **Easy availability of agents or middleman for distributing the branded products:** For distribution and selling of branded goods the wholesaler, retailer or agents gets agreed easily. When a brand becomes quite popular, the manufacturer can even distribute the product directly to consumers. It is obvious that the less the middleman

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is, the lesser is the price of the product at which it can be made available to the customer.

Brand Awareness

Brand awareness is defined as the extent to which consumers are familiar with the qualities and image of a particular brand of goods or services. Brand recognition is the extent to which a consumer correctly identifies a particular product by viewing its logo, packaging, tagline or advertising campaign. Brand recall performance is the ability of the consumers to retrieve the brand from memory when given the product category, the needs fulfilled by the category, or a purchase or usage situation as a cue.

Brand Equity

Brand equity refers to the value of a brand in the eyes of the customer. It is the ability of a brand to capture the consumer's attention while making purchase decisions. A strong brand name works as a trustworthy signal for the quality of the product and generates price premiums as a return to branding investments. The firms are able to charge price premiums that derive from brand equity and product differentiation. A consumer's knowledge about a brand also depends on how the manufacturers and advertisers are marketing the brand. Brand equity is created by educating the customer and formulating investment plans, thereby admitting an increase in market share and profit margins. These strategic investments will be realized over time to deliver a return on the initial investment.

6.3.3 Brand Strategy Decisions

Branding includes a set of intricate branding decisions- Development, Positioning, Name selection, Sponsorship- all are important factors in any brands' strategy. The company's strong branding decisions help it create its unique image in the minds of consumers and stand out of the competition.

For example: No matter the occasion- from romantic dates to festival celebrations- Cadbury has created a special place in the heart and palate of its consumers and with the slogan of "*KuchhMeethaHoJaaye*",and has become an integral part of every celebration.

A. BRAND POSITIONING

Brand positioning explains how a brand differs from its rivals in the market and can be positioned at three levels i.e. on the basis of product attributes, benefits, beliefs and values. It is the act of designing the company's offer and image so that it occupies a distinct and valued place in the target customer's mind. Good brand positioning helps guide marketing strategy

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by clarifying what a brand is all about, how it is unique and how it is like competitive brands, and why consumers should purchase and use it.

Imagine a scenario: you just got into the college of your dreams, or you just got a big promotion at work or the person of your dreams finally agrees to marry you. The list goes on, but the feeling remains the same. These are the "feel-good" moments of your life, moments of pure bliss that call for a celebration. And nothing is better than the taste of sweet chocolate to match the sweetness of life in that moment. This is when comes to mind, the purple wrapped chocolate of Cadbury. With the words 'KuchShubhKaamKarne Se PehleMeethaKha Lena Chahiye', Cadbury has been the first responder to every happy occasion.

From celebrating the taste of life through 'Asli_Swad_Zindagi Ka' to the auspicious beginning of new things through 'Shubh_Aarambh'& 'Kuchh_Meetha_Ho_Jaaye', - the brands taglines clearly sum up the attributes that it stands for. In its decade's long journey, Cadbury has stood the test of time, rising to glory with an indomitable spirit of celebration, cheer and happiness.

Recently, the brand moved from its slogan of "Free the joy" in Favour of "Taste like this feels" to focus marketing on the founding ideologies of the brand & its creator, philanthropist John Cadbury, by presentation moments of "kindness and generosity".

B. BRAND NAME SELECTION

Choosing a brand name is very crucial as a good name adds to a product's success. Finding the best name requires a careful review of a product and its benefits, and the target market to which it caters to. Ideally the name of a brand should possess the following qualities in order to be favorable in the eyes of customers.

Criteria for Brand Name Selection

- Be distinctive
- Easy to pronounce
- It should be easily memorable
- Adaptable to addition to product line
- Capable of being registered and legally protected.
- Should be meaningful or suggest something about product benefit or its use.

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Strategies for Brand Name Selection

1. **Individual name**: Different brand name for different products. Example: - Head and shoulders and Pantene, here both are shampoos of P&G.
2. **Separate Family name**: Different brand name for different product line. Example: - Hindalco for alumina, Ultra tech for cement, Idea for telecom of Aditya Birla Group.
3. **Blanket Family name /Company Brand name**: Single brand name is used for all types of products. Example: - TATA – TATA Consultancy Services, TATA Salt, Tata Motors

C. BRAND SPONSORSHIP

There are many options available with respect to brand sponsorship. The product may be launched as manufacturer's brand or national brand, or it can be sale out to reseller who give that product a private label and it will become private label brand or store brand. Some producers market licensed brands or go for co-branding where two companies join hands and co-brand a product.

National Brand

P.Kotler et al. (2018) defines a national brand (also called manufacturer's brand) as "a brand created and owned by the producer of a product or service." National brands were the market leaders till the last century, but they are receiving a serious threat and competition from private label brands. This is owned and coordinated by a producer and sold through a specific chain of stores. Earlier manufacturer brand approach was followed where a manufacturer or producer produced his goods, marketed it under his brand name and made it available at retail stores for selling. Example: **Nike, Coca-Cola, Raymond** etc.

Private Label Brand

Private Label brands are the brands owned, coordinated and sold exclusively by a retailer or supplier who gets its goods (Baltas 1997) produced by a contracted manufacturer under license under its own label (Berthon et al., 1999). Kumar and Steenkamp (2007) have defined the store brand to be any brand that is owned by the retailer or distributor and is sold only in its own outlets.

private labels are also termed as retailer brands i.e the brands which are owned and sold by the retailer, moreover, distributed by the retailer. Retailer brands are also commonly called "store brands" or "own labels". Private Label brands are the brands offered by retailers in their store within their own branded label. According to Beneke (2009), private labels are

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usually manufactured by a third party under license. This third party is called the contract manufacturer. Example: **Big Bazaar, Shoppers Stop, Lifestyle**

Licensing: This type of brand sponsorship is a contractual arrangement between two or more firms where the licensor firm contacts with licensee firm to use its brand name, symbols, logo in exchange for a licensing fee. This type of sponsorship is common for apparels, entertainment products, toys, school supplies and accessories. Licensing is a highly profitable business and provides benefit to the licensor. **Gucci, Tommy Hilfiger, Armani** receive huge royalties for their products from licensee. **Spider man, Harry Potter, Dora, Winnie the Pooh** are the licensed character names which sellers of children products attach with lunch boxes, water bottles, toys etc.

Co-branding: In this marketing strategy, two or more brands are used together to promote a new product. Co-branding offers many advantages as both the brand names dominate in their respective categories. Both the brands when combine, creates broader consumer appeal and greater brand equity. This strategy allows company to enter into new and profitable market segments which were earlier remained untapped. While co-branding each partner must coordinate carefully in their advertising, promotion and other marketing efforts. Example: **BMW and Louis Vuitton**. In their co-branding partnership BMW created a sports car named BMW i8 and Louis Vuitton made a design of complete 4 piece set of suitcases and bags that fit to perfection into this sports car rear parcel shelf.

D. <u>BRAND DEVELOPMENT</u>

It is the strategic method for creating and distinguishing a company's image, goods, and services from those of its rivals. It is an ongoing process that builds and strengthens a brand so that it can remain relevant, serve a purpose, and grow in the market.

The brand development matrix is as below-

1. **Line Extension- Existing Brand Name, Existing Product Category:** When a company extends an existing brand name to new form, flavor, size, colour or ingredient to existing product category it is called Line extension. For Example: **<u>5 Star</u>-** Launched in India in 1969 as a "caramel and nougat mix covered with smooth milk chocolate" in a golden wrapper decorated with stars, the product has seen many line extensions throughout its life cycle. **Price Options-** Rs.5 (11.1 gm), Rs.10 (19.5 gm), Rs.20 (40 gm) **Flavours-** Normal**,** Fruit & Nut, Crunchy and Chomp, 5 Star 3D, 5 Star 3D OREO
2. **Brand Extension- Existing Brand Name, New Product Category:** It involves extending an existing brand name to a new or modified product category. This gives the

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new product instant recognition and faster acceptance and can save substantial advertising costs for establishing a new brand. For example:

Dairy Milk Ice Cream- With another marketing masterstroke, Cadbury successfully rode into the Ice-Cream category with the help of pre-built reputation of its chocolate brand Dairy Milk. Dairy Milk, being a household name in chocolates helped successfully launch the ice-cream segment of the brand and ensured acceptance in the market without putting in much marketing effort or costs.

Dairy Milk Candies "Marvellous Creations"-Yet another example of successful brand extension of Dairy Milk is into the candies segment through "Marvellous Creations" Candies.

3. **Multi Brands-New Brand Name, Existing Product Category:** This includes marketing of various different brands in a given product category to cater different segments as per specific needs. Cadbury offer multiple chocolate brands within the chocolate segment. The brand sells numerous types of chocolates with unique tastes, textures and features to cater to different segment of customers in the market.

   For Example:

   - **Dairy Milk** for Milk chocolate lovers.
   - **5 Star** for those who prefer sweet nougat flavor.
   - **Perk** for those who like crispy wafer chocolates.
   - **Silk** for Teenagers &Millennials with changing tastes.
   - **Bournville** for those who prefer dark chocolate.
   - **Temptations** for premium quality customers.

4. **New Brands- New Brand Name, New Product Category:** A company creates a new brand name for entering a new product category if the power of existing brand names has diminished or if current brand name is not suitable for the new product category. For Example:

   Tang- It is surprising to hear that Tang, a drink-mix, is manufactured by a company of chocolates. Chocolates and fruity drink-mixes have nothing in common, yet they are offered by (Mondelēz International a.k.a. Kraft Foods), parent company of Cadbury. The firm used a new brand name Tang to enter a completely new product category, since no existing brand name was suitable for this diversification. Today, Tang is sold in more

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than 30 countries around the world and is the leading brand in Cadbury's powdered beverage portfolio.

Halls- a chocolate manufacturing brand also sells cough-drops. Halls is the leading sugar confectionary brand in the whole world and accounts for more than 50% of cough-drop sales worldwide. The same product is used as a cold relief product in the northern hemisphere and in drier countries; it is even used as a refreshing candy.

IN-TEXT QUESTIONS

- A company when uses successful brand name to launch a new or modified product in a new product category, the strategy is called as _____.
- _____ assures repeat purchase of same company product and help to overcome competition from other firms.
- Nowadays retailers and wholesalers are creating their own private brand called _____.
- Two established brand names of different companies when join hands to promote a new product , it is termed as_____.
- _____ refers to the value of a brand in the eyes of the customer.
- Brand name is termed as good when it is easy to pronounce. T/F
- Nyka is a clothing brand name. T/F
- Branding enhances the financial value of the firm. T/F

6.4 PACKAGING

Packaging entails the functions that ensure the safety and integrity and facilitate the transportation process. Packaging is a subset of marketing where a brand designs and develops the wrapper or container to aid its transport, handling, delivery, and communicate the brand and product information by making it look attractive. However, the function of packaging has evolved with the times. It no longer serves the simple utilitarian function of protection but rather it serves as a blank canvas for the company's marketing team.

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6.4.1 Functions of Packaging

1. The global markets run with myriads of similar products, and packaging, when looked at as a component of the *Marketing Mix*, presents companies with the opportunity to distinguish them from the competition while still performing its primary function of providing protection and a means of effective storage.
2. Effective packaging also helps facilitate the use of the product itself. Some products such as toothpastes are inseparable from their packaging i.e., toothpaste tube.
3. With rising concerns for health, people are more gravitated towards products that are packaged with utmost care as it is seen as a sign of purity (free from adulteration) and higher standards of production.
4. Many a times, as it can be observed in self service outlets the products are responsible for their own personal selling. Packaging of a product act as silent salesman and helps in grabbing customer attention along with describing the attributes of product and making an overall favourable impression.
5. Good packaging reduces wastage and help in preserving food items for longer duration and thus large proportion of food doesn't get spoiled.
6. Packaging enhances company and its brand image and provides instant recognition. It acts as a billboard because of its vibrant bright colours.

6.4.2 Types of Packaging

There are three types of packaging: primary, secondary and tertiary

1. Primary packaging is the wrapper or the material that first envelops the product to hold it. Here the package is in direct contact with the contents. For example: a chocolate bar wrapper, soft drink can, a packet of chips etc.
2. Secondary packaging is wrapped outside the primary packaging which is used to hold primary packages together. It is designed for retail use instead of final consumers. Secondary product protects the individual units during packaging. For example: cardboard boxes/trays, plastic trays, plastic rings holding six pack cans together.
3. Tertiary packaging is used for shipping and bulk handling, warehousing and storage. The most common is the wooden pallets and large shipping containers. These pallets can be easily moved by forklift trucks or small forklifts within the warehouse or large stores.

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6.4.3 Requisites of Good Packaging

1. It must advertise the brand name and the manufacturer
2. It must be strong enough to withstand the strain of handling and transportation.
3. It should be requiring minimum shelf space.
4. Package material must be able to keep hygiene for the inner product specially when it is something eatable to enhance shelf life.
5. It must be able to differentiate the product from its competitors.
6. The packaging should not be easily breakable or spoiled and should be designed keeping in mind the cost effectiveness.
7. Tertiary packaging should not be too heavy to handle, and it should be less expensive on freight.
8. The package should be convenient to display on shelf.
9. The cartons should be able to dispose of easily.
10. It must be able to create psychological and social good image.

6.4.4 Criticism of Packaging

1. After consuming the product, people through away the packaging at public place which litter the streets and add to solid wastes. Firstly, we should not through the packaging anywhere as per our convenience and secondly, this problem can be tackled by using biodegradable material in packaging.
2. Manufacturing of containers requires scarce raw materials which depletes the natural resources. This problem can be addressed by using recycled material for packaging the products.
3. Packaging also increases the price of the product which is borne by consumer, but simultaneously good packaging reduces the transport and handling cost.
4. Some forms of plastic package are harmful for our health. Due to government regulations on use of plastic, large number of firms are switching to safe packaging materials.
5. Sometimes packaging deceives consumers, size of the package is such that it conveys that it carries large content but actually it is not true. Sometimes due to attractive colour of packaging we feel that product is of good quality but in reality, it is not

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always true. Government has imposed many restrictions on firms to deal which such situations.

CASE STUDY

The Problematic Purple

The colour Pantone 2685C might seem like any other colour out of the infinite spectrum of colours, but it has its own history and relation with Cadbury. Pantone 2685Cis the iconic shade of purple that Cadbury has been using for decades for packaging its products. Since 1905, the renowned company has wrapped their well adored chocolates in this purple colour and has also fought valiantly to preserve the rights to use the same. In 1995, Cadbury submitted an application to obtain legal ownership of the Pantone 2685C colour mark. However, only chocolates in bar or tablet form were covered by Cadbury'soriginal application of 1995. In 2004, Cadbury submitted a new application in order to broaden the scope of its colour mark protection beyond just chocolates to include cakes and drinking chocolates. The application was opposed by Nestle, another well-known confectionary juggernaut, on the grounds that the colour mark (for Purple) is not unique and is too general for a variety of products. After years of legal battles, in 2019 Cadburylost an appeal that would have safeguarded a trademark it had acquired in 1995, making it more difficult to stop competitors from using a similar colour. However, in July 2022, Cadbury was again allowed to register the iconic purple colour trade mark after a UK High Court ruling, allowing brands to register a colour.

Key Take away from the case

Cadbury's decades long legal struggleemphasis just how crucial it is to ensure the protectionof a brand's identity, and how trademarks and brand names must be accurately specified, especially for distinctive marks like sound, colour etc. A layperson can readily associate some colours with a particular thing, like red with danger, green with nature, blue with water or the sky and hence these may not be distinguishable. However, in this instance of Cadbury, the referred-to shade of purple has nothing to do with chocolates and just goes on to show that in business, competitors will stop at nothing just to make things even a little harder for you.

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IN-TEXT QUESTIONS

9. Packaging must be designed in such a way that it is convenient to handle the product for middlemen and final consumers. T/F
10. Packaging always increases the cost of the product. T/F
11. _____packaging is used for shipping and bulk handling.
12. Packaging should be requiring_____shelf space.

6.5 LABELLING

6.5.1 Meaning

We have understood packaging in the previous section. Nowadays, there is a need to give constant attention to government regulations while managing the function of packaging. Government has laid down various regulations relating to use of packaging materials while transportation of hazardous cargo and for consumer protection. The most prevalent regulation is related to the information producer or manufacturer of good is compelled to provide on packaging is labelling, most importantly on eatables, pharmaceuticals, cosmetic products etc.

Labelling means printed or graphic matter on the package of container or on the container. A good label is the one which fulfils all legal requirements as well as act as an important sales instrument. Label is regarded as a source of information for the buyer, who reads the label and makes a purchase decision on the basis of correct and relevant information. A label therefore provides the following information:

1. Net weight, when packed
2. Manufacture's name
3. Manufacturing date
4. Expiry date
5. Maximum retail price
6. Directions for use
7. Directions for storage
8. Ingredients used
9. Cautions against misuse, if any
10. Brand name

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6.5.2 Functions of Labelling

Labelling provides necessary information about the quality and features of a product. Consumers can compare similar products on the basis of price, quality, quantity and other important information provided on the label and can buy them without any hesitation or doubt. Labelling has become an important element which helps to boost sales and distribution process of a company's product. The functions of labelling of a product are stated as follows:

1) Label helps to identify the product and hence popularize the brand name.
2) Labelling grades, the product and classify them on the basis of quality. You might have seen on olive oil container of 1kg, 2kg or 5 kg. They are classified as pure, virgin and extra virgin.
3) Different descriptive are provided by labels like price, manufacturer details, expiry date etc.
4) Labels promote the product through attractive figures, graphics or marks, thus play the role of advertiser and helps in promotion of the product.
5) Labelling protects consumers from deception as composition of ingredients, weight, utility of a product is clearly mentioned. In case of any grievance customer can also get legal remedies.

6.5.3 Types of Labels

There are primarily four types of labels:

1) Brand label: When a label only denotes the brand name of a product along with its logo or trademark like LG, amazon, Dettol, Close Up and many more.
2) Grade Label: A tag on the product, sticker, letter or number that identifies the grade or quality of a product. Grade labels are given as A, B, C, D or 1,2,3,4 to packed food items.
3) Descriptive label: The label which gives instructions and information about a product like price, weight, manufacturer name and address, manufacturing date, expiry date etc.
4) Informative Label: The label which give a lot of information about the usage of the product, its performance levels and the care required while handling the product like microwave ovens, washing machines, air conditioners use descriptive labelling.

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IN-TEXT QUESTIONS

13. _____ is useful in providing detailed information about the product.

14. Label which only denotes the brand name of a product is called_____.

15. Labelling protects consumers from deception. T/F

16. Package of Lassi having description of quantity, ingredients, weight, nutritional value, price is an example of _____ label.

6.6 SUMMARY

In this lesson we have discussed the process by which a product or service is turned into a brand, a name which is easily memorable and suggest something about product benefit or its use. Branding includes a set of intricate branding decisions: development, positioning, name selection and sponsorship. These four factors are important in any brand building strategy. The company's strong branding decisions help to create its unique image in the minds of consumers and stand out of the competition. Further, we learnt that packaging is regarded as a subset of marketing. It no longer serves the simple utilitarian function of protection but rather it serves as a blank canvas for the company's marketing team. The criticism through which packaging goes through is also viewed along with how this problem can be tackled. We have also learned various regulations that govern packaging and labelling industry along with their functions and types.

6.7 GLOSSARY

Brand: A brand can be a sign symbol, term, name or design or a combination of them.

Brand Name: Brand name or a trade name is the name given by a producer or manufacturer to his specific product or service.

Brand Awareness: Brand awareness is defined as the extent to which consumers are familiar with the qualities and image of a particular brand of goods or services.

Brand Equity: Brand equity refers to the value of a brand in the eyes of the customer. It is the ability of a brand to capture the consumer's attention while making purchase decisions.

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Brand Positioning: It is the act of designing the company's offer and image so that it occupies a distinct and valued place in the target customer's mind.

Labelling: The printed information that appear on the package or on the container of a product.

Packaging: The activities involved in designing and producing the wrapper or container for a product.

6.8 ANSWERS TO IN-TEXT QUESTIONS

1. Brand extension	9. True
2. Brand loyalty	10. False
3. Store brand	11.Tertiary
4. Co-branding	12.minimum
5. Brand Equity	13. Labelling
6. True	14. Brand label
7. False	15. True
8. True	16. Descriptive

6.9 SELF-ASSESSMENT QUESTIONS

1. Companies mostly stick to one logo, but Google Doodles are changed as per the occasion. Do you consider it a powerful branding tool?
2. What is branding? Explain the benefits of branding a product.
3. Discuss the brand development strategies marketers use to develop brands. Provide an example of each strategy.
4. List the names of store brands found in following stores
   a) Pantaloons b) Metro c) Shoppers Stop d) Croma
   b) "Packaging is a silent salesman". What is your opinion about this statement? Give the advantages of packaging.
5. What are the various functions performed by packaging?

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6. Distinguish between packaging and labelling.
7. How many types of labels are used by marketers and what information must be contained on labels.

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LESSON - 7

DEVELOPING PRICING STRATEGIES: SETTING PRICE, FACTORS INFLUENCING PRICE DETERMINATION

STRUCTURE

7.1 Learning Objectives

7.2 Introduction

- 7.2.1 Pricing in a Digital Era

7.3 How Companies Price

- 7.3.1 Consumer Psychology and Pricing
- 7.3.2 Reference Pricing
- 7.3.3 Price-Quality Inferences
- 7.3.4 Price Ending

7.4 Setting the Price

- 7.4.1 Selecting the Pricing Objective
- 7.4.2 Determining Demand
- 7.4.3 Estimating Costs
- 7.4.4 Analyzing Competitors Costs, Prices and Offers
- 7.4.5 Selecting a Pricing Method
- 7.4.6 Selecting a final Price

7.5 Factors Involved in Pricing Decisions

7.6 Types of Pricing Strategies

7.7 Summary

7.8 Self-Assessment Questions

7.9 Glossary

7.10 References

7.11 Suggested Readings

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7.1 LEARNING OBJECTIVES

The lesson's goals will aid in your comprehension of the following. How a consumers assess prices? How should businesses decide how much to charge for goods or services? How do corporations modify them~~its~~ prices to take advantage of emerging possibilities and changing conditions? When and how should a business begin changing prices?

7.2 INTRODUCTION

Price is one of the components of 4P's. If we talk about price it is not simply a number that is represented on a tag rather it comprises many functions. For instance if we talk about college fees, bus fares, metro fares, tuition fees, salaries, commissions etc. All the above mentioned points are said to be an exchange of two things i.e., to purchase a product or to avail any service you need to pay for its price. Another example, If are purchasing a new car, the ex-showroom price and the on-road price would be adjusted by various benefits that the company would like to provide to consumers such as Welcome Kit, Insurance, Other Benefits, Additional Insurance, Benefits for taking Loans for purchase of your vehicle. In return they would give you some sought of benefits or goodies to engage and delight consumers.

If we talk about price throughout the period from traditional to modern marketing, price is said to be negotiation and deal between the buyer and the seller. In the changing times nowadays no uniform or same price can be given to all the consumers due to change in lifestyle and mindset of consumers. Price is considered one of the key aspects for consumers decision making. Price is equally important if we talk about production, and exchange, for consumption or even for distribution. Earlier consumers preferred brick and mortar models. They were not so much concerned about comparing products before purchasing but now with the use of the internet and newer technologies consumers can compare the same products over different platforms before its actual purchase.

7.2.1 Pricing in a Digital Era

first century, consumers have all the access to credit nowadays. Consumers and all other purchasing agents who have all the information which help them to create some sought of pressure to retailers so as to lower down their prices. In the same manner retails goes further down the channel to manufacturers to lower their prices so as to compete in this market. This leads to heavy discounts and other promotions at the marketplace. Nowadays Internet provide a great access to consumers and the sellers to interact. It can provide various benefits to buyers and sellers.

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Benefits to Buyers

- Instant price comparisons from thousands of vendors
- Check prices at the point of purchase
- Get Free Products

Benefits to Sellers

- Understand the consumer behavior and provide tailored made offers to them
- Discounted Price to special consumers
- Free Goodies on purchase of certain specified amount

7.3 HOW COMPANIES PRICE

Prices are set differently among different companies depending upon its size. In small companies prices are set by its heads, In large companies we have various specifications and divisions such as product managers, line managers, marketing managers who perform activities to set price for products. It include all personnel from various departments from manufacturing to finance to marketing to all other personnel for price setting for a product. Companies must keep in mind consumer psychology for setting prices or adapting new prices or changing prices for products.

7.3.1 Consumer Psychology and Pricing

Traditionally it was assumed that consumers are said to be price takers and not price givers. Now with use of technology consumers are proactive in information search (Online, offline, word of mouth, advertising, brochures, pamphlets, seeking recommendations from friends,

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family, etc) prior to purchase of any product or availing services. If we talk about purchase decision of consumers it is based on the prices which are perceived by consumers and not the stated market price. The following example talks about the psychology of consumers for a same product i.e., black T-shirt.

Example

A Black T-Shirt for women looks ordinary. In fact, it's not that different from the black T-Shirt sold by Gap and by Swedish discount clothing chain H&M. Yet, the Armani T-Shirt costs $275 whereas the Gap item costs $14.90 and the H&M one $7.90. Customers who purchase the Armani T-shirt are paying for a T-shirt made of 70 percent nylon, 25 percent polyester, and 5 percent elastane, whereas the Gap and H&M shirts are made mainly of cotton. True, the Armani T is a bit more stylishly cut than the other two and sports a "Made in Italy" label, but how does it command a $275 price tag? A luxury brand, Armani is primarily known for suits, handbags, and evening gowns that sell for thousands of dollars. In that context, it can sell its T-shirt for more. But because there aren't many takers for $275. T-shirts, Armani doesn't make many, thus further enhancing the appeal for status seekers who like the idea of having a "limited edition" T-shirt. "Value is not only quality, function, utility, channel of distribution," says Arnold Aronson, managing director of retail strategies for Kurt Salmon Associates and former CEO of Saks Fifth Avenue; it's also a customer's perception of a brand's luxury connotations.

Figure 2: The perceived Value of a product as simple as a black T-shirt depends in part on where it is sold

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7.3.2 Reference Pricing

In Today's scenario consumers are more knowledgeable related to prices as they can have various sources through which they can check and compare the prices. For Example: If we want to purchase camera from Croma (A Tata Product) they would provide the best deal and simultaneously they would also compare their price with other players such as Vijay Sales, Reliance Digital, Other big stores that are available in the market. They certainly reference their prices with competitors' prices that are prevailing in the market.

There are various types of reference prices that are available in the market nowadays which are as follows :-

- Fair Price
- Last Paid Price
- Typical Price
- Expected Future Price
- Lower Bound Price (That is the minimum price which a consumer is willing to pay)
- Upper Bound Price (That is maximum price which a consumer is willing to pay)
- Historical Competitor Price and Usual Discounted Price

7.3.3 PRICE-QUALITY INFERENCES

For many consumers price plays an important indicator of quality. For consumers the price they are paying for the product is representing its quality. Consumers prefers expensive products such as designers' clothes, designer bags, perfumes, luxury cars, expensive sunglasses etc. For instance, Rs 5000 bottle of perfume if we talk about only have worth Rs 400 of scent, but for gifting purpose the giver would be ready to pay Rs 5000 to express their regard to the person whom they are gifting.

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Also, if we talk about perception about cars there is a very important relationship of price and quality in it. The cars which are costly are considered superior and elite class cars. For examples we always consider BMW, Audi, Ferrari etc. elite and premium cars in the segment and are generally priced higher than their actual price. If the information about the product is available the role price is significantly reduced compared to when information is not available the price act as a benchmark for quality for the product.

Brands often look forward to adopt exclusivity for their product and also lays emphasis to its uniqueness so as they are able to justify why they are charging exclusive price for the product. Companies look forward if the consumer is willing to go forward for exclusive and unique products they certainly charge higher price for the same because few consumers are able to afford the product.

7.3.4 Psychological Pricing

Sellers in price ending plays with the psychology of the consumers by displaying the price which ends in odd number. If a consumer is willing to see a price of product is Rs 399, they would consider the price close to Rs 300 rather than Rs 400 range. The consumers also tend to process information related to price from 'left-to-right' instead of rounding it off to nearest number. For example, in India Bata is considered as a great example who had played with price ending by displaying all their products ending with'9' such as Rs199, Rs299, Rs499, Rs999 and so on. So the influence of 9 is more in the mind of the consumers rather than '0' or '5'.

Figure 3: Bata offering its products on price endings (Source: Bata website)

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ACTIVITY

You are a marketing manager at a company of your choice. You have to launch a new product in the industry of your selected company. What all aspect you would consider before pricing the product. Discuss in group of 2-3 students and make a short note for the same.

7.4 SETTING THE PRICE

Firm usually set prices for the product when it developing a new product in the market. For the new product they need to take into consideration all the factors such as geographical areas, distribution channels, marketing strategies for the product. The company also emphasize and segregate the position of the product depending upon its prices and the quality of the product.

Example

Majorly markets have 3-5 price points. Marriott Hotels had different brands or variations of brands for different price points:

Highest Price for Marriott Vacation Club

High Price for Marriott Marquis

High- Medium Price for Marriott

Medium – High Price for Renaissance

Medium Price for Courtyard

Medium – Low Price for Towne Place Suites

Low Price for Fairfield Inn

Firms devise their branding strategies to help convey the price-quality tiers of their products or services to consumers.

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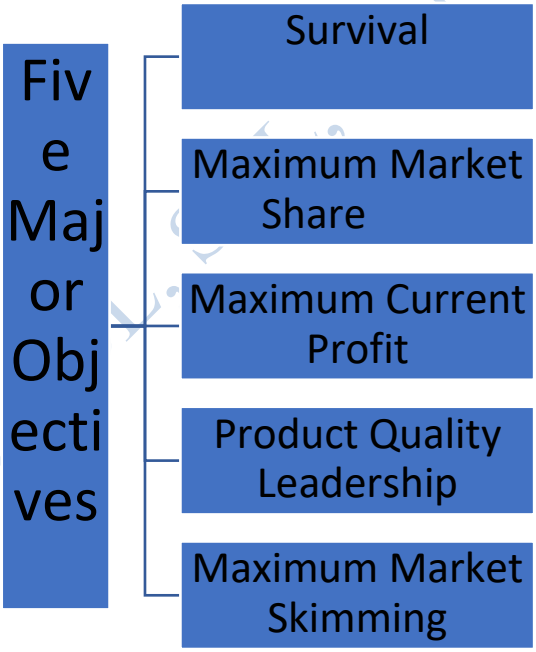
The firm must take into consideration various factors that are important before we set the price for the product. There are six steps that are considered important for setting the price which are as follows: -

Step 1: Selecting the Pricing Objective
Step 2: Determining Demand
Step 3: Estimating Costs
Step 4: Analyzing Competitor's Costs, Prices and Offers
Step 5: Selecting a Pricing Method
Step 6: Selecting the Final Price

7.4.1 Selecting the Pricing Objective

The initial stage for the business is to decide where the product will be offered first. Setting the pricing for the goods is simple if the company's goals are precise and obvious.



7.4.2 DETERMING DEMAND

Companies marketing objective is been impacted with different products as every product have their own demand and its own price. There is an inverse relationship between price of the product and demand of the product which is shown below in the diagram.

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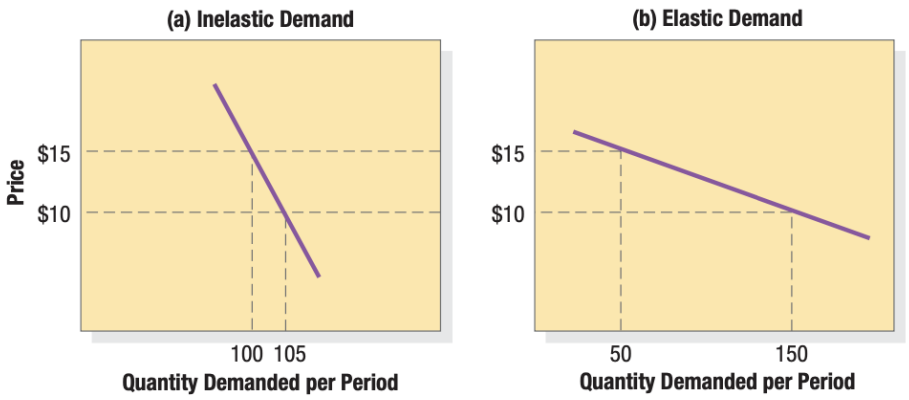

Figure 4: Inelastic and Elastic Demand

To estimate demand curve many companies uses different methods such as:-

- **Surveys: -** To understand the purchase intention of the consumers that at what price they are willing to purchase the product.
- **Price Experiments: - To** understand the purchase response the company do price experiments depending upon territories and stores.
- **Statistical analysis: -** To understand the consumers on the basis of past purchases, quantities sold and other factors.

7.4.3 Estimating Costs

Cost is considered to be an important aspect for setting the floor for the price whereas demand set the ceiling of the price. It is very important for the company to cover its all the cost that includes producing cost, cost related to distribution, cost related to selling the product and any other type of cost incurred to produce a product. Company includes a price of product where they are able to cover the above-mentioned cost and after that they can earn the profit on the same product. Various types of cost that company takes into consideration are as follows: -

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7.4.4 Analyzing Competitors' Costs, Prices, and Offers

When a company is determining its cost or market demand for the product, they should always consider the competitors aspect of Price, cost and its reaction in the market. If we are providing some exclusive feature which isn't offered by competitor that can add value addition to your product and thus you can charge little high price for the product. Whereas if competitors' products is exclusive and have a feature which is not available in your product in that case you shall set your product price less than competitor's price.

Despite the strong competition among Coca-Cola and Pepsi but the prices of the product are same and they can certainly work on their cost but the price of the product remains same among competitors brands as well. It is better for company to have harmony with competitors otherwise if a strong competitor who have any problem and have strong brand proposition can harm your brand image.

It is important to anticipate competitors' reaction, it can be done if there is a price change by the competitors or any fresh challenge given by competitor. Competitors can have different interpretations and reasons for lowering the price so that they can steal the majority of market. For example, when Reliance Jio was introduced, it was introduced free of cost for using internet and calling and it had forced other players in the market such as Airtel, Idea, Vodafone to lower down their prices in order to compete with the new player in the market. Jio had taken up huge share of market from the existing players.

Green Works

Green Works Although the natural cleaner market was pioneered by Seventh Generation and method cleaning products, Clorox Green Works now commands 42 percent market share. The Green Works product line consists of 10 natural cleaners using biodegradable ingredients, packaged in recyclable materials, and not tested on animals. The first major new Clorox brand in more than 20 years, it doubled the size of the natural cleaning category with its strategy of "delivering a line of affordable products that are good for consumers, good for retailers, and good for the environment." The company charges only a 10 percent to 20 percent premium over conventional cleaners, versus the premium of 40 percent or more charged by other natural cleaners. Launch marketing efforts included the use of viral marketing and social media, prominent TV coverage in shows like *Ellen* and *Oprah*, collaborations with retail customers such as Safeway and Walmart in product development and in-store promotion, and an endorsement from and cause marketing program with the Sierra Club (resulting in a donation of $645,000 to the organization in 2009).[48]

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7.4.5 Selecting a Pricing Method

Till now the company are able to understand the demand schedule of the consumers, the cost associated with the product, the pricing strategy of competitors. Now company is ready to finalise and select their price for the product. Company must take into consideration three aspect while setting the price i.e., Ceiling Price, Floor Price and Competitors Price. It is Shown in the diagram below:-

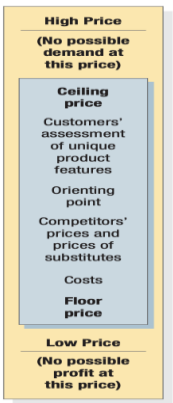

Figure 5: The 3 C's Model for Price Setting

Companies select a pricing method on the basis of various aspects that are as follows:-

- **Markup Pricing**: It includes all the cost which is associated with the product and adding certain profit part in it.

Variable cost per unit	$10
Fixed costs	$300,000
Expected unit sales	50,000

Suppose a toaster manufacturer has the following costs and sales expectations:
The manufacturer's unit cost is given by:

$$\text{Unit cost} = \text{variable cost} + \frac{\text{fixed cost}}{\text{unit sales}} = \$10 + \frac{\$300,00}{50,000} = \$16$$

Now assume the manufacturer wants to earn a 20 percent markup on sales. The manufacturer's markup price is given by:

$$\text{Markup price} = \frac{\text{unit cost}}{(1 - \text{desired return on sales})} = \frac{\$16}{1 - 0.2} = \$20$$

The manufacturer will charge dealers $20 per toaster and make a profit of $4 per unit. If dealers want to earn 50 percent on their selling price, they will mark up the toaster 100 percent to $40.

- **Target Return Pricing**: In this company determine the price of the product based on the rate of return they are expecting on the investment.

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Suppose the toaster manufacturer has invested $1 million in the business and wants to set a price to earn a 20 percent ROI, specifically $200,000. The target-return price is given by the following formula:

$$\text{Target-return price} = \text{unit cost} + \frac{\text{desired return} \times \text{invested capital}}{\text{unit sales}}$$

$$= \$16 + \frac{.20 \times \$1{,}000{,}000}{50{,}000} = \$20$$

- **Perceived Value Pricing**: Companies set the price of the product based on the value that the product has in the mind of the consumers which is built on the basis of past buying pattern, past product performance, the customer support service, after sale service and trustworthiness of the product. It is a bundle of value that the consumer hold in its mind by actual purchase of product in the past or the image they develop watching an advertisement. Example: A Croma Product
- **Value Pricing**: In this Company at first go prefer to win the loyalty of the consumers by changing floor price or lower prices for high quality products and continue to maintain the same over the time frame so that they tend to engage consumers and have faith in company products and brand image. Many companies now a days prefer everyday low pricing where consumer research in designing its new products and markets aggressively to spread the word. The company spent over $1.2 billion on research and development after the Fusion' they tend to provide lower prices for the selected products on selected days. Example: Big Billion Day Sale, Monday Blues Sale, Weekend Dhamaka Offers etc.

Example: Gillette

In 2006, Gillette launched the "best shave on the planet" with the six-bladed Fusion – five blades in the front for regular shaving and one in the back for trimming – in both power and non-power versions. Gillette conducts exhaustive consumer research in designing its new products and markets aggressively to spread the word. The company spent over $1.2 billion on research and development after the Fusion's predecessor, the Mach3 was introduced. About 9,000 men tested potential new products and preferred the new Fusion over the Mach3 bya two-to-one margin. To back the introduction, Procter & Gamble spent $200 million in the United States and over $ 1 billion worldwide. The payoff? Gillette enjoys enormous market leadership in the razor and blade categories, with 70 percent of the global market, and sizable price premiums. Refills for the Fusion Power cost $14 for a four pack, compared to $5.29 for a five-pack of Sensor Excel. All this adds up to significant, sustained profitability for corporate owner P&G.

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- **Going-Rate Pricing**: In this company set prices on the basis of how competitors perform. In this it is basically we will follow the leaders whatever prices is been set by them will follow that.
- **Auction-Type Pricing**: In this the consumer generally bid the price for the product if it matches with the sellers price the product is sold. It usually applicable in electronic products.

7.4.6 Selecting a Final Price

While selecting the final price the company must take in consideration all the factors and additional factors such as impact of other activities which are related to marketing, other company policy of pricing, various impact of prices on other parties.

IN-TEXT QUESTIONS

How many steps are involved in setting a price _____.

Mention the steps involved in setting a price in the sequence _____.

Does Estimating Cost come prior to Estimate Demand (True/ False)

7.5 FACTOR INVOLVED IN PRICING DECISIONS

Pricing decision factors can be grouped into two categories namely (i) Internal Factors and (ii) External Factors

INTERNAL FACTORS	
Marketing Objectives	Market positioning and a number of other pricing goals influence price strategy. Surviving, Increasing current profits, Market share leadership, low cost leadership, and product quality leadership
Marketing Mix Strategies	Pricing to be coordinated well with elements of marketing mix Target costing on the basis of price support product positioning strategies..

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Costs	Various sorts of costs, including total costs, fixed costs, semi-variable costs, and variable costs. Different costs at various production levels would affect price fixing.
Organizational Considerations	• Who determines the cost? CEO or top management for a small company. Divisional or product line managers for large companies. In industrial settings, where pricing departments might be established, price bargaining is frequent.
External Factors	
Nature of Market and Demand	• Market types include pure competition, oligopolistic competition, monopolistic competition, and pure monopoly. • Recognizing how customers view value and price. Demand curve for prices and quantities.
Competitors' Costs, prices and offers	• Always examine the costs, prices, and potential reactions of your competitors. • The type of competitions has an impact on pricing strategy. • Low-price, low-margin business practises discourage rivalry. • High-price, high-margin business models draw rivalry. • Compare marketing expenses to those of the competition.
Other Environmental Factors	• Economic factors influence production costs, customer perceptions of price and value, and production costs.

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	• Government restrictions or limitations on pricing alternatives must be taken into account; • Social considerations might be considered.

IN-TEXT QUESTIONS

How many types of Factors are considered for pricing decisions ……

Does organization consideration part of External Factor (True / False)

Competitors Cost and price are part of Internal Factor (True/ False)

7.6 TYPES OF PRICING STRATEGIES

There are various types of pricing strategies which the companies adopt while introducing their new product in the market or changing pricing strategy of the existing product in the market. The various types of pricing strategies are as follows:-

1. Penetration Pricing
2. Economy Pricing
3. Premium Pricing
4. Price Skimming or Skimming the Milk Strategy
5. Psychological Pricing
6. Bundle Pricing
7. Geographical Pricing
8. Promotional Pricing
9. Value Pricing
10. Captive Pricing
11. Dynamic Pricing
12. Competitive Pricing
13. Cost-plus Pricing
14. Freemium Pricing

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Pricing Strategy	Meaning	Suitability	Pros	Cons	Example
Penetration pricing	Aims to attract buyers by offering lower prices on goods and services than competitors	Small businesses with the main goal of building brand loyalty and reputation	• Allows a product to be quickly adopted and accepted by customers • Generates a high sales quantity • Creates a large inventory turnover rate since demand will be higher • Encourages positive word of mouth	• Can create pricing expectations for customers meaning they might always expect a low price and be dissatisfied if the price rises • May reduce customer loyalty since most will be bargain hunters • Can trigger price wars • May hurt brand image as customers could perceive discounted products as cheap or bad quality	McDonald's selling low budget burgers in India targeting youth
Economy pricing	Aims to attract the most price-conscious consumer	Businesses that want to keep their overhead costs low	•Easy to implement • Keeps customer acquisition costs	• Can be challenging to cut production costs	Indigo airline uses economy pricing to fill any

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	s.	and that sell commodity goods	low • Attracts price-sensitive customers • Best strategy to use during an economic downturn or recession	• Small businesses may not have enough brand awareness to forgo custom branding • Works only if there's a steady stream of customers • Potential to negatively impact brand perception	empty seats and lower the cost per unit
Premium pricing	Businesses set costs higher because they have a unique product or brand that no one can compete with.	Businesses that have a considerable competitive advantage and know that they can charge a higher price without being undercut by a product of similar quality	• Makes your brand appear more desirable • Higher profit margins • Provides a competitive advantage	• Higher cost of production and marketing • Smaller target audience • Reduced sales volume	Tech giants like Apple can sell their products at a premium price compared to their competitors because of their name

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Price skimming	This involves setting rates high during the initial phase of a product, then gradually lowering prices as competitor goods appear on the market	Businesses that have products that are in high demand, like tech companies	• Allows businesses to maximize profits through early adopters • Helps small businesses recoup development costs • Creates an illusion of exclusivity and quality	• Excess inventory may occur if this strategy fails • The quality of the new service or product must justify the higher cost to be effective • Won't work if your competitors are creating similar products	An 8K TV would benefit from a higher marked price when only 4K TVs and HDTVs currently exist on the market
Psychological pricing	Techniques that marketers use to encourage customers to respond based on emotional impulses, rather than logical ones	Businesses aiming toward short-term goals and quick wins	• May offer a high return on investment • Allows for cost transparency • Simplifies the decision-making process for customers	• Could cause customers to feel as though they're being manipulated • Doesn't set you apart from competitors since it's a popular strategy • Requires consistent demand for your product	Use of "buy one get one free" language versus "50% off two items." This strategy relies on the customer favouring one wording

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					over another even though they're the exact same deal.
Bundle pricing	Selling multiple products for a lower rate than selling each item individually.	Businesses that want to create large margins while offering a lower price than competitors	• Increases the value perception in the eyes of your customers • An effective way to reduce inventory • Lowers marketing and selling costs	• May affect products that may be selling better than the other if they're bundled (product cannibalization) • Some customers may not want all products offered in the bundle, resulting in an unwanted or unused product • May cause a negative perception of the brand due to customers assuming the product is of	Combos at McDonald's are cheaper than individual items on the menu.

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				lower quality since it's bundled	
Geographical pricing	Setting a price point based on the location where a product or service is sold. Factors for the changes in prices include: •Taxes •Tariffs •Shipping costs •Location-specific rent •Supply and demand	Businesses that have markets in many different locations	• Allows you to gain local appeal • Can boost perceived value in certain locations	• Local regulations need to be considered, such as pricing laws • Accounting and bookkeeping can become more complicated since there are different regions to be accounted for	A gym may charge a higher price for membership in Delhi a than they would at the same location in Kanpur.
Promotional pricing	Offering discounts on a particular	Businesses that want to generate quick demand for	• Increases sales volume in the short	• More calculations are required to ensure the	Mega Diwali Sale, New Year's Sale in

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	product.	their products or services	term • Increased inventory turnover • Promotions can build customer loyalty	sales volume compensates for the discounted prices • Lowered perception by customers due to "cheaper" prices • Customers may be reluctant to purchase again if you don't keep offering promotions	India.
Value pricing	Setting your prices based on your customer's perceived value of what you're	Businesses that specialize in SaaS or subscriptions	• Potential for high profit margins • Increased perceived value in your brand and services • Increased	• Requires additional market research to determine what is of value to your audience • Markets that work	An example of value pricing can be seen in the fashion industry. A company

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	offering. This occurs when external factors, like a sharp increase in competition or a recession, encourage the small business to further provide additional value to its customers to maintain sales.		customer loyalty	well with this strategy tend to be very niche since they're high-end • Goods will cost more to produce	may produce a product line of high-end dresses that they sell for Rs.1,000. They then make umbrellas that they sell for Rs.100.
Captive pricing	The method behind captive pricing is to generate profits from	Businesses that have a product that customers will continually renew or	• Increases flow of traffic to the core product • Boosts sales each time the upgraded accessory is	• Customers may begin to feel unsatisfied with having to update their products repeatedly	Club Mahindra selling holiday packages.

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	added accessories that go along with the core product you're selling.	update	released • Customer loyalty increases	• High-priced accessories can lead to a loss of sales • You'll need to continuously offer new and improved products each time to maintain revenue and customer interest	
Dynamic pricing	It's a flexible pricing strategy that takes many factors into account—particularly changes in supply and demand.	Businesses looking to maximize their profit margins and boost declining sales	• Allows for pricing to reflect the market demand for the product or service • Provides more insight into customer demand and purchase patterns • Enables you to maximize your profits by matching your price to the demand.	• Customers may be scared off by prices that are always fluctuating • Higher risk of price wars • Increases competition within the industry	Flight prices can change depending on when you book, you've experienced dynamic pricing first-hand.

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Competitive pricing	When prices either match or beat those of similar products that are sold by competitors.	Businesses that are just starting out	• Simple implementation • Can be combined with other strategies such as cost-plus pricing to make efforts more rewarding	• Not good to use long-term since competitors will catch on and modify their strategy • Not a strategy to use if you want to stand out since your competitors are likely using the same methods	Flipkart will compare the prices of products sold on their platform and utilize that information to offer the lowest price in the market.
Cost-plus pricing	Marking up (adding a fixed percentage) the cost of services and goods to arrive at your selling price.	Businesses with a cost advantage or an interest in using price transparency as a differentiator	• May lead to positive differentiation and customer trust • Reduced risk of price wars • Can provide predictable profits • Simple to implement	• Discourages efficiency and cost containment • Potential for customers to perceive the product negatively • Not guaranteed to cover all costs since much of the calculation	Grocery stores and supermarkets work on a cost-plus basis to determine the prices of items such as eggs and milk.

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				is an estimation. • Can be difficult to change prices when needed	
Freemium pricing	A service or product is given to a customer free of charge unless they want to access premium features or services within that product.	Businesses that intend to offer both free and paid versions of their product and those that offer free trials	• Potential to unlock viral growth • Creates a no-risk environment that attracts customers who want to try something for free • Opportunity to monetize on advertising	• A higher percentage of free users may never convert • Cash reserves can be depleted quickly due to a large number of non-paying users •	YouTube, Spotify

7.7 SUMMARY

1. Despite the growing importance of non-price considerations, pricing is still seen as a key component of marketing. Only one price factor in the marketing mix element results in product revenue; the other three factors result in costs. The pricing decision is the most difficult in the changing environment.
2. Setting the price policy is a six-step process. The first stage is choosing the pricing goal. Following that, it proceeds to calculate the demand curve and the likely quantities

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it will sell at each potential price. Then it continues by calculating how its expenses change with output levels, levels of experience gained in production, and with differentiated marketing offerings. The costs, pricing, and offers of competitors should then be compared. We choose a pricing strategy moving forward based on all the aforementioned phases, and that method chooses the final price.

3. In most cases, businesses establish a pricing structure rather than a single price to account for changes in geographic demand and costs, market-segment requirements, purchase timing, order amounts, and other considerations. There are several price-adaptation tactics available: Geographic pricing is one factor, followed by price reductions and allowances, promotions, and discriminatory pricing.
4. Businesses frequently need to adjust their prices. A price reduction may result from an increase in production capacity, a loss of market share, a desire to control prices in order to dominate the market, or a downturn in the economy. Overdemand or cost inflation could both contribute to price increases. When raising pricing, businesses must carefully control customer perceptions.
5. Businesses must anticipate price adjustments from rivals and set up backup plans. There are several possible answers in terms of maintaining or modifying price or quality.
6. The company facing a competitor's pricing change must make an effort to comprehend the competitor's motivations and the anticipated timeframe for the change. The production of homogenous or nonhomogeneous products by a company has a significant impact on strategy. A market leader under pressure from lower-priced rivals may try to better distinguish itself, launch its own low-cost rival, or alter itself more thoroughly.

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CASE STUDY

Southwest Airlines

Southwest Airlines entered the airline industry in 1971 with little money but lots of personality. Marketing itself as the LUV airline, the company featured a bright red heart as its first logo and relied on outrageous antics to generate word of mouth and new business. Flight attendants in red-orange hot pants served Love Bites (peanuts) and Love Potions (drinks).

As Southwest grew, its advertising showcased its focus on low fares, frequent flights, on-time arrivals, top safety record, and how bags fly free. Throughout all its communication efforts, Southwest uses humor to poke fun at itself and convey its warm, friendly personality. One TV spot showed a small bag of peanuts with the words, "This is what our meals look like at Southwest Airlines. . . . It's also what our fares look like." Its ongoing "Wanna Get Away?" campaign uses embarrassing situations to hit a funny bone with consumers. And its tagline: "Ding! You are now free to move around the country" is a self-parody of its in-flight announcements. This light-hearted attitude carries over to the entertaining on-board announcements, crews that burst into song in the terminal, and several personalized aircrafts, including three painted as flying killer whales, "Lone Star One" painted like the Texas flag, and "Slam Dunk One," symbolizing the airline's partner- ship with the NBA.

Southwest's business model is based on streamlining its operations, which results in low fares and satisfied consumers. The airline takes several steps to save money and passes the savings to customers through low fares. It flies over 3,100 short, "point-to-point" trips in a day—shuttling more passengers per plane than any other airline. Each aircraft makes an average of 6.25 flights a day, or almost 12 hours each day. Southwest can accomplish such a feat because it avoids the traditional hub-and-spoke system and has extremely fast turnaround service. In its early years, it turned planes around in less than 10 minutes. Today, its turnaround averages 20 to 30 minutes—still the best in the industry and half the industry average. Southwest's unique boarding process helps. Instead of assigned seating, passengers are assigned to one of three groups (A, B, C) and a number when they check in. The number refers to where they stand in line at the gate. Group A boards first, and once on board, passengers may sit anywhere they like. Southwest grows by entering new markets other air- lines overprice and underserve. The company believes it can bring fares down by one-third to one-half whenever it enters a new market, and it expands every market it serves by making flying affordable to people who could not afford it before. Southwest currently serves 68 cities in 35 states, usually secondary cities with smaller airports that have lower gate fees and less congestion—another factor that leads to faster turnaround and lower fares.

CASE STUDY

Southwest Airlines - Continued

Southwest currently serves 68 cities in 35 states, usually secondary cities with smaller airports that have lower gate fees and less congestion—another factor that leads to faster turnaround and lower fares.

Another unique cost savings strategy is Southwest's decision to operate Boeing 737s for all its flights. This simplifies the training process for pilots, flight attendants, and mechanics, and management can substitute aircraft, reschedule flight crews, or transfer mechanics quickly.

Jet fuel is an airline's biggest expense. According to the industry's trade group, Air Transport Association, jet fuel now accounts for 40 percent of an airplane ticket versus 15 percent just eight years ago. Southwest's biggest cost savings technique and competitive advan- tage has long been its program to hedge fuel prices by purchasing options years in advance. Many of its long- term contracts allow the airline to purchase fuel at $51 per barrel, a significant savings especially during the oil shocks of the 2000s that drove oil past $100 per barrel. Analysts estimate that Southwest has saved more than $2 billion with fuel hedging. Because lighter planes use less fuel, Southwest makes its planes lighter by, for instance, power-washing their jet engines to remove dirt each night. It carries less water for bathrooms and has replaced its seats with lighter models. Southwest consumes approximately 1.5 billion gallons of jet fuel each year so every minor change adds up. The airline estimates that these changes saved $1.6 million in fuel costs over just three months.

Southwest has pioneered services and programs such as same-day freight service, senior discounts, Fun Fares, and Ticketless Travel. It was the first airline with a Web site, the first to deliver live updates on ticket deals, and the first to post a blog. Despite its reputation for low fares and no-frills service, Southwest wins the hearts of customers. It consistently ranks at the top of lists customer service for airlines and receives the lowest ratio of complaints per passenger.

Southwest has been ranked by Fortune magazine as the United States' most admired airline since 1997, the fifth-most admired corporation in 2007, and one of the top five best places to work. Its financial results also shine: the company has been profitable for 37 straight years. It has been the only airline to report profits every quarter since September 11, 2001, and one of the few with no layoffs amid a travel slump created by the slow economy and the threat of terrorism.

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CASE STUDY

Southwest Airlines - Continued

Although the hot pants are long gone, the LUVing spirit remains at the heart of Southwest. The company's stock symbol on the NYSE is LUV, and red hearts can be found across the company. These symbols embody the Southwest spirit of employees "caring about themselves, each other, and Southwest's customers." "Our fares can be matched; our airplanes and routes can be copied. But we pride ourselves on our customer service," said Sherry Phelps, director of corporate employment. That's why Southwest looks for and hires people who generate enthusiasm. In fact, having a sense of humor is a selection criterion it uses for hiring. As one employee explained, "We can train you to do any job, but we can't give you the right spirit." And the feeling is reciprocated. When Southwest needed to close reservation centres in three cities in 2004, it didn't fire a single employee but rather paid for relocation and commuting expenses.

Questions

1. Southwest has mastered the low-price model and has the financial results to prove it. Why don't the other airlines copy Southwest's model?
2. What risks does Southwest face? Can it continue to thrive as a low-cost airline when tough economic times hit?

Sources: Barney Gimbel, "Southwest's New Flight Plan," Fortune, May 16, 2005, pp. 93–98; Melanie Trottman, "Destination: Philadelphia," Wall Street Journal, May 4, 2004; Andy Serwer, "Southwest Airlines: The Hottest Thing in the Sky," Fortune, March 8,

7.8 SELF-ASSESSMENT QUESTIONS

7. How do companies understand the psychology of consumer before pricing its product in the market. Explain with examples.
8. What are various factors affecting pricing decisions?
9. Explain the steps of setting up pricing

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7.9 GLOSSARY

Consumer: A consumer is an individual who intends to either purchase a product or avail a service.

Price: It is an amount a consumer is willing to pay for the product.

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7.11 SUGGESTED READINGS

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LESSON-8

CHANNELS OF DISTRIBUTION

STRUCTURE

8.1 Learning objectives
8.2 Introduction
8.3 Defining a channel of distribution
8.3.1 Designing distribution channel
8.4 Managing conflicts and control in channels
8.4.1 Types of conflicts
8.4.2 Effects of price battling
8.4.3 Ways to control channel conflicts:
8.5 Retailing
8.5.1 Concept of retailing
8.5.2 Two main channels of retailing: multi-channel retailing and e-commerce
8.6 Wholesaling
8.6.1 How does wholesaling work?
8.6.2 Functions of wholesaling
8.6.3 Types of wholesaling
8.6.4 Wholesaling vs retailing
8.7 Logistics
8.7.1 Classification of logistical activities
8.7.2 Key activities involved in logistics management
8.8 Summary
8.9 Glossary
8.10 Answers to in-text questions
8.11 Self-assessment questions
8.12 References
8.13 Suggested readings

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8.1 LEARNING OBJECTIVES

After studying this unit, you should be able to:

- ✓ understand the channel of distribution
- ✓ develop a distribution channel
- ✓ identify the types and causes of channel conflict
- ✓ manage a channel conflict
- ✓ explain the retailing, wholesaling and logistics

8.2 INTRODUCTION

The process of moving products from the producer to the final consumer is known as distribution in marketing. Distribution takes place through channels, which are agents that enable and promote consumer purchasing and whose quantity and nature are decided by the producers. In order to assemble items, staff, advertising messages, and downstream selling partners that, when combined, enhance competitive advantage, producers must first choose and then manage a channel or array of channels. Producers may alter their distribution methods in reaction to modifications in the market, technological advancements, or other circumstances, but unwise or poorly executed channel changes usually lead to the loss of reseller support, disappointing sales, and decreased earnings.

How to go to market, or how to create a distribution system, is a crucial strategic marketing choice for many businesses, with each strategy offering a different set of advantages and disadvantages. A multistage distribution process in which a manufacturer sells to a reseller (a wholesaler, who may subsequently sell to retailers), who then sells to consumers, is frequently the only viable choice. In the business-to-business market, the producer frequently sells to the final user through wholesale distribution or, in some cases, through a distributor to a dealer or supply house who then provides the final user with the product. Simple economic models of company behavior sometimes neglect the existence of this multistage process, but economists and marketers are increasingly examining the degree to which producer/reseller connections and incentives impact how goods and services reach customers and at what price.

A producer must weigh three key factors before deciding on a distribution strategy: control, effectiveness, and efficiency. Where efficiency is the capacity to provide products and services to customers and merchants at the lowest possible cost and effectiveness is the

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maximum market coverage and control is the ability to fix the timing and focus of distribution efforts.

One of a marketing manager's biggest challenges is designing and implementing distribution channels. All facets of the company's operations, from segmentation and targeting high-priority clients to defining revenue streams and profitability, could be significantly impacted by how the company chooses to enter the market. Channel decisions may require more time to implement than other marketing-mix considerations.

A group of interconnected businesses that work together to make a good or service accessible for end-user consumption is referred to as a channel of distribution. Important is the interdependent component. To meet the needs of the end-user customer, channel members must understand that they cannot act alone and must collaborate. If one member views another as a dependent, an opportunistic and harmful self-interest is likely to emerge, and power and conflict may govern the relationship. Conflict tends to be contained if participants perceive themselves as interdependent, even though it is inevitable in all channel connections.

8.3.1 Designing Distribution channel

The successful introduction of new products is essential for many Organizations to keep their market dominance. Sadly, empirical facts show that between one-third and fifty percent of all new goods fall short of a company's financial and marketing objectives. These failures have been attributed to a number of reasons, including an inadequate focus on the commercialization process, a lack of management backing, and subpar marketing planning and execution. In this part, we systematically evaluate, plan, and execute the distribution channel design.

The main query is to the channel structure; specifically, which intermediary, or intermediary group, is most suitable to promote the new product? A related but equally crucial issue is how the intermediary network should be run once it is operational.

Designing a distribution channel refers to the choices made when creating new marketing channels or altering those that already exist (Rolnicki, 2018).

The distribution channel design decision can be broken down into six steps namely:

1. Identifying the need for channel design decision
2. Setting and organizing distribution objectives
3. Specifying the distribution responsibilities
4. Developing alternate channel structures

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5. Evaluating important variables
6. Choosing the best channel structure

1. Identifying the need for channel design decision

The first and one of the most important tasks for any organisation is to recognize the need for a channel design. For the following reasons, an organisation would opt for a new channel design:

i. When a new line of products is created, usually when the existing channels are insufficient for the new line

ii. when a new target market for the existing product is chosen. This frequently occurs when a company that typically serves B2B clients decides to enter the consumer sector.

iii. When there is a shift in the components of the marketing mix when a company lowers the price on a particular item, the channel chosen will be depending on the price points, and they might look for discounters.

iv. when dealing with significant environmental changes, especially those in the economic, technological, or legal domains.

v. Lastly, when the company expands its geographic marketing areas

2. Setting and organizing distribution objectives

The channel manager's next responsibility is to figure out how to construct the channel structure, either from scratch or by changing the existing one, after the need for a design has been identified. The channel manager needs to carefully assess the company's distribution goals. The channel manager must do three responsibilities for the distribution objectives to be successful and well-coordinated.

i. Learn about the firm's other pertinent goals and strategies as well as the ones in the other parts of the marketing mix. In most circumstances, the same individual or group that sets the distribution objectives will also set them for the other components of the marketing mix.

ii. Define the goals and make them clear. A good objective is one that is plain, clear, and plays a bigger part in attaining the company's overarching goals. The following are some illustrations of effective distribution goals. With its "Apple experience," campaign Apple Computers set a distribution goal to reach more customers. As a

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result, Apple revived and re-established its connections with major retail chains, which it had neglected in recent years.

Similar to this, Coca-Cola wants to increase its market share in schools and colleges. As a result, it has contacted numerous educational institutions in order to have them offer only Coca-Cola products on their campuses.

iii. Verify that the distribution goals are in line with the company's marketing, overall goals, and other strategies. This entails confirming that the distribution goals do not clash with those of the other marketing mix components or even with the business's overall goals. Examining the interrelationships and hierarchy of the firm's goals is crucial for cross-checking. Figure 1.1 gives a clear picture of the same.

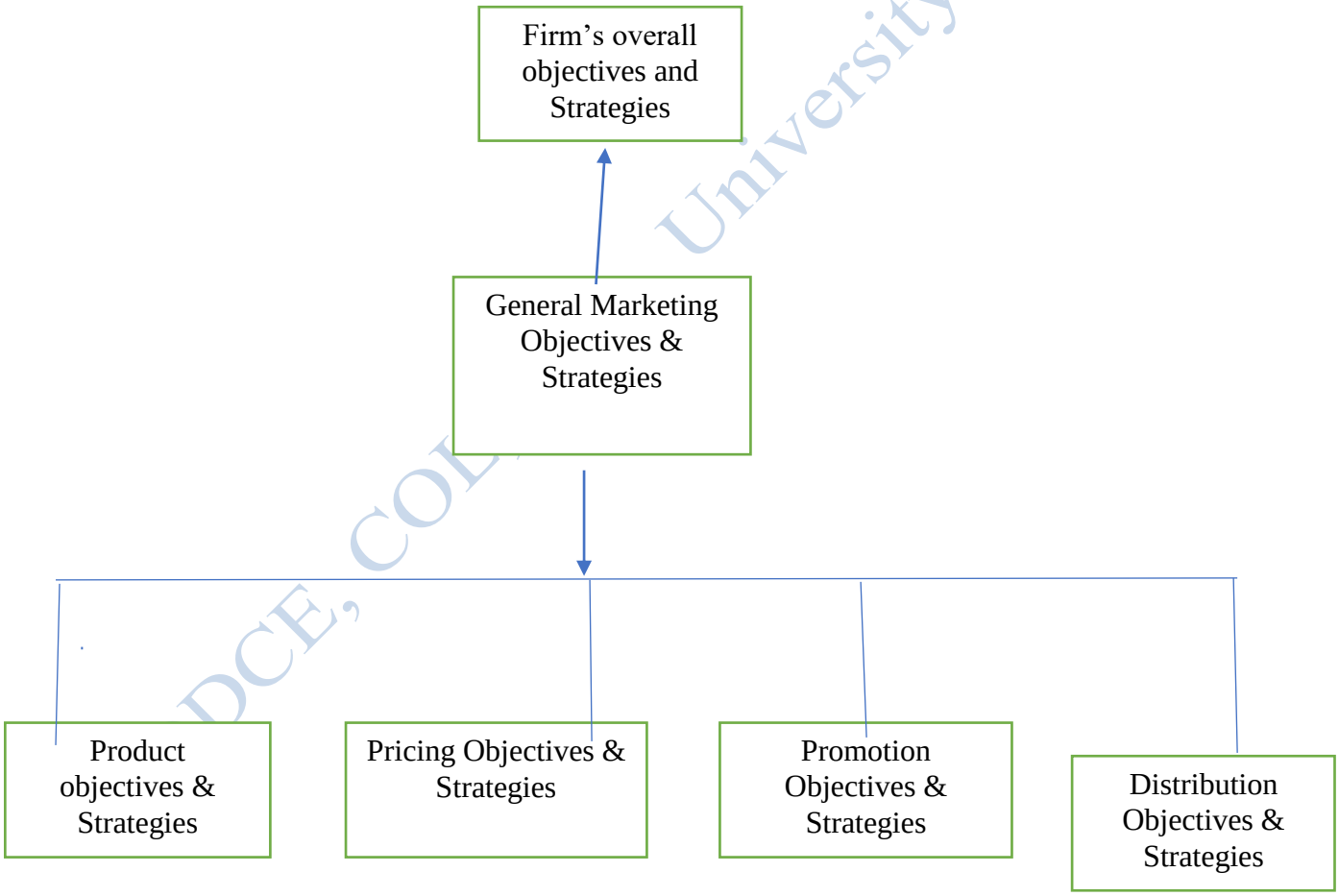

Figure 1.1: Distribution Goals (Adapted from (Dent, 2011))s

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Specify the distribution responsibilities

Once the goals have been established, certain tasks must be carried out in order to achieve the distribution goals. Therefore, in order to achieve the goals, the management must describe the kind of tasks that must be completed. To fulfill the defined distribution objectives, the duties must be clearly stated.

For instance, a producer of a consumer good, such as high-end cricket bats targeted at serious amateur cricket players, would have to specify distribution tasks such as gathering information on target markets shopping patterns, promoting product availability to the target, maintaining inventory and timely availability, compiling information about the product features, providing hands-on experience using the product, processing and filling customers' orders, transporting the product, and setting up credit. When we talk about seeing clients, these duties are in fact distribution tasks, even though they may appear to be production-oriented rather than distribution tasks.

Develop alternate channel structures

The channel manager should research other methods of assigning these jobs after having specified them. To effectively contact the consumer, the channel manager typically selects multiple channels. Britannia offered its biscuits for sale at pharmacies, department stores, convenience stores, and wholesale food distributors. Whatever the channel layout, there should be options for allocating resources based on (a) the number of levels in the channel, (b) the intensity at different levels, and (c) the kinds of intermediaries.

There is a range of levels available, from two to five. The channel manager may choose between meeting clients directly and employing two middlemen as appropriate approaches. The quantity of intermediates at each level is referred to as intensity.

Generally speaking, there are three types of intensities:

i) Intensive

ii) Selective

iii) Exclusive.

Using the maximum number of outlets at each level of the channel is what is meant by intensive saturation. Selective refers to the utilization of only a subset of the available intermediaries at a certain level. Exclusive describes an extremely selective distribution pattern.

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A company like Rolex may use a high level of selectivity, whereas a company like Parle Products may use an intense distribution channel strategy. The third component, or categories of intermediates, must be handled carefully. Businesses shouldn't disregard the new kinds of intermediaries that have developed recently.

ACTIVITY

(A) Would you use exclusive, selecting or intensive distribution for the following products?

1. Kia India Private Limited (Automobile Company)

2. ITC Kitchens of India

3. Evaluate important variables affecting channel structure

Each channel structure needs to be assessed based on a variety of factors after the various designs have been described. There are five fundamental categories, including

i. **Market variables:** Marketing management is founded on the marketing concept idea, which emphasises the requirements and wants of customers; managers must follow the market's indications. Market geography, market size, market density, and market behavior are the subcategories that have the biggest impact on the market structure.

ii. **Product variables:** Product variables include things like volume and weight, perishability, unit value, level of standardization, technical vs. non-technical, and newness. These are some of the most crucial product factors. Products that are large and heavy have high handling and shipping expenses compared to their value. Manufacturers of these goods must remember to ship in bulk to the fewest locations possible.

iii. **Company Variables:** Size, financial capability, managerial competence, goals, and tactics are significant factors that influence effective channel design. The ability to exert significant power in the channel increases with the size of the firm. The company has some freedom in choosing the channel structures because of its size. When it comes to financial capabilities, the same is true. The amount of capital a company has accessible will reduce its reliance on intermediaries.

For an example companies like General Electric and AEC business engages in industrial marketing prefers to have its own sales force, storage, and order processing

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capabilities. Larger companies with strong financial foundations are better able to endure the high expense of these facilities. When a company lacks good managerial abilities, a thorough channel structure ranging from wholesalers to brokers is required to carry out the distribution activity. As the company gets expertise, the number of intermediaries can be changed or decreased.

The use of intermediaries may be constrained by the goals and plans an organisation has. These tactics may place a focus on aggressive promotion and even change the duties involved in distribution. This is one of the main factors considered while appraising something.

iv. **Intermediary Variables:** The crucial intermediary variables are services provided, price, and availability. One of the important factors is availability because it affects the channel shape.

If we look at the example of Dell Computers, it created a direct mail order channel in the absence of a proper channel structure, which also offered a solid technical backup. Another factor a channel manager takes into account is the price. The manager may think about decreasing the use of intermediaries if the cost of utilising a particular intermediary is too high relative to the services it provides. Another crucial element is the services provided by the intermediaries; a reputable intermediary will provide effective services at a reasonable price.

v. **Environmental Variables:** The various facets of channel development and management may be impacted by uncontrollable or large-scale environmental phenomena. In this context, "environment" refers to the setting in which a company, its consumers, and its distribution channels operate. Environmental variables like socio-cultural, technological, and legal have a big impact on the channel structure. The other factors can be changed or improved upon by the organisation, but the environmental forces are those that the organisation must contend with.

4. Choose the best channel structure

The management should select the best channel structure available in order to achieve the necessary degree of effectiveness at the lowest cost. Although there isn't a single right way to choose an ideal channel structure, it all comes down to the firm's orientation. The channel structure would be appropriate if the company's objective were profit maximization. However, the majority of channel decisions are still made using administrative discretion and the information at hand.

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The channel structure should always be kept short as this will always be superior. Food items and flowers are regarded as being extremely perishable. Highly perishable products should have a channel structure that allows for quick distribution from producers to consumers. One crucial factor to keep in mind is that the longer the channels, the lower the unit value of the product, the less room there is for distribution costs.

Figure 1.2 explains the relationship between the channel length and degree of standardization. The degree of personalization is greater if the product flows directly from the maker or producer to the user, but as the product becomes more standardized, it passes through more channels. While many consumer markets are primarily standardized, B2B machinery has a high degree of customization as it moves from the maker to the industrial user.

Because of their technical know-how and support, industrial items are typically distributed through direct channels, but many technical consumer products do use shorter channel structures. A shorter channel is suggested to raise awareness when the product is new and in the introduction stage in order to take advantage of the aggressive promotion.

IN-TEXT QUESTIONS-PART A

What do you understand by the channel of distribution.

State whether the following statements are True or False.

Buying and Selling are the only activities that are carried on by a distribution channel.

Risk bearing is one of the functions of a distribution channel.

Transportation is the primary function of a distribution channel.

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CASE STUDY

Lids Off Jar Opener: Major ADL Distribution Channel, Vast Cross-Media Marketing Campaign

In the past, opening vacuum-sealed food jars has proven to be a difficult process for people of all ages and abilities. In today's supermarkets, a wide range of prepared meals and condiments are packaged in jars, including pickles, mayonnaise, and sauces of many kinds. It was determined that there was a chance to create an automated jar opener device that would fill this clear market need and greatly improve the quality of life for those with functional limits or disabilities.

Black & Decker, a significant consumer appliance maker, was approached and persuaded to enter this undeveloped market. Throughout the whole product development process, direct consumer engagement was used, and the end product, dubbed Lids Off, was produced with an initial manufacturing production run of 500k units. As a preliminary "testing of the waters" on consumer buy intent and price point, distribution would first be accomplished through an Internet product launch. Consumer testing had revealed a consumer price point of $39.39, but for the introduction of its Internet product, a starting retail price of $49.99 was chosen. Additional distribution channels would be through big-box stores (Wal-Mart, Target, and others) that already offer modest home kitchen equipment after a successful internet launch.

At a press and marketing gathering called Christmas in June in New York City, The Lids off Jar Opener made its official debut. With adverts in numerous newspapers and family-friendly periodicals, a comprehensive publicity campaign was launched.

Online sales were modest. After about a month, it was decided to boost the product's advertising budget while lowering the retail price to $39.99. The item was delivered to big-box stores, who featured it in weekly sales ads that were published across the country in newspapers and on the Internet. Sales of the new jar opener soared thanks to an expanded advertising campaign and the product's accessibility through common distribution channels. Sales were so strong that the company's initial product run was sold out in November and that it was forced to pull its December holiday advertising for the appliance because it was out of stock. Sales of Lids off Jar Openers continued to grow quickly after inventories were restocked the following February, with more than 1 million units sold in the first year.

One important finding from consumer focus groups was that the intended user of the appliance would not necessarily be the one who bought it. Although older folks were prepared to spend money on buying the equipment, they clearly wanted and required it. They were more than happy to accept it as a present, though.

(Source: www.resna.org)

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8.4 MANAGING CONFLICTS AND CONTROL IN CHANNELS

Channel conflict is defined as any argument, disagreement, or strife between two or more channel partners if one partner's actions or operations have an impact on the other's operations, sales, profitability, market share, or achievement of comparable objectives.

Channel conflicts are one of the drawbacks of marketing your company over several web channels. The likelihood of channel friction grows when we use a variety of sales channels to promote your business. Other resellers may quickly identify the goods we sell online, where we store them, and how much we charge, which causes conflict, unlike offline retail. Particularly when various shops are offering the same products to the same markets at various costs.

On the other side, thanks to the increasing expansion of ecommerce sales, online channels, and features like simple-to-use and reasonably priced Sales for ecommerce tools and platforms, selling directly to consumers (D2C) has never been simpler for manufacturers.

To balance one's ecommerce stores with other online distribution channels like wholesalers and merchants is difficult for a manufacturer. The first rule is to treat each other as partners rather than rivals with the aim of creating and maintaining satisfied consumers (Gorchels, 2004).

8.4.1 Types of Conflicts

We define 3 types of channel conflicts:

i. Horizontal Conflicts

In horizontal conflicts, the conflicts arise here between two or more related parties who work for the producer or wholesaler. Assume a wholesaler provides items to four distinct retailers in the four cities Delhi, Mumbai, Bangalore, and Hyderabad. A channel dispute can only arise when one merchant decides to sell products in another city if there is a significant agreement among all parties to stay inside their cities. Conflicts will undoubtedly arise as a result of this, and if they cannot be resolved, it's possible that everyone engaged in providing that product—from the manufacturer to the retailers—may be impacted. Additionally, if these merchants are the only ones selling the products in specific cities, consumers may suffer.

ii. Vertical Conflicts

Unlike horizontal conflict, vertical conflicts occur between two members on a consecutive level, like a wholesaler and a retailer. Assume that a retailer gets products from a wholesaler

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for ₹ 40 each, and happens to sell them at ₹ 100 each to consumers. If consumers happen to get to know the actual cost of such a product, they might make a complaint to the manufacturer who in turn might phone the wholesaler. Thus, the wholesaler will have to question the retailer on such actions, especially if it is affecting the demand for such a good in the market. It may also result in a direct rivalry between manufacturers and retailers resulting from manufacturers selling directly to consumers (D2C) rather than through retailers.

iii. Multichannel Conflicts

This often refers to disputes that have an impact on various supply circle participants in any order. Assume for the moment that a company owns both traditional and online marketing channels. Currently, he charges ₹45 for traditional channel distribution of his goods and ₹30 for internet marketplace distribution. Now, just by taking a quick look at this, one might infer that it will cause problems for the reseller of such things. Let's however imagine that the wholesaler purchases these goods from the producer for ₹45 to sell them to the retailer for ₹48. The retailer chooses to purchase this product directly from the manufacturer through the online marketplace at a price of ₹30 per unit because he just requires a sufficient number of these products to meet market demand. Now, if he chooses to sell these goods to customers for ₹35 each, he will be able to increase sales as compared to when he purchases from the wholesaler and decrease sales as compared when he competes with the manufacturer. This demonstrates that all three of the involved channels are immediately impacted. In this situation, the store will suffer greater losses because customers can use the internet market to purchase goods for ₹5 less, but he would save ₹18 compared to purchasing from the wholesaler. In either case, the wholesaler won't be selling since there isn't a retailer to buy at that price, and the retailer won't be selling as much either because there is another channel with lower pricing. The producer will now have to decide whether to fix the pricing problems or abandon the conventional sales strategy. To select option two would not be a wiser idea.

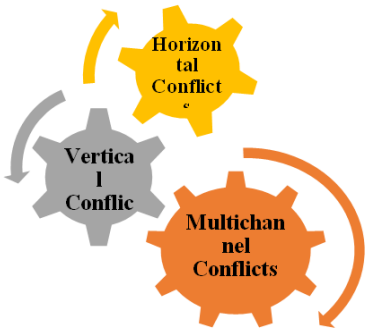

Figure 8.3: Types of Conflicts

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1.4.2 Effects of Price Battling

i. Chain Reaction - Brand and Product Lose Value:

Consider the scenario where you wish to run a pricing promotion on a retailer's website just for its customers. Within a few hours, the pricing bots on the marketplaces will recognize this promotion and automatically match it (or possibly beat it). The likelihood is that additional retailers will follow suit within the following 24 hours. This kind of domino effect can cut your product price, reduce its worth, reduce your profit margin, and seriously harm your brand's reputation.

Figure 8.4: Effects of Price Battling

Sales Stagnation:

Buyers can postpone purchases when prices are unstable since they are aware of this. Customers who purchase a product only to discover that the price has lowered later on feel tricked, which increases product returns and damages a brand's reputation

ii. Price battling can weaken the distribution channel:

When retailers and wholesalers stop marketing or even selling your products.

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8.4.3 Ways to Control Channel Conflicts:

i. **Offer exclusive products:** Offer a unique product that can only be found on the brand website. Build demand, generate discussion, and showcase your business. Giveaways of your products are another option. Add value by introducing a supplementary item, like the Apple gift card. Offer kits and bundles: Helping clients get more use out of your items will increase sales. By bundling things, you can offer a discount without it appearing to be one. As much as you can, try to vary your offering; you might even provide distinct SKUs for other shops. To safeguard profits, make it harder for retailers to match identical product pricing.

ii. **Set appropriate boundaries:** Change to a selective distribution model (for at least some products) to control unauthorized resellers and distributors who are not part of your brands' network. It is important to find unlicensed vendors on marketplaces using ecommerce monitoring software, such as Site Lucent, and try to determine where their supply comes from. Your reseller network might need to be thinned out. Any non-compliant or unauthorized seller can be contacted and asked to take corrective action, sometimes even converting them into authorized ones.

iii. **MSRP policy & Monitoring:** To avoid any price competition between wholesalers, retailers, and manufacturers, keep product prices uniform throughout all sales channels. While MSRP refers to the price a manufacturer advises retailers to sell a product for, MAP pricing focuses on how a reseller markets a product. In the nations where they are legal, a brand or manufacturer will enter into a Minimum Advertised Price (MAP) Policy with authorized merchants. Monitoring your online retailers' and marketplaces' prices regularly to check for MAP compliance is known as MAP monitoring. Pricing SKUs at or above a predetermined minimum price is agreed upon. The agreement is not enforceable in court. Retailers can continue to sell a product below the MAP price as long as they don't promote it.

IN-TEXT QUESTIONS-PART B

Explain the concept of channel conflict.

State whether the following statements are True or False.

Due to price battling brand and product lose its value. True

When a single company employs two or more marketing channels to connect with one or more consumer segments, this is known as multi-channel marketing. True

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8.5 RETAILING

The delivery of finished products starts with the producer and ends with the final consumer. There is a third party—the retailer—between the two of them. Retailing is characterized as a series of actions taken to sell a good or a service to customers for domestic or private consumption. It is in charge of coordinating individual consumer needs with producer supplies. The French verb “retailer”, which means "to cut a piece of" or "to break bulk," is the source of the English word "retail."

According to Cundiff and Still, “Retailing consists of those activities involved in selling directly to ultimate consumers.”

Thus, Retailing includes all the activities involved in selling goods or services directly to final consumers for personal, non-business use. A retailer or retail store is any business enterprise whose sales volume comes primarily from retailing.

“A set of business activities carried on to accomplishing the exchange of goods and services for purposes of personal, family, or household use, whether performed in a store or by some form of non-selling.” – American Marketing Association

“Retailing includes all the activities involved in selling goods or services to the final consumer for personal, non-business use.” – Philip Kotler

According to Cardiff and Still, “Retailing consists of those activities involved in the selling directly to ultimate consumers.”

Our daily lives now include retailing so thoroughly that it is frequently taken for granted. The countries with robust retail sectors have seen the greatest economic and social improvement. Why has retailing grown to be such a common way of doing business? The answer is the benefits of a thriving retail industry i.e., easy access to a wide range of products, freedom of choice, and excellent levels of customer service.

A retailer is a person, agent, agency, business, or other entity that plays a key role in getting products, items, or services to the final customer. Retailers carry out particular tasks such as anticipating client needs, creating product assortments, gathering market data, and financing.

One prevalent misconception about retailing is that it exclusively involves the sale of goods in physical storefronts. The selling of services, such as those provided at a restaurant, beauty parlour, or by automobile rental companies, is also included. Selling does not always have to happen through a store.

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Retailing includes selling through every channel that could be used to approach the consumer, including the mail, the Internet, and door-to-door sales. Manufacturers like Dell Computers become retailers when they sell directly to customers. Small family-run chains and stores with a regional focus are the dominant players in the global retail industry whereas Wal-Mart, Sears, McDonald's, and Marks & Spencer are a few of the multibillion-dollar multinational corporations that slowly gained control of western markets. The larger shops have established huge supply or distribution networks, inventory management systems, financing agreements, and extensive marketing plans, allowing them to achieve economies of scale and offer better services at competitive pricing (Xu, 2009).

The introduction of numerous retail formats that have started operating in the majority of product categories is a significant recent development. Large departmental shops, for instance, provide a wide range of products and services. Discount retailers compete primarily on price and provide a wide range of goods. Big Bazaar and Reliance Mart are two examples. Other high-end shops use luxury labels like Dior and Louis Vuitton to target extremely niche markets. It will be interesting to observe how these advantages play out for each of these shops as they each have unique advantages. For instance, bargain merchants typically outperform their competitors in difficult economic times, whereas the reverse is true when the economy is doing well (Konings, 2020).

8.5.1 Concept of Retailing

It is essentially the marketing idea of a company-wide, customer-centered approach to creating and carrying out a plan. It lays forth the rules that all merchants must abide by, regardless of their size, channel design, or mode of sale.

The retailing concept has four broad areas that are an essential part of the retailing strategy:

i. **Customer Orientation** – The retailer carefully considers the demands of the customer and makes an effort to meet those needs.

ii. **Goal Orientation** –The retailer sets tactics to accomplish its well-defined objectives.

iii. **Value Driven Approach** –The merchant provides the customer with goods that are reasonably priced and of high enough quality to appeal to the target market.

iv. **Coordinated Effort**- Every business operation is coordinated with the overall objective to maximise effectiveness and provide customers with value.

Although the retailing concept is straightforward to embrace, many retailers fail to adhere to it because they overlook one or more of the a core mentioned elements. For the retailer to be

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successful, there needs to be a good balance between all the components of this concept. The retailing notion, while significant, is constrained by the fact that it does not take into account the firm's internal resources or the level of competition in the outside world. However, it is still a crucial strategic directive (Ampountolas et al., 2019).

8.5.2 Two Main Channels of Retailing: Multi-Channel Retailing and E-Commerce

i. **Channel 1: Multi-Channel Retailing:** Retail does not always have to begin with a physical location. The Indian unicorn startup Nykaa has been around for a very long time. To supplement their long-running catalogue channel, which was initially introduced in 2012, they did, however, open their first store in 2018.

Retail Channels and Multi-Channel Retailing

How a retailer sells its goods are known as retail channels. Although physical stores account for the majority of sales, other avenues including online shopping and catalogue sales are also significant. Depending on the services a retailer offers and prospective client behavior, a channel must decide which retail channel to use. Retail channels are currently becoming more confounded. Given that customers can now purchase "anytime, anywhere," it is crucial for merchants to be available across multiple channels to retain customers.

Different Retail Channels:

a) **Brick-and-mortar stores:** Many customers still choose to browse and shop in actual stores. When we talk about brick-and-mortar stores customers can chat with staff members and inquire about the goods or services in physical stores. Customers may try products like video games or laptops at Croma stores and have lunch in cafe while shopping in IKEA, and other experiences in brick-and-mortar stores. Brick-and-mortar stores also give customers immediate satisfaction when they make a purchase.

b) **Direct response channel:** In direct response channels, the retailer contacts and approaches potential customers directly. Conversion rates (from potential to member) are greater and it is more personalised. The Direct Response channel also includes Internet channels.

There are other retail distribution methods also which include selling directly to customers, souvenir shops, institutional distributors like restaurant chains, etc.

Multi-Channel Retailing

Customers expect to be able to shop "anytime, anyplace" in the modern world. Multi-channel retailing is a hybrid strategy that combines a variety of possibilities. Technology development

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has improved retail channels as well. Customers can choose between purchasing goods from an outlet on the one hand and using online websites as their marketplace for their preferred goods on the other. The goal of multi-channel retailing is to use a variety of distribution channels rather than just one. Few of the many successful businesses that have benefited from the multi-channel retailing in the Indian market are Patanjali, Xiaomi and Nykaa.

Benefits of Multi-Channel Retailing

In today's cutthroat industry, multi-channel selling is not an option; it is a requirement. Customers who use many channels are the most affluent, picky, and time crunched. They are also your brand's most priceless assets.

Because customers increasingly expect consistently outstanding buying experiences regardless of the channel, merchants are under increasing pressure to deliver superior customer experiences across all channels. The thought of developing a thorough and integrated multi-channel experience intimidates many businesses, and they wonder whether the work will be worthwhile.

The four benefits that make investment in multi-channel strategy valuable include:

a) Enhanced customer perception
b) Increased Revenue
c) Enhanced data collection
d) Enhanced output.

ii. Channel 2: E-Commerce:

Any business or commercial transaction involving the transmission of information over the Internet is referred to as "Electronic-commerce" or "e-commerce." It includes a variety of industries, from consumer-focused retail websites to auction or music websites to commercial exchanges where firms trade goods and services. Currently, it ranks among the most significant elements of the Internet.

Over the past ten years, e-commerce has grown quickly and is still growing. The retailing sector has jumped on board and started to offer online shopping and e-trading, including fashion retail and grocery retail. "Shopping carts" are used in online retailing which enables customers to make purchases, track them, and tie all aspects of e-commerce together into a single, seamless system. E-commerce has the potential to be a tremendously lucrative endeavour, but success takes time. It is crucial to conduct extensive research, ask questions, put in a lot of effort, and base business decisions on information obtained through studying e-commerce (Bloomberg 2020).

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E-Commerce Strategies

Over time it has been observed that both B2B (Business to Business) and B2C (Business to Consumer) e-commerce are expanding daily. All businesses now understand how important it is to have an entire retail strategy that includes an e-commerce plan. Ecommerce is a very different business model from traditional retail in every way.

When launching an online store, a retailer should keep a few things in mind, some of them are as follows:

a) Understand market trends, opportunities, and risks. Planning for business growth and dealing with numerous external influences are both aspects of retail strategy.

b) The consumer must come first. When selling through physical, traditional establishments, customers get a tactile experience, making it simpler to develop a relationship with them. E-Commerce platforms need to come up with ways to connect with virtual customers one-on-one and establish relationships. Everything starts with a great, user-friendly website that delivers the information in the "proper way" to draw in customers.

c) To stand out from the competition and attract clients to your online store, you must provide something better than the other e-commerce companies.

d) Pricing: Compared to traditional physical storefronts, online retailers have significantly lower operating and sales costs, which may persuade customers to make larger purchases.

Logistical emphasis - The management of shipping costs presents the biggest difficulty in operating an online store. To save costs, retailers must collaborate with numerous logistical providers.

IN-TEXT QUESTIONS-PART C

What are the four broad areas of retailing?

Explain the concept of E-commerce retailing.

What is multi-channel retailing?

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8.6 WHOLESALING

Buying products in bulk from the producer and reselling them to the retailer for a profit is known as wholesaling. A wholesaler is a person or company that acts as a link in the supply chain, linking the producer and the retailer. They have the option of selling a single item, a variety of items, or both. Wholesalers are common in industries including banking and finance, telecommunications, and energy in addition to physical goods distribution. They offer businesses in the commercial, industrial, and other professional sectors affordable business-to-business (B2B) services. Even if they charge merchants more, the price they charge is still considerably less than the standard retail price.

8.6.1 How Does Wholesaling Work?

Buying huge quantities of products from producers and reselling them to merchants who then sell them to consumers is known as wholesaling. The idea of economies of scale underpins the entire procedure. A wholesaler first invests in purchasing and warehousing a sizable quantity of goods. They then make money by offering those goods in modest amounts to shopkeepers in a town, city, or market. The idea gained popularity in the 19th century as a result of the development of mass production and marketing techniques.

There may be numerous wholesalers selling the same or different goods made by the same manufacturer. Similar to how one wholesaler might sell to lots of different stores. It is important to note that organizations like manufacturers and service providers occasionally function as wholesalers. Wholesaling has a substantial economic impact because it is an essential part of the distribution system. To efficiently transport their goods to retailers and eventually consumers, manufacturers work with wholesalers. In this way, the supply chain is made up of the manufacturer, wholesaler, retailer, and customer, each of whom functions at their level and depends on the one above them (Neha Wadhawan., R K Arya., 2020).

8.6.2 Functions of Wholesaling

i. Wholesalers carry out a wide range of tasks in addition to selling products, including marketing, risk-taking, warehousing, shipping, financing, management, and advising.

ii. Due to operational or warehousing costs that vary depending on process efficiency, costs of goods and services, and inventory turnover, wholesalers have more control over pricing.

iii. Since they are not producers and primarily sell competing items, they typically do not offer after-sales service or product support.

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8.6.3 Types of Wholesaling

The definition of wholesaling can be any of the following types, depending upon their field of business and functions:

i. Merchant

Large quantities of goods are purchased by these wholesalers from the producer, who then retains possession of them, stores them, and sells them to anyone other than the consumer. They primarily come in two varieties and work independently:

Wholesaler Merchants: They frequently work in the hardware, pharmaceutical, apparel, and seafood industries and sell to retailers.

Industrial Merchants: They frequently work in the consumer goods, engineering, industrial, and equipment industries and sell to makers.

ii. Merchandise Agents or Brokers

Wholesalers that buy goods from numerous producers to resale them are known as merchandise agents. However, they do not take possession of the products. Instead, they help with its display and storage. Contrarily, product brokers serve as a mediator in negotiations between the manufacturer and the merchant. They make money off of sales commissions, as is seen in the stock, real estate, and insurance industries.

iii. Mini Offices and Branches

To participate in the wholesale process, the manufacturer establishes a new branch or a small office. These divisions or offices directly accept purchase orders from retailers and deliver goods to them. They concentrate on sales, marketing, and inventory management with a particular geographic area in mind.

iv. Specialized

These distributors focus on a certain good or commodity and are well-informed about its advantages and disadvantages.

8.6.4 Wholesaling vs Retailing

Retailing and wholesaling are both necessary for a supply chain to work properly. A wholesaler acts as a bridge between manufacturers and retailers by concentrating on preserving relationships with both groups. In situations involving product shortages, supply issues, price increases, discount offers, or complaints, retailers do not speak with corporate representatives directly. They visit the wholesaler instead. Contrarily, retailing simply

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describes a local store owner who buys numerous things from a wholesaler and then sells them to customers directly. Retailers are seen as the company's face by end users. Retailers benefit when wholesalers get a good deal or a discount when buying products from a company (Shaffer & Zettelmeyer, 2018). After that, retailers pass it on to final customers, guaranteeing everyone's profit and fairness.

Other striking differences between wholesalers and retailers include:

i. Since wholesalers don't have any additional expenses, they can sell products in greater quantities and at lower costs to shops, businesses, and other organisations. Retailers sell products to end customers in smaller quantities and at higher prices as a result of added expenditures.

ii. The role of wholesalers is to act as a middleman between manufacturers and retailers. Wholesalers and customers are connected by retailers.

iii. Wholesalers frequently require large sums of cash and have lower profit margins. Small firms with strong profit margins and little capital requirements are retailers.

IN-TEXT QUESTIONS-PART D

How does wholesaling works and what are its functions?

Explain different types of wholesaling.

Explain how wholesaling differ from retailing.

8.7 LOGISTICS

Planning, implementing and controlling the effective movement of raw materials, work-in-progress items, finished goods, and related information from the point of origin to the site of consumption to ensure customer satisfaction is known as the concept of logistics (Rolnicki, 2018).

According to Phillip Kotler, "Market logistics involve planning, implementing and controlling the physical flow of material and final (finished) goods from the point of origin to the point of use to meet customer requirements, at a profit."

Certain pertinent observations on the concept of logistics are:

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a) Logistics' actual work is primarily supportive. Operations in manufacturing and marketing require the help of logistics.

b) The idea of logistics is based on an overall system viewpoint of the numerous tasks involved in moving resources and goods from supply sources to consumers. As a result, it forces management to consider managing the entire system rather than simply a single component of it.

8.7. 1 Classification of Logistical Activities:

Logistics (or Logistical Activities) may be Broadly Classified into Two Categories:

i. Inbound Logistics:

Inbound logistics is concerned with the efficient and cost-effective influx of supplies to the manufacturing facility, including materials and other inputs required for production. The management must continuously engage with suppliers for appropriate management of incoming logistics (vendors).

ii. Outbound Logistics

Outbound logistics, also known as physical distribution management or supply chain management, is concerned with the movement of completed products and other relevant data from a business to a client. The management must continuously interface with transport providers and channels of distribution to manage outbound logistics effectively.

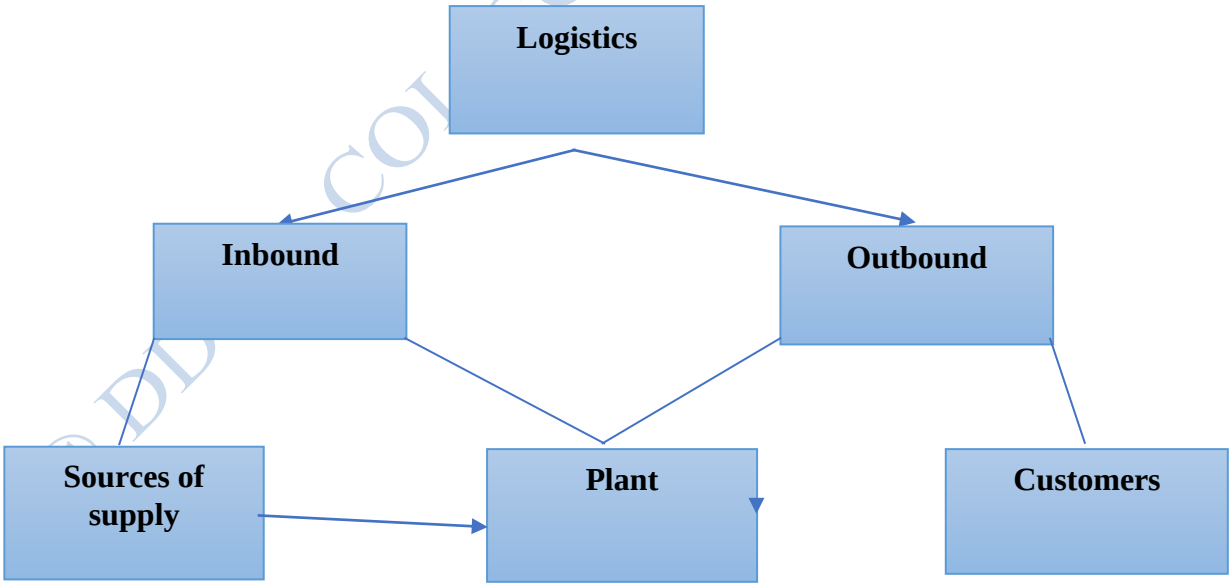

Figure 1.5: Scope of logistical activities (Adapted from (Gorchels, 2004))

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8.7. 2 Key Activities Involved in Logistics Management:

Following is a brief account of key activities involved in logistics management:

i. **Network Design:** One of the main responsibilities of logistics management is network design. The size and placement of the industrial facilities, warehouses, material handling equipment, etc. that are necessary for logistical efficiency must be determined using this network.

ii. **Order Processing:** Orders from customers are crucial in logistics management. Receiving, handling, filing, and recording orders are all included in order processing activities. Management must here make sure that orders are processed accurately, reliably, and quickly. To achieve quick order processing, management must also reduce the amount of time between the receipt of orders and the date of consignment dispatch. Order execution delays have the potential to seriously irritate customers, which is something that must be avoided at all costs.

iii. **Procurement:** It has to do with getting supplies from outside vendors. Inbound shipping, receipt and inspection, order placement, negotiation, supply sourcing, storage, and handling are all included in procurement. Its main goal is to promote manufacturing by offering prompt supplies of high-quality materials at the most affordable prices.

iv. **Material Handling:** In production, distribution, and transportation, material handling is implemented to enhance customer service, decrease inventory, speed up delivery, and cut total handling costs. Management must ensure that the raw materials, parts, semi-finished, and finished goods are handled properly. Additionally, the management needs to cut down on handling expenses and labour time.

v. **Inventory Management:** It entails tasks including moving raw materials, components, semi-finished products, and final commodities into and out of a facility's warehouses and transportation hubs. To reduce losses from

The main goal of inventory management is to keep working capital out of inventories as little as possible, while still maintaining a steady flow of resources to meet production demands and timely deliveries of items to satisfy consumer wants.

vi. **Packaging and Labelling:** A crucial part of logistics management is packaging and labelling. Packaging refers to enclosing or encasing a product into suitable packs or containers allowing both the seller and, especially, the customer to easily and conveniently handle the product.

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Packaging facilities the sale of a product. It serves as a quiet salesman. On the eve of Diwali, for instance, the sale of sweets, cookies, and other such things is boosted by their elegant and decorative packaging.

Labelling implies putting identification markers on the package of the goods. A label contains information about - the date of packing and expiry, weight or size of goods, ingredients used in the manufacture of the product, instructions for sale handling of the product, the price payable by the buyer etc.

vii. **Warehousing:** Storage, often known as warehousing, is a logistical operation that saves time by keeping items on hand from the point of production until the point at which the final consumers require them.

viii. **Transportation:** Transportation is that logistical process which creates place utility.

Transportation is needed for:

a. The transfer of raw materials from suppliers to the production facility.

b. Movement of ongoing projects throughout the plant.

c. Transfer of finished items from the factory to the end users.

8.8 SUMMARY

A distribution channel is a set of people and firms involved in the flow of title to a product as it moves from producer to ultimate consumer for the business user. A channel includes the producer, final customer and any middlemen that participate in the process. Distribution channels perform transactional functions, logistical functions and facilitating functions.

The distribution channel design decision can be broken down into six steps namely:

1. Identifying the need for channel design decision
2. Setting and organizing distribution objectives
3. Specify the distribution responsibilities
4. Develop alternate channel structures
5. Evaluate important variables
6. Choose the best channel structure

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Conflicts across distribution channels are one of the disadvantages of marketing a firm through many web channels. When you market your company through a multitude of sales channels, the risk of channel friction increases. In contrast to traditional retail, other resellers may easily determine the products you sell online, where you store them, and how much you charge, which might lead to disputes. especially when different stores are charging different prices for identical products to the same markets. Conflicts can be largely divided into three types: multichannel, vertical, and horizontal.

8.9 GLOSSARY

Channel of distribution: A distribution channel is a network of firms or middlemen that a commodity or service travels through before reaching the final consumer or buyer. Wholesalers, merchants, distributors, and even the internet are part of distribution channels.

Channel conflict: Any disagreement or conflict that could arise between two or more channel partners when one partner's decisions or actions have an impact on the other's financial results, sales, or market share is referred to as a channel conflict.

Retailing: Retailing is the practise of selling goods and specific services to customers. It typically involves a business established for that express purpose selling single units or small lots to numerous buyers.

Wholesaling: Purchasing items in bulk at a reduced cost from a manufacturer and selling them to a retailer at a higher price for them to repackage and then sell to customers in smaller quantities at an even higher price is known as wholesaling.

Logistics: The term "logistics" describes the total process of controlling the acquisition, storage, and delivery of resources to their intended location.

8.10 ANSWERS TO IN-TEXT QUESTIONS

Part A	Part B
Ans 2. i. False ii. True iii. False	Ans 2. i. True ii. True

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8.11 SELF-ASSESSMENT QUESTIONS

8 Enumerate six steps performed in the distribution channel design.

9 A new lemon soda manufacturing co. which has successfully launched its lemon drink in Delhi is planning to launch this product to three other cities. What kind of distribution channel would you recommend to them?

10 What are the different types of conflict in channel of distribution?

11 What are the effects of price battling?

12 Explain the different ways to control channel conflict.

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LESSON 9

PROMOTION

STRUCTURE

9.1 Learning Objectives
9.2 Introduction
9.3 Promotion
9.3.1 Definition
9.3.2 Role of Promotion Mix
9.3.3 Promotion Mix
9.3.4 AIDA model
9.4 Integrated Marketing
9.4.1 Definition
9.4.2 Communication process
9.4.3 Factors Influencing Promotion Mix
9.4.4 Social media platform
9.5 Summary
9.6 Answers to In-text Questions
9.7 Self-Assessment Questions
9.8 References
9.9 Suggested Readings

9.1 LEARNING OBJECTIVES

- ✓ Define the role of promotion mix
- ✓ Define the AIDA model to influence the consumers
- ✓ Describe to communication process
- ✓ Which type of factors are influence the promotion mix

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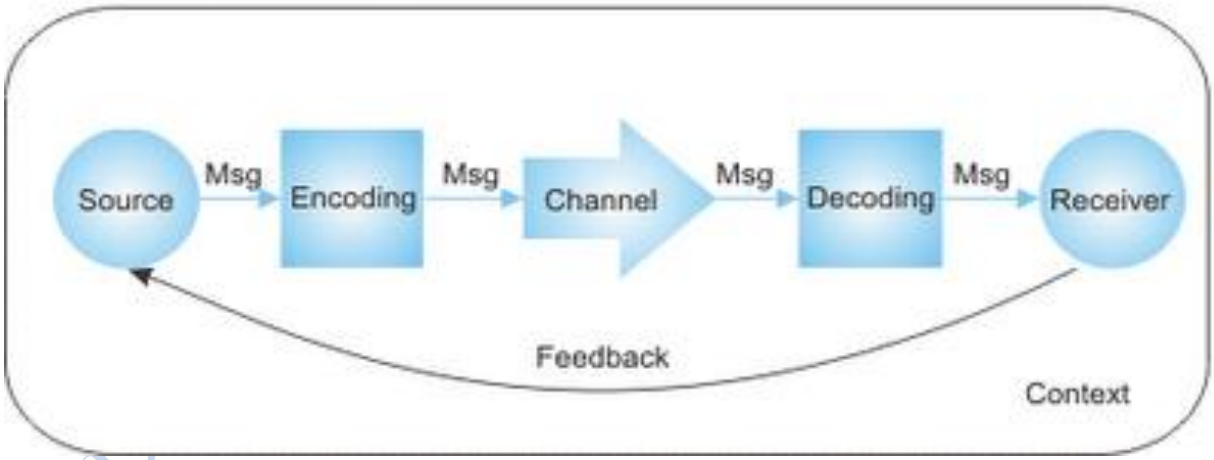
9.2 INTRODUCTION

Promotion is the important part of marketing mix, they are provided the quality information for customers in the target market, i.e., its share the features of the products, quality, price and availability of the goods in market. Marketing professionals are sharing the valuable suggestion for manufactures to related goods & services. The companies are depending on the customers interest and needs or wants of the products. The professional are share the market research related to particular product & services in the market.

"Giving the information to the target customers about the products / service that's called to promotion" promotional activities are create the demand in the market about the product/ services.

Promotion is a key element in marketing strategy. Marketing calls for more than developing a good product, pricing it correctly, and making it easily available to the customer. Product, price and distribution alone cannot create sufficient sales and profits for the organization. But promotion is an important role play to share the information for the potential customers and create the interest to purchase the goods and services.

The Communications Process



Sources: - google.com/communication images. com

The communication process contains five elements – the communicator, the message, the medium, the audience and feedback and can be summarized as:

Who……Says What……? In what way……To whom……. with what effect?

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We will be discussed about, how the model helps a marketing communicator to arrange effective messages and media for an intended audience. To do this effectively, we shall discuss the four elements not in the order of the message flow (from communicator to audience) but in terms of planning flow (from target audience backward through channels to the communicator). The communicator must start with the audience because it is the audience who determines what is to be said, how it is to be said, when it is to be the said, where it is to be said and who is to say it.

Promotion is a persuasive communication that inform potential customers of the existence of the products and persuades them that these products have want- satisfying capabilities. The communication process is the foundation of promotion. Let us, therefore, look at the process of communication as it is used in marketing.

In marketing management, the communicator is the manager who desires to promote his product. The audience is the target market segment. Feedback is the flow of communication information from the consumer to the marketing manager.

9.3 DEFINITION

Prof. Philip Kotler has defined promotion as, ***"Promotion includes all the activities the company undertakes the communication and promote its products to the target market."***

Prof. William J. Stanton has defined it as, ***"Promotion in the element in an organization marketing mix that serves to inform, persuade and remind the market of the organization and or its products."***

E. J. McCarthy has defined promotion as, ***"Promotion is any method of informing, persuading or reminding consumers, wholesalers, retailers, users or final consumers about the marketing mix of product, place and price which has been assembled by the marketing manager."***

The above- mentioned definitions make it clear that promotion is one of the important tools of marketing. It creates demand in target markets and gives information to the customers about the products & services. Promotion activities are the crucial part to share the information's make believe for the companies, enthusiasm or influence and remind the customers about manufacturing goods. These activities are positively impact on customer mind then now a day, every company and manufacturing firms are conduct these promotional activities in the market.

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Marketing communications can be defined as "the means by which firms attempt to inform, persuade, and remind customers—directly or indirectly—about the products and brands they sell. In a sense, marketing communications represent the 'voice' of the company and its brands and are a means by which it can establish a dialogue and build relationships with consumers.

9.3.1 Role of Promotion Mix

1. **Helpful to create the image in the customer mind: -** Promotion tools are very helpful to create the image in the consumer mind, because the companies are focused to create the awareness and share the information for the potential customers through any media channels or social media portals.
2. **Create the demand in the market: -** Promotion is helpful to create the demand in the market, today senior mostly peoples are used the social media portals and e-shopping portals through purchase the products. Promotion is helpful to create the awareness in consumers mind and prompted the product through social sites. Promotion is helpful to boost the sale in market. Nike is promoting the shoes for many social sites and blog & other promotion tools are used by the company, that only focus to create the interest related to our product.
3. **Brand Awareness: -** Promotion is main objective to create the brand awareness in consumers mind through the any media channels i.e., social media, Facebook, Instagram, e-commerce sites, blogs, amazon, flip kart etc. promotion are main point to attract the consumers, then appeal to purchase the articles.
4. **Create the interest: -** Promotion is advantageous, to create the interest in related to product/ services in consumer's mind. This is very important thing, which type of promotion are choose by the company, how much people are engaged to in this website or social sites. For example, in today, senior mostly companies are used to promote the product in online or social media portals Facebook, Instagram, YouTube, social media pages etc.
5. **Brand loyalty:** -Mostly companies are provided the special service for the specific customers. Brand loyalty is **perception-based (image and experience)**. Brand-loyal customers believe that a certain brand represents both higher quality and better service than any competitor—and the price does not matter. i.e., amazon provided the more discounts during the festival season. Diwali sale, seasonal sale but they are provided the special sales or coupons or other types of discounts only prime customers

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9.3.2 Promotion Mix

Promotion is an important element of the marketing mix for every business enterprise. It is the inspiration outlets of the marketing mix. It is a process of communication involving information, persuasion and influence. It has included all types of personal or non-personal communication with customers as well as middlemen in distribution.

Source (Google images .com)

Advertising

"Any paid form of non-personal prestation and promotion of ideas, goods, or services by an identified sponsor through the various media." (Richard F. Taflinger)

. American marketing association defines advertising as, "any paid form of non-personal presentation of ideas, goods or services by an identified sponsor". Advertising is a prime part of promotion mix. For example: - advertisements on the television and radio, and magazines etc. Mainly small businesses must choose the advertising to promote the product through the newspaper's ads, ratio, Tv ads, railway stations, Trains etc. to achieve the target audience.

1. **Public presentation: -**It should be advertising is a highly public mode of communication. Its public nature confers a kind of legitimacy to the product and suggests a standardized offering.
2. **Pervasiveness: -** Advertising is a pervasive medium that permits the seller to repeat his message many times. It also allows the buyer to receive and compare the messages of various competitors. Large-scale advertising by a selling, approximately positive regarding the seller's size, reputation and success.
3. **Amplified expressiveness: -** Advertisement are giving opportunities for overstating the companies and its products beyond the artful use of print, sound and colour.

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4. **Impersonality: -**As a non- personal tool, advertisement in spite of being public, pervasive and expressive, cannot be as compelling as a personal salesman. The audience does not feel obliged to pay attention or respond. Advertising is only able to carry on monologue, not a dialogue, with the audience.

Advertising sacrifices the effectiveness which is generated by feedback in personal selling -no-tailor -adjusted in this sales pitch, no probing for objections, etc. on the other hand, advertising is more efficient, it can reach many potential customers at relatively low cost. To some extent therefore, personal selling and advertising are complementary, rather than alternative, promotional media.

Personal Selling

"Personal presentation by the firms sales force for the purpose of making sales and building customer relationships". This is one of the oldest processes of promotional tools, in which the salesman is linked to directly for customers. It is a face -to – face communication between the company representative and customers, the company has main motive to manipulate the customers for purchase the goods and service. i.e., retail stores, business to consumers etc.

Personal confrontation: - personal selling includes an alive, immediate and collaborative relationship between two or one persons. Each party can observe at close hand the characteristics and needs of the other and make immediate adjustments

Cultivation: - Personal selling permits all kinds of relationship to spring up, ranging from a matter of fact selling relationship to a deep personal friendship.

Response: - Personal selling in contrast with advertising make the buyer real under some obligation for having listed to the sales talk or using up the salesman's time. He had a greater need to attend and respond, even if the response is a polite 'thank you'.

Personal selling is an effective tool. The salesman can observe the potential customer's behavior and change his sales talk to more closely match the customer's wants and desires. He can point out the specific advantages of his product, probe objections and answer them, and ask directly for the sale. But this effectiveness is often purchased at high cost in efficiency. One -to-one relationships are relatively expensive.

Sales Promotion

"Sales promotion are short term incentives to increase sales of product or service for specific period. Generally, Companies are providing the exclusive discounts, sales promotion schemes during special occasions or festival seasons by customers i.e., discounts, coupons,

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payback offers, freebies etc. are the sales promotion schemes. During the sales promotion, the company has earned the more profits on short terms periods, by attracting the new and existing customers., Diwali sales, Season sales, Discounts, Coupons, Buy get 1free, promote the new product in the market, Promote the unsold inventory etc.

American marketing association defines sales promotion as those activities, other than personal selling, advertising & publicity that stimulate consumer purchasing and dealer effectiveness, such as display, shows and exhibitions, demonstrations, and various non-recurring selling efforts not in the ordinary routine.

1. **Insistence presence:** Many sales promotion tools have an attention -getting, some-tomes urgent, quality that can break through habits of buyer inertia towards a particular product.
2. **Product demeaning: -** some tools are suggested that the seller is anxious for their sale. If they are used too frequently or carelessly, they may lead buyers to wonder whether the product class or brand is desirable or reasonably priced.

The term sales promotion is a catchall for a wide variety of promotional activities. But this category cannot be overlooked. i.e., product samples, coupons, premium etc. sales promotions often supplement advertising and personal selling to complete the promotion task by capitalizing on the consumer interest and product knowledge generated by these media. i.e., free samples complement advertising in new product introductions. Therefore, sales promotion plays an integral part in the total promotional program of an organization.

Public Relations

"Building good relations with the company's various publics obtaining favorable publicity, Building the good image in the company, handing, or heading off the unfavorable rumors, stories, and events". (Business Queensland.com)

Public relations tools are extremely helpful to reach the target audience and having their attention using the media channels i.e., news, word of mouth, government announcements etc. Trustable sources, brand oriented communication message, two-way communication, Press release, Sponsorship, event, web pages etc.

Direct Marketing

Direct marketing is different from personal selling. Though even in direct marketing direct contact with the customer is important, normally it doesn't involve a highly personalised sales pitch. Direct marketing refers to a tool of promotion strategy where marketer builds

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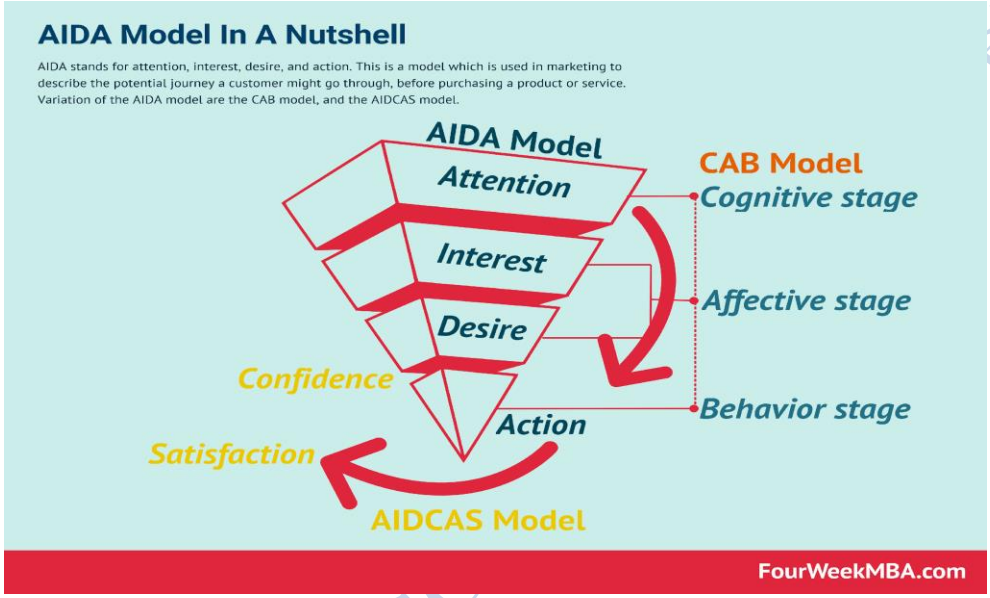
lasting relationship with the customer and receive immediate response from the customers directly. In direct marketing excludes indirect medium like wholesalers and retailer. The information received by a customer through news tends to influence customers better than the advertisement.

9.3.4 AIDA Model



(Fig-1.3)

The marketer may be seeking a cognitive, effective, or behavioral response from the target audience.

Cognitive response: - the marketer may want to put something into the consumer's mind.

Affective response: - the marketer may want to change the consumer's attitude.

Behavioral response: - the marketer may want to get the consumer to undertake a specific action. Here there are four best known response hierarchy models. There are: -

A. The AIDA model shows the buyer as passing through awareness, interest, desire and action.

B. The 'communication' model shows the buyers as passing through exposure, reception, cognitive response, attitude, intention, and behavior.

C. The "hierarchy -of- effects" models show the buyers as passing through awareness, knowledge, liking, preference, conviction, and purchase.

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D. The "innovation-adoption" model shows the buyer as passing through awareness, interest, evaluation, trial and adoption. The six elements of hierarchy ---effects' model are as follow: -

1. **Awareness:** - if most of the target audience is unaware of the object, the communicator's nob is to build awareness.
2. **Knowledge: -** the target audience might have company or product awareness but not know much more. Here objective is to build up product knowledge.
3. **Liking:** - I f the target audience knows the object then the communicator should know the feelings of the audience (Whether favorable or unfavorable outlook).
4. **Preference:** - The target audience might like the product but not prefer it to others. In this case the communicator tries to build consumer preference. The communicator can check on the campaign's success by remeasuring the audience's preferences after the campaign.
5. **Conviction: -** A target audience might prefer a particular product but not develop a conviction about buying it. The communicator should try to convince the target audience.
6. **Purchase: -** Some members of the target audience, might have conviction but quite get around to making the purchase. They may be waiting for additional information, plan to act later and so on. The communicator must lead these consumers to take the final step. Some of the purchase -producing devices are offering the product at a low price, offering a premium, offering an opportunity to try it on a limited basis, or indicating that it will soon be available.
7. Examples:- a company that took a multi-pronged approach, and an unexpected creative campaign, to create a awareness about their new product:

   Most of the differences among these models are semantic. They all see the buyer as having to pass through a cognitive stage, an affective stage and an action stage. Each stage is represented by one or two terms; two are used to express a difference between a weak and strong response in the stage.

   i.e., knowledge is stronger than simple awareness in the cognitive stage, preference is stronger than liking in the affective stage and adoption is stronger than trial in the action stage.

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All these models assume that each succeeding stage implies a higher probability that the person will purchase the product. In general, people may go backward as well as forward, and skip around. Although being is one stage is neither nor sufficient condition for moving to another, but the communicator will generally want to identify the stage his audience is in and tailor his message be desirable: if the audience is aware of the brand, then arguments for its superiority are required to be communicated and if the audience has already tried the brand, then supportive and reminder communications are called for.

IN-TEXT QUESTIONS

1. _____ are the key elements of promotion mix

   A) Advertising and sales promotion
   B) Publicity and public relations
   C) Direct marketing and personal selling
   D) All of the above

2. Which of the following marketing mix activity is most closely associated with newsletters, catalogues and invitations to organization- sponsored events?

   A) Pricing
   B) Promotion
   C) Distribution
   D) Product

9.4 INTEGRATED MARKETING

Integrated marketing communication concepts, the company has participated and manages its many communications channels to deliver a clear and consistent message. It aims to ensure the consistency of the message and the complementary use of media.

Integrated marketing communication is a multi-disciplinary promotional area, these are included in old and new media practices. It is a part of holistic marketing approach, and they are helpful to make the marketing strategy within the context of larger aims of the organizations and business development s and maintain the needs. Using by the IMC theories and strategies, marketing specialists, public relations directors, brand managers, digital media associates, social media marketers, and other media professionals can create, execute and track multi-channel advertising and communication message that reach the target audience and influence the specificity audience. i.e., websites display advertisements, blogs, search engine optimization, newspapers, magazine and more.

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The company has used the marketing tools and approaches for specific reasons, reach the target audience through the social media, maximize impact of consumers mind and resulting in maximum profit at minimum cost. It uses several innovative ways to ensure that the customer gets the right message at the right place and right time.

9.4.1 Definition

According to Philip Kotler, the integrated marketing communications process **involves creating, communicating, and delivering value for consumers such that the 'whole is more than the sum of parts'**.

Simple definitions to own words

"Integrated marketing is **a strategy for delivering a unified message across all the marketing channels your brand uses**. It provides consistency wherever customers choose to interact with a company. Without an integrated marketing strategy, you risk delivering mixed messages or communicating in a disconnected voice"

"Integrated Marketing is a strategic approach to integrating communications and interactive experiences targeting defined audiences and individuals which coordinates all aspects of marketing of a brand, including:

- **Paid media** (offline advertising, direct marketing, and online display and programmatic);
- **Earned media** (Organic search fuel led by content marketing, PR (Public Relations) and online influencer outreach)
- **Owned media** (including social media, on-site UX, customer service and direct messaging through email and mobile)

in order achieve consistent messaging customized where possible by channel which presents a unified and seamless experience to consumers across the customer lifecycle or path to purchase".

Plan and optimize your Omni channel digital marketing strategy using The Race Framework to structure your digital media, digital experiences, and digital data.

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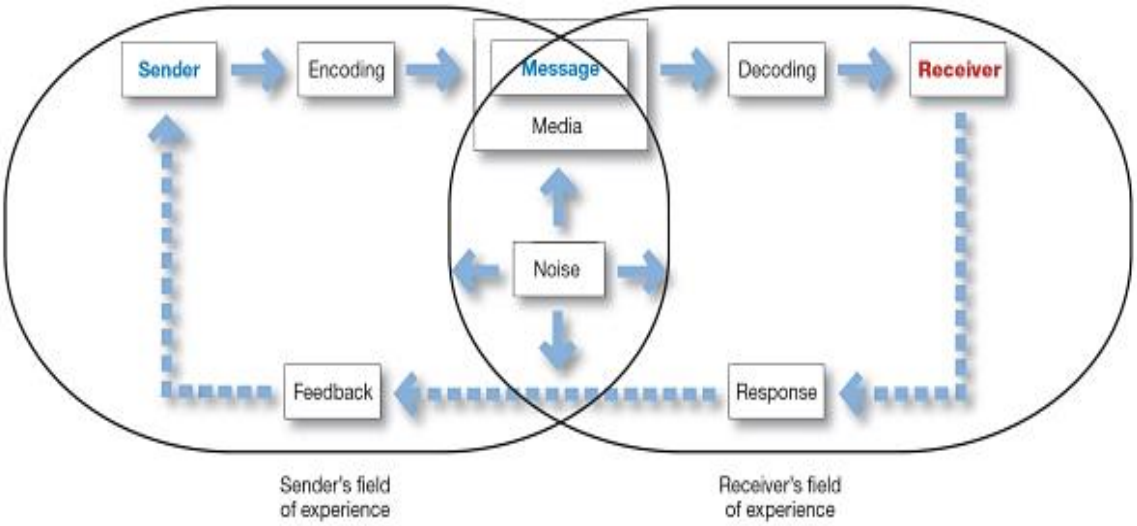
9.4.2 Communication Process



Source: - Integrated marketing communication process, Philp Kotler, Principles of Marketing

Fig :- 1.4

This is a two ways communication process, one person is sharing the information for other person, that is called Integrated marketing communication

1. **Sender: -** A Sender is the person who initiates, generates, and sends the message. He is representing the sources of message. The communication process begins when the sender develops an idea or message that he wants to transmit. He arranges the ideas in a manner that can be understood by the receiver. A teacher delivering a lecture in the classroom is the sender of the message.

   The sender is sending the information for other party, that is called to sender.

2. **Encoding: -** Transferred the message in the code form i.e., words, symbols, pictures and signs and body gestures etc., Because no two people interpret information in the exact same way, the sender must be careful to choose words, symbols and gestures that are commonly understood to reduce the chances of misunderstanding. Therefore, a sender must be aware of the receiver's communication skills, attitudes, skills, experiences, and culture to ensure clear communication.

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3. **Message: -**encoding has finished than next one is message mode; Senders gets the message that he intends to convey. The message is a written, sign, symbol, silent and body gestures or in different forms of message triggers the response of a receiver.

   A message is the idea or information that the sender wants to convey. He may convey it verbally (by writing or speaking) or non-verbally (through gestures or body language). Whatever the form, the message should be clearly formed so that the objective is accomplished

4. **Communication channels: -** which types of channels are used by the person, message can attempt to convey the information, alter perceptions, stimulate desires, produce conviction, direct attention, and provide reassurance. The choice of message depends on the state the audience is in, each type of message works on a separate set of principles.

5. **Decoding** – When the message reaches the receiver, the message must be decoded into its intended meaning. Therefore, the receiver must translate the words, symbols, and gestures as the sender intended. Because no two people interpret information in the exact same way, incorrectly decoding a message can lead to misunderstanding. Successful decoding is more likely when the receiver creates a receptive environment and ignores distractions. Alert receivers strive to understand both verbal and nonverbal cues, avoid prejudging the message, and expect to learn from the communication.

6. **Receiver: -** The receiver is the person or group for whom the communication effort is intended. The message must be crafted with the receiver's background in mind. An engineer in a microchip manufacturing company, for example- might have to avoid using technical terms in a communication with someone in the company's advertising department; for the same reason, the person in advertising might find engineers unreceptive to communications about demographics. If the message does not reach the receiver, communication has not taken place. The situation is not much improved if the message reaches the receiver, but the receiver does not understand it.

9.4.3 Factors Influencing Promotion Mix

Type of the product; -

The types of products are helpful to companies, and which types of promotion tools are best for promoting the product in the market. Companies are divided in different types of products, first one is branded product and second is non- branded products, luxury products,

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necessary products, new product etc., all these types of products required to different types of promotion tools in promote in the market. I.e., advertising is suitable for branded and popular product. Personal selling is fit for non-branded product in the market. Advertising, personal selling, sales promotion and publicity – four types of promotion tools are required to launch the product in market by company.

Use of the product: -

Product may be defined as an industrial product (Raw materials), consumable product (basic products), luxurious product (Gold, diamond) these types of products must be need for promotional tools. They are depending on the promotion tools. i.e., advertising and sales promotion techniques are widely used for consumer goods while personal selling is used for industrial goods.

Purchase, quantity and frequency

Companies are considered, which types of goods are mostly preferred or purchase by the consumers, that's an important point, how much quantity are mostly preferred by the consumers. Then companies are decided to which kinds of goods are needed to promotion tools. Infrequency buying the goods by the consumers. Investigators are indicated that individual selling and sales promotion methods used by the companies to sell the goods in the market.

Fund available in the market Promotion: -

Financial conditional of the company is crucial impact on the promotion tools. Advertising through the Television ratio, digital marketing, social media, campaign this is very costly promotion tools. Companies have not financial conditional good that is not bear to these types of promotion tools. They are chosen to personal selling and any other cheaper tools to promote the product in the market.

Mostly companies are focus to which types of promotional tools are used to promote the product in market. Advertising or publicity (organized the evets, trial etc.) this is too much costly promotion mix.

Types of the market

Consumer characteristics are defined, which types of audience are livelihood in near the market area. these factors are also helpful to influence the promotion mix, Demographical factors, (education, age, lifestyle capacity, knowledge, personality of the consumers)

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Geographical factors (locations, areas) these types of factors are very helpful to make the strategy for successful business.

Stage of the product life: The promotion mix changes as the product moves along its life cycle. During the introduction stage of the product in the market, the principles and objective stage of the promotion is too helpful to create a demand by highlighting the product features, utility etc. Promotion mix are helpful to launch the product in the market, advertising and publicity is way to convey the message for potential consumers. Each stages pose different threats and opportunities. Each stage is different strategies in sperate marketing stages.

Identify the target audience: A marketing communicator must start with a clear target audience in mind. The audience may be potential buyers of the company's products, current users decides or influencers. The audience may be individuals, groups, particular publics, or the general public. The target audience will influence significantly the communicators decisions on what is to be said, how it is be said, who is to say it, where it is to be said and who I to say. The communicator should research the audience's needs attitudes, preferences, and other characteristics in order to establish the audience's current image of the object.

Images is the set of beliefs, ideas and impressions that a person holds of an object. The first step is to measure the target audience's familiarity with the object. Respondents who are familiar with the product should be asked how favorable they feel towards it. The marketer should then know the desired image in contrast to the current image, (in terms of resources & reality).

Selecting the communication channel: Once the target audiences are identified, the communicator can think about the specific channels for reaching them. Channels of the influence are two based types personal, non- personal.

i. Personal (expert channels, social channels)

ii. Non- personal (Mass and selective media, atmospheres, events)

Personal influence channels are means to direct inter-personal contact with the target individual or groups. These personal influence channels can be distinguished- advocate or representative or salesman of the company, they have personal contact, connection for the company. They are important role to influence the consumer to purchase the articles. Expert channels consist of independent persons, exercising an influence on the buyer by dint of their expertise. Social media channels consist of the buyer's associates, neighbors, friends or family who may exercise an influence on him.

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Non- personal influence channels are media that carry influence without involving interpersonal contact. Three types of non-personal media can be described, mass and selective media is related to newspapers, magazines, television, radio and billboards that people might buy or perceive. Mass media are aimed at large, often undifferentiated audience, selective media are more specialized in reach and focus. Atmospheres are designed environments calculated to create positive feelings in persons regarding a company or product.

9.4.4 Social Media Platform

Social media marketing is strong way to convey the message for the target audience. People find, learn about, follow and shop from branding product or create the awareness, this is platform to convey the message for potential consumers., Facebook, Instagram, LinkedIn Social media is helpful to bring remarkable success to your business, creating devoted brand advocates and even driving leads and sales.

Social media benefits: -

Over 70% of populations are used to social media through the smartphones, and peoples have positive experience with a business on social media will recommend that business to their networks.

Facebook users click on 12 Facebook ads on average every month.

81% of the population is use Instagram to research products and services.

IN-TEXT QUESTIONS

3. Which of the following consumer promotion tools is the most effective, but most expensive, way to introduce a new product?
   A) Coupons B) Price Packs
   c) Contents D) Samples
4. Which tool of the promotional mix consist od short-term incentives to encourage the purchase or sale of a product or service?
   A) Advertising B) Public relations
   C) Direct marketing D) Sales Promotion

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9.5 SUMMARY

Promotional activities are important role play to influence the consumers buying behavior, these activities are helpful to convey the message for potential buyers. Promotion is a important part of marketing mix, they are helpful to share the quality information for the target customer in the market, i.e., ., its share the features of the products, quality, price and availability of the goods in market. Marketing experts providing the useful suggestion for the manufactures related to products for according to customers interest & needs and wants for exploring the markets. Promotion mix- advertising, social media marketing, publicity, public relationship, direct marketing.

The model of AIDA is defined that, they are helpful to create the awareness related to goods in the consumers mind, promotion is beneficial to create the interest in consumers mind, and build up the knowledge, liking, preference, conviction, and purchase. In today scenario, social media promotion is very effective to manipulate the consumers, because 70% peoples are used to social site, i.e., Facebook, Instagram, twitter, LinkedIn etc. Communication process is important role play to convey the message, because which types of tools are used by the company to convey the message for potential buyers.

9.6 ANSWERS TO IN-TEXT QUESTIONS

1.All of the Above

2. Promotion

3. Samples

4. Sales Promotion

9.7 SELF-ASSESSMENT QUESTIONS

1. What does the promotion mix, which factors are influenced to motivate to purchase power?
2. Which types of factors are more influences the promotion mix activities?
3. What is the integrated marketing?
4. What is the communication and explain the process of communications

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LESSON 10

TRENDS IN MARKETING: SERVICE MARKETING, SOCIAL MEDIA MARKETING, GREEN MARKETING, CUSTOMER RELATIONSHIP MANAGEMENT, RURAL MARKETING, OTHER EMERGING TRENDS

STRUCTURE

10.1 Learning Outcomes
10.2 Introduction
10.3 Service Marketing
- 10.3.1 Concept of Service
- 10.3.2 Difference between Goods and Services
- 10.3.3 The 7Ps of Service Marketing

10.4 Social Media marketing
- 10.4.1 Tools for social media marketing
- 10.4.2 Importance of social media marketing

10.5 Green Marketing
- 10.5.1 Green Product and its Characteristics
- 10.5.2 Reasons for Going Green

10.6 Relationship Marketing
- 10.6.1 Relationship Marketing Process
- 10.6.2 Customer Relationship Management (CRM)

10.7 Rural Marketing
- 10.7.1 Rural Consumers
- 10.7.2 Marketing Mix for Rural India

10.8. Some other concepts in Marketing
10.9 Summary
10.10 Exercises
10.11 Glossary
10.12 References

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10.1 LEARNING OBJECTIVES

After studying this lesson, you should be able to:

- ✓ Understand the concept of services marketing and its importance.
- ✓ Understanding social media marketing
- ✓ Understand the concept of green products, green marketing and marketing mix.
- ✓ Gain insight about the concept and growing importance of relationship marketing.
- ✓ appreciate the concept of CRM.
- ✓ Understand the concept of rural marketing and its growing importance and challenges it poses to marketers.
- ✓ Develop understanding regarding the marketing mix for rural India.
- ✓ Appreciate some of the recent concepts in marketing.

10.2 INTRODUCTION

Marketing is a vital ingredient for business success. It affects our day-to-day life in a significant manner. The concept of marketing has broadened from being associated with pushing the products to consumers, to understanding the needs of consumers and building long term relationships with them. The marketer can reach customers 24X7 via mail, smart phones or even through social media accounts. So the marketer is no more limited to his shop. This chapter discusses some of the most important trends in the field of marketing. The growth of online marketing, increasing focus on rural markets, rising concern for green products and focus on building long term relationships with customers are a few of the visible changes in the life of a marketer.

10.3 SERVICE MARKETING

Services marketing is "**a form of marketing businesses that provide a service to their customers to increase brand awareness and sales"**. Service marketing is different from product marketing in the fact that it focuses on promoting and advertising intangible products. For example, Imagine a advertisement showing a stay at a Club Mahindra resort, the advertisement would focus on the various aspects of the stay like the lush green resort, room service, ad on services like pool and spas. The ad would capture the happiness and

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excitement of a consumer staying at the resort, so that element of intangibility which cannot be touched liked a product but can be felt would come under the purview of service marketing. Hence, Service marketing is a marketing concept which takes into view the business of non-physical intangible goods. It is done for company given benefits which cannot be seen, touched, felt etc. The benefits given to the customers are taken up mostly by people, process & cannot be kept by a customer. Sectors like hospitality, tourism, financial services

ACTIVITY

In the category mentioned above, identify companies falling into product and service category.

10.3.1 Concept of Service

A service can be defined as "any act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything." Its production may or may not be tied to a physical product. From the organization's view point, service is a process, but it is an experience for the customers. To move ahead and dwell deep into the concept of service marketing it is very important for us to understand the basic difference between a product and a service. The major differences between the two are tabulated below in the form of a table. It is very important for a marketer to have a clear understanding of the difference between the two so that he is able to easily and effectively market the product to the target audience.

Think of any 10 things that you see or buy in the market. Based on your understanding of product and service, classify them into the relevant category. Analyze the target segment that the marketer has tried to target.

10.3.2. Difference between a product and service

Product is tangible while service is intangible. Product is perishable while the services are non-perishable. There is a uniformity while we talk of products, services might vary from person to person and service to service.

10.3.3 Marketing Mix for Service marketing

In the previous chapters we have talked about the marketing mix for a product which consists of 4Ps namely Product, Price, Place and Promotion. In a service marketing mix we have 3 more additional Ps namely People, Physical Evidence and Perishability. Let us now discuss all the Ps of service marketing in detail.

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1. **Product:** In service marketing products can be viewed as some asset plus a process around it. When you book a hotel room for a night you use the hotel room for an evening (the asset). But you also undergo a series of processes such as checking-in, checking-out, and having your luggage brought up to the room etc.
2. **Price:** It is the amount of money a customer is willing to spend for a particular service. Pricing is slightly tricky as compared to product pricing because of a variety of reasons or factors. For example, the price of the room will depend upon the season, group bookings, peak season etc.
3. **Place:** Place in service marketing refers to ease of access that the customer has to the service. In the example that we have been discussing it refers to the channel through which hotel booking is done, like is it done through an online site or some travel agent or through the hotel itself.
4. **Promotion:** Promotion refers to the different ways you communicate, describe, and advertise your product. Since services are intangible it is difficult to promote services. Various methods used to promote services are celebrity appeals, testimonials, warranty etc.
5. **Physical evidence:** It refers to the tangible elements which are involved with the delivery of services like companies' website, accounts, business cards, logos, equipment, brochures etc. in the above case the hotel building would come under the physical evidence.
6. **Process:** Process refers to the procedures and flow of activities that occur when the customer and the business interact with each other. The processes are well defined and written in a document called as the standard operating procedure. For example, when a customer enters the hotel, a process is initiated, when he checks out a process is initiated etc.
7. **People:** People in service marketing are the resources which are required to complete or service or through whom a customer will interact. For example, when a customer enters a hotel, he will interact with the front desk first followed by other people. It is very important to train the staff well.

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Case Study

Mr. Walter Sullivan (owner of the Sullivan Auto World) has purchased small Ford dealership in 1983, after the many years; the dealership built their good reputation as one of the best in city. In 1999, he decided to move locations of dealership to more populated area closer to major intersections. With sudden death of Mr. Walter at the age of 56 years, her younger daughter Ms. Carol Sullivan who is health care manager by profession taken over the charge of family business and which is not running well these days, profit margins continuously decrease over the years due to increase in fuel prices, interest rates, mainly poor performance of the service department. Ms. Carol wonders whether a turnaround is possible.

Q.1 How is marketing of cars different from marketing of services?

Q.2 Compare and contrast the sales and service department of Auto World.

Q.3 From a Customer's Perspective, What Useful Parallels Do You See Between Running a Car Sales and Service Dealership and Managing Health Care Services

10.4 SOCIAL MEDIA MARKETING

Social media marketing is about creating and promoting content about your product or service through various social media platforms. Social media marketing is all about interacting with your target audience and customers. There are a variety of platforms through which social media marketing can be done. All major platforms are represented in the table below:

10.4.1 Tools for social media marketing:

Facebook	**Twitter**	**LinkedIn**	**Instagram**
1.9 billion active users	211 million active users	774 million active users	1 billion active users
Best for brand awareness and branding	Best for Public relations; customer service; community building	B2B relationships, business development, and social selling	High-quality images and videos; user-generated content; advertising
Audience is an even spread of Generation X and Millennials	Audience is Primarily Millennials	Audience is Baby boomers, Generation X, and Millennial	Primarily Millennials

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Table 2.1: Table showing comparison of the mostly widely used social media platforms.

10.4.2 Importance of Social Media Marketing

Social Media marketing is gaining importance in today's time because of the following reasons:

- It helps in building a stronger audience and customers for the business.
- It helps in the generation of more leads and conversions.
- It helps you to give a regular update on your competitors
- It is a cost-effective tool for marketing and promotions.

Examples of companies adopting successful social media campaigns

1. Mercedes Benz – Repeated and successful marketing campaigns

Mercedes Benz to keep the car selling, so they really worked hard on their social media campaigns. The best one goes back to 2013 when the company believed to have the best campaigns. Mercedes wanted to reach out to younger audience and hence they hired five top Instagram photographers to take the wheel of new Mercedes CLA and this campaign really worked well. By the end of the campaign Mercedes received 87,000,000 organic Instagram impressions, 2,000000 Instagram likes and 150 new marketing assets.

Oreo : Smart content planning and timely delivery

Oreo is another brand known for their creative social media marketing. They have a big design team to produce the content. They are consistent with their branding and manage to catch real time events. The twitter campaign done by them are the best. The campaign Power out was retweeted 15,000 times.

Q. You have been appointed as the social media manager for a new firm selling ethnic bags. Create a social media campaign for the same. What platforms will you use for the same.

10.5 GREEN MARKETING

American Marketing Association defines green marketing as: "the marketing of products that are presumed to be environmentally safe."

As per Businessdictionary.com green marketing "Promotional activities aimed at taking advantage of the changing consumer attitudes toward a brand. These changes are increasingly

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being influenced by a firm's policies and practices that affect the quality of the environment and reflect the level of its concern for the community."

Green marketing "involves development and promotion of products and services that are capable of satisfying customer's wants and need for quality, performance, affordable pricing and convenience without having any detrimental effect on the environment"

The concept of green marketing has grown over a period of time. Initially it was known as the ecological green marketing. Green consumerism refers to "recycling, purchasing and using eco-friendly products that minimize the damage to the environment." This involves decisions such as using energy star appliances consuming less power, using alternate sources of energy like solar, wind to generate electricity, not using plastic bags, car pooling, water harvesting, buying hybrid cars that emit less carbon dioxide, buying locally grown vegetables and fruits.

10.5.1 **Green products and characteristics of green products**

A green product is a "sustainable product designed to minimize its environmental impacts during its whole life-cycle and even after it's of no use". These products have two major goals of reducing waste and improving resource efficiency.

Characteristics of a green product are:

- Grown without toxic chemicals
- Can be recycled, reused and is biodegradable in nature
- Packaging is eco friendly
- Less resources are used
- Are Eco efficient
- Has carbon and plastic footprint.
- In the usual scenario, brands producing green products use green marketing to communicate their value proposition to the market.

Advantages Of Going Green to The Brands

Diversification of products and markets: Developing green products opens the doors to a new segment who are willing to buy green products at a higher price also.

Competitive Advantage: Going green helps to achieve a competitive advantage.

Positive Public Image: When a brand does something for the society and the environment, its brand image automatically enhances.

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Brand Loyalty: Consumers have a higher brand loyalty for such brands since they attach an emotion or sentiment towards it.

Examples of company showing green marketing

British petroleum (BP) displays gas station which its sunflower motif and boasts of putting money into solar power. Indian Tobacco Company has introduced environmental-friendly papers and boards, which are free of elemental chlorine. Toyota is trying to push gas/electric hybrid technology into much of its product line. It is also making the single largest R&D investment in the every-elusive hydrogen car and promoting itself as the first eco-friendly car company. International business machines Corporation (IBM) has revealed a portfolio of green retail store technologies and services to help retailers improve energy efficiency in their IT operations. The center piece of this portfolio is the IBM Sur epos 700, a point-of-sale system that, according to IBM, reduces power consumption by 36% or more. We even see the names of retail outlets like "Reliance Fresh", Fresh@Namdhari Fresh and Desi, which while selling fresh vegetables and fruits, transmit an innate communication of green marketing.

Case Study: Coca-Cola: A Case Study In Sustainability

How does Coca-Cola integrate sustainability into their operations? For several years its facility in Brampton, Ontario, one of its largest in North America, has been transforming its manufacturing and distribution to save energy, reduce carbon footprint, water usage, and material usage. In this case study we look at the goals, implementation, and progress of the programs put in place by this $20 billion food and beverage giant.

Coca-Cola‘s 600,000 square foot facility in Brampton houses the plant, management team, and warehouse. It has three plastic bottling lines, including a Dasani line; one bag-in-box line producing syrup for national accounts; one pre-mix line for the restaurant business, and one canning line. There are 650 plant operators, sales and equipment service representatives, truck drivers, warehouse employees, management and staff.

Located within the eco-business zone around Toronto Pearson International Airport, Coca-Cola in Brampton joins the local community of businesses to collaborate on green projects. Under the stewardship of Partners in Project Green, businesses participate in programs to reduce energy and resource costs, uncover new business opportunities, and address everyday operational challenges in a green and cost-effective manner. Other companies in this program include Xerox, Unilever, FedEx, Hewlett-Packard, Walmart, Kraft, and Loyalty One.

Social and environmental risks are now one of seven business risk categories and are formally embedded into Coca-Cola’s enterprise risk management process. This in turn guides

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the business processes, including annual planning, three-year business planning, and internal audit planning. As a result, sustainability decisions are becoming an integral part of the business decision making, commercialization and capital management processes, the three-year business planning process, and customer and supplier relationships. Highlighted here are some of their goals, implementation, and progress.

Energy Conservation and Climate Change

The goal is to reduce the overall carbon footprint of our business operations by 15 percent by 2020, as compared to the 2007 baseline.

The Brampton operation converted to an energy efficient lighting system that uses 50% less energy and provides 50% more light. These new fixtures also operate on motion sensors for even greater savings.

In the distribution channels, the company has installed 2000 EMS-55 energy management devices in vending machines. These devices activate lights and adjust cooling based on use, leading to improved energy efficiency by up to 35 percent.

In addition, the company installed 1,400 climate-friendly coolers at the 2010 Olympic Games to reduce greenhouse gas emissions by approximately 5,600 metric tons, the equivalent of taking about 1,200 cars off the road for an entire year.

Finally, 37 heavy-duty hybrid delivery trucks and tractors were introduced to the Canadian fleet in 2008 and 2009. These vehicles improve fuel consumption and reduce emissions by about one third and create less noise and emissions when stopped in traffic.

Water Usage

The goal is to establish a water-sustainable operation to minimize water use and have a water-neutral impact on the local communities by safely returning the amount of water used in the beverages to the local communities and environment.

A 20% reduction in water use, accompanied by an efficiency ratio of 1.62 liters was achieved between 2005 and 2007. Plant teams focused on: 1) reducing the water use ratio; and 2) recycling the water used in operations (wastewater treatment).

To help reach its water usage goals the company developed and used a water conservation toolkit to identify actions that would conserve water. It implemented recycle and reclaim water loops through the plant's membrane water treatment system. And it installed a new osmotic water recovery system designed to reclaim nearly 11 million liters of water for production. In addition water based container rinses were replaced with ionized air rinses and

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the lubrication system on all production lines was retrofitted to discontinue water use, saving approximately 28 million liters of water annually.

Sustainable Packaging and Recycling

The goals are to: (1) avoid the use of 100,000 metric tons of packaging materials between 2007 and 2010, (2) recycle or recover more than 90% of waste materials at production facilities by 2010, (3) increase recycled content in plastic (PET) bottles to an average of 10% by 2010.

For goal (1), Dasani PET bottle weight was reduced by 30%, saving 493 metric tons of PET. Plastic twist-off closures were designed 24% lighter, saving 235 metric tons of resin. Also, lighter fiberboard was developed for Minute Maid products saving 124 metric tons of fiberboard annually. The company also launched the Plant Bottle, a 100% recyclable packaging made with up to 30% plant-based waste materials.

Goal (2) was achieved in 2009, ahead of schedule. The team also implemented a centralized recycling initiative that captures broken, damaged or expired product packaging from satellite facilities to be baled and sold to an industrial recycler.

Investments were made to achieve green innovations in recycling technologies, renewable packaging materials, vending and cooling equipment controls and design, and hybrid trucks.

Among the tools used was a proprietary packaging database to identify opportunities for future packaging material reductions and to benchmark performance against the global Coca-Cola system. See here for more on sustainable packaging.

The Coca-Cola operation in Brampton has shown that there are advantages to thinking "outside the box". By respecting the finite nature of the earth's water and resources the operation is implementing innovative business practices and contributing to the sustainability of communities while meeting the expectations of its stakeholders.

Source: https://www.environmentalleader.com/2011/08/coca-cola-a-case-study-in-sustainability/

10.6 RELATIONSHIP MARKETING

"Relationship marketing is a strategy designed to foster customer loyalty, interaction and long-term engagement. It is designed to develop strong connections with customers by providing them with information directly suited to their needs and interests and by promoting open communication." The four components of relationship marketing are:

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- Satisfaction
- Loyalty
- Profitability
- Customer retention

When the competition is high, and the customers are aware, the organizations cannot just rely on selling their products or services to then. The customers always look for the organizations which provide an added value or advantage to them along with the product or service.

10.6.1 Importance of Relationship Marketing

1.Increase in Sales Volume: Increased customer experience results in cross selling and upselling thereby increasing the sales.

2.Creates Brand Image: A satisfied customer will promote the product or service among circles thereby creating a better brand image.

3.Customer Retention: Acquiring a customer, providing value to him and retaining him can be done with the help of relationship marketing.

4.Gain a Competitive Edge: A loyal customer feels comfortable buying goods or services from one single store rather than shopping around at various places. This is an advantage for the organization over its competitors.

10.6.2 **Customer Relationship Management**

Customer relationship management (CRM) refers to "the principles, practices, and guidelines that an organization follows when interacting with its customers. From the organization's point of view, this entire relationship encompasses direct interactions with customers, such as sales and service-related processes, forecasting, and the analysis of customer trends and behaviors. Ultimately, CRM serves to enhance the customer's overall experience"

Before understanding about what CRM Technology should be used, we should know and understand the difference between CRM technology and CRM strategy which is defined as below:

CRM Technology: It works as a central place where major customer information can be organized, used, securely shared and acquired.

CRM Strategy: These are the processes that organizations put in place to standardize and optimize the way CRM technology is used

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10.6.3 How to lay the foundation of CRM strategy for the organisation

There are 4 steps which would help in identifying the system for CRM:

- Identify internal challenges: Identify hurdles and bottlenecks that your consumers might have to face.
- Map the customer journey: Document how your prospects find you, interact with your brand and consume your content.
- Define your metrics: Define metrics for your sales
- Business Milestones: While finalizing any CRM look for any product launches that you might think of

Examples of companies showing successful CRM strategy:

1. Westfield: Westfield's business is all about selling. The company, which owns and operates 100+ shopping centers worldwide, is expert in helping retailers build thriving businesses. Westfield's own business is also flourishing because of a custom lease management app built on App Cloud that lets the company do more to help its customers meet their goals. Westfield's specialty leasing group which sells retail carts, kiosks, temporary stores, sponsorships, and brand activations, as well as trade shows and other special events wanted to improve the way its sales reps find and showcase inventory to customers so they could close more deals, faster.

2. Best technology services: In an industry that competes primarily on costs, Best Technology Services competes based on its incredible reach. The IT services firm delivers more than 250,000 field service jobs a year throughout Australia – even in the most remote locations. And while its competitors rely heavily on partners and subcontractors, Best Technology Services subcontracts less than 1% of its jobs.The firm has a 300-strong team that stretches from Sydney to Perth, covering all the regional areas in between. Today, these technicians are all connected on Salesforce Field Service. So, whether a customer requires a onetime installation or 700 branch upgrade, Best Technology Services can ensure consistent results.

Source: https://www.salesforce.com/in/crm/examples/

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You own a tech-based company. Create a CRM strategy for the same.

10.7 RURAL MARKETING

"Rural marketing is a process of developing, pricing, promoting, and distributing rural specific goods and services leading to desired exchange with rural customers to satisfy their needs and wants, and also to achieve organizational objectives"

The marketer in rural areas has to understand:

(a) Market segmentation by knowing market potential which will help in the assessment of market demand.

(b) Consumer behavior and the rural consumer's priorities.

(c) Which promotion techniques should be used

(d) Who are the catalytic agents of change and what role can they perform vis-a-vis one's products?

10.7.1 **Marketing Mix for Rural India**

Behavioral factors of rural consumers are very different and unpredictable in nature, it is challenging for marketers to design the marketing mix. The marketing mix for rural marketing is similar to the general marketing mix with slight changes to adjust for the heterogeneity of the demand.

Product: The firm should make products according to the needs and future demands of rural buyers. Features of products like size, shape, colour, weight, qualities, brand name, packaging, labeling, services must suit the demands of the customer.

Price: Rural customers are most sensitive to pricing and hence appropriate pricing should be done for rural products. rice level, discounts and rebates, then credit and instalment faculties are important considerations while setting prices for rural specific products. It is seen that low priced products are preferred by rural consumers.

Promotion: The method of promotion needs to meet the expectations of the market. Vehicle campaigns, edutainment films, generating word of mouth publicity through opinion leaders, colorful wall posters, etc. — all these techniques have proved effective in reaching out to the rural masses.

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Place: Marketer has to strengthen the distribution strategies. Distributing small and medium sized packets through poor roads, over long distances, into the remote areas of rural market and getting the stockiest to do it accordingly is the challenge being faced in rural marketing and hence efforts should be made to strengthen the same.

Case Study: Turning sugarcane waste into electricity

Read the case and answer the question that follows.

With energy generated from renewable sources predicted to be among the major sources of power in the next decade, a company in the Philippines is tackling the challenge head-on and turning trash into a highly prized commodity.

Biopower is constructing three biomass power stations on Negros, the fourth largest island of the Philippines, with the aim of producing a total of 72 megawatts of green baseload power to feed into the local grid as well as for export to surrounding islands.

The key to this clean, green energy is the waste products from the harvest of the local sugarcane crop. The trash that would previously have been left on the ground once the sugarcane was taken from the fields, the collection of this waste is a crucial part of Biopower's operation and one they've entrusted to Case IH, one of the world's leading agricultural machinery brands.

"The cane farmers leave the trash after the harvest, and we move into the field with our equipment and collect it, taking it to the power station for burning in a controlled environment to produce electricity," said Paul Coveney, Vice-President Biomass Operations and Materials Management for Biopower.

Tractors and other associated machinery need to collect the trash and get it to the power station as quickly and efficiently as possible, Paul said, and Case IH is delivering on every one of these requirements.

Paul said when looking for an equipment supplier, they recognized Case IH's position as a leading provider of technology solutions, with a state-of-the-art machinery line-up that assisted Biopower in sustaining the fuel supply necessary for their electricity obligations.

The company has purchased over 100 Case IH machines including Farm lift telehandlers and Farmall, Maxum and Puma tractors through Filho land, the distributor of Case IH machinery in the Philippines.

"Our operation has a very small window to do what we need to do, so we needed reliable tractors that could operate continuously, 24 hours a day," Paul said.

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"The technology in these Case IH tractors has given us that reliability, and along with the support of Filho land, they deliver what we need in the short time we have."

For the Biopower staff who operate the fleet of Case IH tractors, there's no doubting their satisfaction with the machines. Paul said the operators regularly commented on the ease of operation, power and speed of the tractors, and the technological features that made their job easier. Staff also had high praise for the training offered by Filho land on the tractors and telehandlers.

Biopower has also been able to install GPS-trackers and data loggers into the tractor fleet that identify each machine's location and provide detailed information on what they're doing and how they're doing it at any given time—it basically provides a live, real-time overview of the entire operation.

The Case IH Farmall JX is one of the models used in the Biopower operation, a small tractor designed with maneuverability, visibility and handling top of mind. Powered by an upgraded 8000 Series, Tier 3 turbo-charged engine to provide optimum fuel efficiency and maximum power, the Farmall JX also offers logically positioned controls with clear, concise instrumentation that make tasks less arduous when in the field all day.

Paul said the performance of the Case IH tractors and telehandlers had been everything they had expected and this, coupled with the 24-hour service and support, service updates and training provided by Filho land, confirmed they had made the right choice.

When it came to running a high-pressure, round-the-clock operation like that of Biopower, Paul said it was reassuring to have the peace of mind of reliable machinery, and support and assistance when and where it was needed.

"My experience in the sugar industry in Australia means I have seen a lot of Case IH equipment, and know the reputation of their tractors and harvesters, so I had the confidence in the brand to introduce it here onto Negros," Paul said.

"Case IH is well-known worldwide, and with a good partner like Filho land I would have no hesitation in recommending their products to anyone in the Philippines.

"The brand has a great support network, it's a quality product and that's important when you're running any business."

Source: https://ruralmarketing.in/stories/turning-sugarcane-waste-into-electricity/

Q On the basis of the case above, assess what factors have led the brand to be successful in the rural sector.

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Marketing is an ever-evolving subject. Some of the recent concepts in marketing are as follows:

1. **Experiental Marketing:** Experiential marketing, as the name suggests, is a trend that focuses on creating a brand-based user experience, and not just a product-based one. Experiences vary by brand and sector, but corporate events, webinars, competitions are some of the most common examples of experiential marketing"
2. **Influencer Marketing:** "Similar to celebrity endorsements, it's where brands use influencers for their marketing campaigns through social media platforms like TikTok and Instagram. It's by no means a new trend but has gained significant traction in the past few years for its simplicity. Influencers (including micro-influencers) post content in which they interact with a brand, either by using one of its products or services or engaging with employees."
3. **Programmatic advertising:** "Programmatic advertising is the automation of buying digital advertising space. Traditionally, marketing teams would need to create proposals, negotiate and sign contracts. But through programmatic advertising, brands can bid for ad space within milliseconds, freeing up marketers to spend more time on campaign optimization rather than administration. Many brands are now assigning up to 50% of their ad budgets to programmatic advertising, and the trend is expected to exceed $100 billion in 2022"

10.8 SUMMARY

Service marketing needs a different marketing approach to be followed for them from the approach used for products as they have certain distinctive characteristics. Marketing mix for services comprises of 7 P"s. In addition to the traditional 4 P"s- product, price, place and promotion, the additional 3 P"s is- people, process and physical evidence. Green marketing refers to the marketing of products that are presumed to be environmentally safe. It aims at sustainable development. The 4 P"s of marketing mix is modified for green marketing as the green products are produced, promoted and is disposable in a manner which does not harm the environment. The price is relatively high and aims to cut down on transportation emissions while transporting the goods. Relationship marketing aims to build mutually satisfying long-term relationships with the key constituents in order to earn and retain their business. It advocates the philosophy "know your customers". Rural India is gaining importance as it offers huge potential market for various goods and services. Large

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population, rising disposable incomes, changing lifestyle of rural consumers and saturating urban markets are the factors making rural market attractive for the marketers.

In India the retail market is dominated by the unorganized sector.

10.9 GLOSSARY

1. Consumer: A consumer is a person or a group of people, such as a household, who are the final users of products or services.
2. Customer: A customer is the recipient of a good, service, product, or idea, obtained from a seller, vendor, or supplier for a monetary or other valuable consideration. He may or may not be the consumer.
3. Customer loyalty: It refers to the likelihood of previous customers to continue to buy from a specific organization.
4. Direct mail marketing: It includes sending an offer, announcement, reminder or any other object to an individual consumer.
5. e-tailing: The sale of goods and services through the internet.
6. Marketing Mix: The marketing mix refers to the set of actions, or tactics, that a company uses to promote its brand or product in the market. The 4Ps make up a typical marketing mix - Price, Product, Promotion and Place.

10.10 SELF-ASSESSMENT QUESTIONS

Objective Type Questions

State true or false:

Services are homogeneous in nature.

Service marketing and relationship marketing are synonymous.

Retailing involves the sale of goods for non-commercial use.

Retailers can either have physical existence or online existence.

Fill in the blank with appropriate words.

1. Production, consumption and distribution of services is a process.
2. Marketing mix of services has 3 extra P"s, namely people, process and

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3. 4 A"s of rural marketing are accessibility, awareness, and availability.

Short answers type questions:

1. What do you mean by green products?
2. Discuss differentiating features of a product and service.
3. Write a short note on customer relationship management.
4. Compare and contrast rural and urban consumers.
5. Cold drinks like Coca cola are available in rural as well as urban India. What aspects of advertisement will differ while promoting Coca cola in urban and rural India?

Long answer type questions:

1. Why is the concept of green marketing becoming popular? Discuss marketing mix of green products.
2. The marketing mix for services is the same as that for products. Comment and discuss service marketing mix.
3. In this customer-oriented era, relationship marketing helps the company to create and retain loyal and satisfied customers. Do you agree? Discuss.
4. What do you understand by rural marketing? Discuss different characteristics of rural markets and the challenges they pose to the companies.

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LESSON 1

FOUNDATIONS & CONTEMPORARY ISSUES IN MANAGING HUMAN RESOURCES

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1.1 LEARNING OBJECTIVES

The objective of this lesson is to thoroughly understand the concept of *Human Resource Management* and its relevance in an organization. After this lesson, a student will be able to understand the following:

- Foundations of Human Resource Management
- Line versus staff aspects of Human Resource Management
- Human Resource Management versus Human Resource Development
- Strategic Planning Process and its process
- Strategic Human Resource Management and its importance
- Human Resource Manager and his/her key competencies
- 10 Cs of Human Resource Management

1.2 INTRODUCTION

It has been said that when there is two or more people who exist and work together, the entity they are working for becomes an ***organization.*** *For instance, a bank is an organization.* An ***organization*** includes people with formal roles who work together to accomplish the organizational goals. But to keep an eye on organizational goals, we need PEOPLE to manage PEOPLE and supervise PEOPLE. That's why, an emerging term, Human Resource Management comes into the picture. In this lesson, we will see how *Human Resource Management* is important for an organization through comprehending some real-life case studies.

1.3 FOUNDATIONS OF MANAGING PEOPLE

Primarily, there are five M(s) in management: *Materials, Machinery, Money, Methods, and Men*. Out of these, *"Men"*[1] is the most important as it steers other 4M(s) to achieve organizational goals by effectively coordinating and utilizing all available resources. The significance of human resources cannot be replaced as all the organizations are heavily

[1] By "men", we mean human resources of all genders. Hence, not specific to 'male' gender.

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dependent on them for swift functioning of operations. In this section, we will learn some fundamentals or foundations of managing people.

1.3.1 What is Human Resource Management?

As we discovered above that human resource is the fifth M of management that helps in effective coordination and utilization of organizational resources. The process of managing all human resources of an organization becomes ***Human Resource Management (or HRM).*** **HRM** ***"****is the process of acquiring, training, appraising, and compensating employees, and of attending to their labour relations, health & safety, and fairness concerns".*

The term "people at work" refers to a sizable population of people of **different genders, ages, socio-religious affiliations, and educational or literacy levels**. In addition to sharing some traits and behaviour patterns with one another, these people in the workplace also display many differences. Every person who is a part of an organization has a unique collection of requirements, motivations, objectives, and experiences. Despite having unique physical and psychological characteristics, every human being is the outcome of interactions with his environment as well as his biological inheritance.

Fig 1.1: HRM Overview

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Therefore, management **must be cognizant of both organizational needs and personnel demands**. All of these cannot be disregarded. An organised effort makes it feasible for organizations, "people at work," "the people who manage them" (i.e., managers themselves), and other public groups (such as customers, shareholders, entrepreneurs, governments, suppliers, etc.) to achieve their goals. The employee forms relationships on all four dimensions: *(i) between management and employees; (ii) within the workforce; (iii) among the managerial staff; and (iv) throughout the business and community*.

The focus of this lesson is to understand the fundamentals of HRM in detail. However, a few nuances are presented in each section to define the process of HRM in brevity.

1.3.2 Why is 'Human Resource Management 'relevant to all managers

First, let's discuss the definition of a manager. A ***manager*** is an individual who is accountable for accomplishing organizational goals.

ACTIVITY

Imagine that you are a human resource manager at XYZ corporation. And you conduct the following mistakes.

1. Hire the wrong person for the job
2. Waste time with useless interviews
3. People that you hired are leaving your company

Take a moment and discuss your thoughts with yourself only as you might be reading this book on your own. If you have a bunch of friends around you, that's even better, share your reflections on the above 3 mistakes that you conducted hypothetically.

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Remember that as a manager, you can do everything else right but still fail at the end. HRM is about thirty percent of ***everything else*** and seventy percent of the ***mistakes*** that are mentioned in above activity. As you go ahead with this book, you'll learn HRM methods and techniques that you make an effective human resource manager. The importance of human resource is summed up in Lawrence Bossidy's quote:

"I am convinced that nothing we do is more important than hiring and developing people. At the end of the day, you bet on people, not on strategies."

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1.3.3 Line Versus Staff aspects of Human Resource Management

Managers of different departments, in a sense, are human resource managers as they get involved in the hiring process. For instance, when a financial company visits a University of Delhi university college for finance-related placements, the candidates usually must go through two rounds of interview – i) *HR Round and ii) Technical Round.* The HR round is organized with the human resource (HR) manager and the technical round is organized with the finance manager. In a way, both, finance, and HR manager are helping the company to hire the best pool of candidates.

If a hiring can be done by a non-HR manager, then why do we need HR managers in the workplace? To answer this dilemma, one needs to understand the basic distinction between line authority and staff authority.

The **line authority**[2] conventionally gives managers the right to issue orders, however, the **staff authority** provides managers the right to advise other employees or managers. On an organizational chart, the managers with line authority are called **line managers** and managers with staff authority are called **staff managers**. Human resource managers are commonly staff managers. The following are the staff functions of human resource managers:

1. Advises the top management (CEO, COO, CFO) on personnel aspects of an organization
2. Assists in hiring, training, counselling, and firing of employees or managers
3. Administers benefits programmes like retirement, vacation etc.

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[2] *"Authority is the right to make decision, direct others' work, and give orders"*

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IN-TEXT QUESTIONS

1. Ankur has the right the issue orders and Ankit has the right to assist other employees. Choose the correct option:
   a. Ankur is the line manager and Ankit is the staff manager
   b. Both are line managers
   c. Ankur is the staff managers and Ankit is the line manager
   d. Both are staff managers
2. If you are responsible for accomplishing organizational goals, then you are?
   a. Boss b. Manager
   c. Supervisor d. CEO
3. _____ includes people with formal roles who work together to accomplish the organizational goals.
   a. Organization b. Firm
   c. Company d. All the above
4. Suppose you are the human resource manager at company XYZ, and the top management wants you to conduct a survey to comprehend the determinants that drive employees to perform better. What would you include in the survey?
   a. Organizational goals b. Personal Demands
   c. Both A and B d. None

1.3.4 Human Resource Department

A human resource department is responsible **for effectively managing an organization's human resources**, which are primarily its employees. Like a HR manager, the key responsibility of human resource department is to collectively manage, compensate, and train employees. The following are the core functions of HR department (including HR managers):

1. Recruitment and Selection

Recruitment is the process of attracting qualified pool of candidates whereas selection is placing the right candidate for a job. An advertisement published in the newspaper is a recruitment technique and conducting interviews is a selection technique. You will learn this concept in detail in the lesson 2 of this book.

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2. *Training and Development*

   Training and development are educational or skill development initiatives that an organization undertakes to improve the job-performance of employees. From instilling motivation to providing resources for knowledge, are a few examples of T&D (or training and development) activities. You will learn this concept in detail in the lesson 3 of this book.

3. *Industrial Relations*

   As the name comprises two terminologies, i) *industrial* & ii) *relations*. By industry, we refer to the organization, and by relations, we mean the relationship between employer and employees. In nutshell, the industrial relations are *"the relationship between employer and employees in an organizational setting"*. You will learn this concept in detail in the lesson 4 of this book.

4. *Conflict Management*

   As the name suggests, conflict management is the process by which conflicts are resolved in an organization. The primary responsibility of an HR manager is not to avoid conflict but to deal with them and provide efficacious solutions to resolve the conflict. You will learn this concept in detail in the lesson 5 of this book.

1.3.5 Human Resource Development

Human resource development (HRD) is the process of nurturing a company's workforce. It means to provide the abilities and pertinent information that might help in employees' overall professional development. As a result, HRM includes human resource development as well.

HRD begins with a clear goal of employee development and is frequently met through training activities that are conducted in an organization. These efforts help employees in their career chart as well as in personal lives.

As **Human Resource Developers** oversee several areas within the human resources division of an organization, including training, employee development, executive and leadership development, human performance technology, and organizational learning, they have become very **important members of the HR team** in some organizations. They may be responsible for establishing mechanisms to recruit and retain talent, developing training programmes, and organizing organizational development activities, such as planning workshops, among other things.

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Table 1:

Human Resource Development versus Human Resource Management

Particulars	Human Resource Development	Human Resource Management
1. Function	It is a proactive function.	It is a service and reactive function.
2. Objective	It aims to ameliorate efficiency of people.	It aims to develop professional capabilities of employees while enhancing overall organizational culture.
3. Responsibility	It is the responsibility of human resource as well as technical manager.	It is the responsibility of human resource manager.
4. Terminology	Human Resource 'Developers'.	Human Resource 'Managers'.
5. Focus	It usually focuses on 'creative aspects' to motivate employees.	It usually focuses on 'organizational goals.'

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Even though these two concepts are distinct, they have a lot in common. For instance, they both require addressing problems. When disagreements emerge inside a company, HR managers may be relied upon to find innovative, considerate solutions. Similar problem-solving exercises may be assigned to HR developers when creating new training techniques and systems. Since both positions need interaction with others, having **interpersonal skills** may be advantageous in creating and maintaining positive working relationships between workers and a company.

1.4 PRINCIPLES OF MANAGING PEOPLE

Many experts believe that managing people mainly involve five functions: *planning, organizing, staffing, leading, and controlling*.

- **Planning**: In this stage, the ***planning*** related to tasks is formulated.

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- **Organizing**: In this stage, whatever was planned in the ***planning*** stage, is allocated to each employee.
- **Staffing**: After ***organizing*** stage, most of the times an organization feels lack of adequate personnel, lack of skilled personnel. Therefore, in this stage, activities such as recruitment and selection, training and development etc. are focussed.
- **Leading:** Once you are clear on the **staffing** process, it is consequential to motivate and encourage employees. Hence, under this stage, motivation is given utmost importance.
- **Controlling:** After ***planning, organizing, staffing, leading,*** it becomes important to check how well an organization has achieved its goals. In this stage, evaluation of the performance is done and based on that corrective measures are devised.

SWOT MATRIX WITH GENERIC EXAMPLES

Potential STRENGTHS:

- Market leadership
- Cost advantage
- High quality products

Potential OPPORTUNITIES:

- New market
- Diversification
- Merger with competitor

Potential WEAKNESSES:

- Negative market image
- Lack of resources
- Lack of research and development

Potential THREATS:

- Takeover threat
- Slow market growth
- Excessive regulations

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1.4.1 The Strategic Human Resource Management Process

The **strategic management process** starts with the basic five functions (explained above) of management and ends with scanning internal strengths (S) & weaknesses

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(W) and external opportunities (O) & threats (T) to establish a competitive advantage in the market. This helps an organization decide its **strategy.**

Strategic human resource management (SHRM) process is *"formulating and executing human resource policies & practices the produce the employee competencies and behaviours the company needs to achieve its objectives"*. An effective SWOT analysis helps organizations in their SHRM processes.

1.4.2 The New Human Resource Manager

Earlier, a human resource manager used to focus on only administrative activities like hiring and firing employees, keeping an eye on compensation management etc. But today the employer faces several challenges related to the functionalities of an organization. The HR managers of today are expected:

1. *To focus more on big picture issues (or strategic issues)*

   Human resources are more often used in helping companies address strategic and big picture issues. As explained above in section 1.4.1, this is known as **strategic human resource management**.

2. *To focus on improving performance*

   The human resource managers of today are equally responsible for **improving performance of employees** associated with the organization.

3. To measure performances of an employee and give timely results to the organization.

   Measurability is another task that is very challenging. Human resource managers make sure to provide **well equipped benchmarks** for evaluating current performance of employees.

4. *To manage ethics*

   Ethics is "the standards that someone uses to decide what his/her conduct should be". Human resource managers are also responsible to **pen down workplace related ethics**.

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STRATEGIC MANAGEMENT PROCESS: PROCESS

Step 1 – Where are we now?
Here, the manager starts with defining company's current business and mission. Questions like, what products need to be sold, where to sell them and how to gain competitive advantages are answered in this step.

Step 2 – Perform SWOT analysis

The next step is to ask, "are we heading in the right directions given the challenges that we face".

Step 3 – Create a few Strategic Options

Under this phase, several strategic options are created by the management for the company.

Step 4 – Review Strategic Options

This step helps the management to review strategic options created in the third step and shortlists viable options to purse.

Step 5 – Make a Strategic choice

Under this step, a strategic choice is decided after performing SWOT analysis of each strategy shortlisted in the step 4.

Step 6 – Translate into Goals

Under this step, the strategic choice, decided in the step 5, is divided into actionable strategic goals.

Step 7 – Implement the actionable strategic goals

Now, in this step hiring and firing of people is decided according to the actionable strategic goals.

Step 8 – Evaluate Performance

"Things don't always turnout as planned". Therefore, a continuous evaluation is required in the last step.

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IN-TEXT QUESTIONS

5. Developing skills of employees are needed to run business in

   a. Short-term b. Medium-term

   c. Long-term d. All of the above

6. Which of the following problems can be disguised in organizations?

   a. Territorial b. Social

   c. Environmental c. Economic

7. _____ is the process of acquiring, training, appraising, and compensating employees, and of attending to their labour relations, health and safety, and fairness concerns.

   a. HRM b. HRD

   c. SHRM d. None of the above

8. Which of the following does not imply the staff functions of human resource management?

   a. Advises the top management (CEO, COO, CFO) on personnel aspects of an organization

   b. Assists in hiring, training, counselling, and firing of employees or managers

   c. Administers benefits programmes like retirement, vacation etc.

   d. Looking after profit and loss accounts

9. Suppose you are the CEO of XYZ company, which department should you be giving your valuable time and efforts?

   a. Marketing b. HRM

   c. Finance and Operations d. All of the above

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CASE STUDY

The Tata Group

One of India's biggest and most reputable business giants, the Tata Group, has a distinguished history of implementing some of the best human resources (HR) practices. The group had significantly grown over the years, necessitating the need for a shared HR platform inside the organization. A successful group-wide HR strategy was developed and put into practice. It would be difficult to implement HR policies across all the different entities as many group companies expand internationally. It remained to be seen if the Tata group would uphold the basic principles and ideals in its pursuit of development and international enlargement. Discussion of the difficulties huge corporations have adopting uniform HR rules is made possible by the case. It also makes it easier to have conversations about employer branding concerns and how to maintain brand equity in a globalized environment. Students can also explore Tata's HR initiatives as a model employer, the Tata brand's ability to be sustained in the face of global competition, and whether growth will dilute the company's reputation.

Questions:

1. Is the Tata Group the best employer in the country? What are reasons for your answer?

2. Visit the Tata Group's website and list down some of their best employee practices of the following:

   a. Tata Steel

   b. Tata Motors

   c. Tata Electronic Private Limited

   d. Tata Consultancy Services

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1.4.3 Key Competencies of the Human Resource Manager

Figure 1.2:
Human Resource Manager Competencies

Let's discuss each competency[3] one by one.

1. *Strategic Managers*

   This competency is related to the ability required for strategic human resource management which has been explained in detail in section 1.4.1. Through having this competency, the managers help organization in creating the strategy.

2. *Leaders*

   By having leadership attributes, a human resource manager is respected and admired in the organization.

3. *Innovators*

   With this competency, a human resource manager can create a platform for meaningful work environment in an organization. They train, develop, and retain talent with their innovative ideas.

4. *Tech Savvy*

   Technology plays an important role in the lives of human resource managers. During the COVID-19 pandemic also, it was HR managers' responsibilities to connect people via technology and colleagues do the same.

[3] An ability or skill required for a task

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1.4.4 10 Cs of Human Resource Management

Since its inception in the 1970s, the area of human resource management has been developing. Numerous models have been put out by HRM specialists to interpret, clarify, and promote HR practices and policies that are in line with a certain ideology and philosophy. The **Ten C model of HRM** is recognised as an all-inclusive and practical model within this new genre. This model was created by **Alan Price**, who published it in his 1997 Book 'Human Resource Management in a Business Context'. The 10 Cs, or the ten fundamental principles, comprise this approach. These are:

1. **Comprehensiveness** -An organization's HRM plan must cover employee-related strategies right from their selection to the time they decide to exit the organization.
2. **Credibility** -The HRM practices must promote employee engagement and foster trust between workers and senior management.
3. **Communication** -All workers need to understand and accept the organizational and HRM goals. Organizational culture must promote transparency and be devoid of any obstacles.
4. **Cost effectiveness** -Fairness is required in the promotion and reward system.
5. **Creativity** -The company's distinctive HR initiatives must be the source of its competitive advantage.
6. **Coherence** -HRM strategies and activities need to make sense.
7. **Competence** -The HRM strategy should be designed in way that the organization develops the capacity to accomplish its goals with the aid of individual competences.
8. **Control** -HRM methods and policies must make sure that HR performance is in line with corporate goals.
9. **Change** -The fundamental tenet of any HRM strategy must be that existence depends on ongoing development and improvement.
10. **Commitment** -The last C emphasises that the individual must be inspired to pursue organizational objectives.

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1.5 CONTEMPORARY ISSUES BEHIND HUMAN RESOURCE MANAGEMENT

Organizational environments will inevitably alter because of changes in socioeconomic and political circumstances. Due to quickly evolving business environment, it becomes important to regularly update the knowledge and abilities after considering the goals and objectives of an organization. Five of the contemporary issues include:

1. *Setting up an adequate internal environment*

   The foremost crucial aspect of managing management employees is weaving an environment that is i) **adaptable** to external changes, ii) **satisfactory** for current employees, and iii) **sustainable** in the long term.

2. *Coping up with the increasing workforces*

   The organizational size and complexities keep growing just like the number of individuals who work in the organization. The management of a larger workforce presents significant difficulties and obstacles, particularly when **employees' awareness of their rights increases.**

3. *Dealing with the legal environment*

   Adjustments will need to be made to **better utilise human resources** to keep up with the legal environment.

4. *Maintaining a psychological state of employees*

   The paradigm of managers would involve **encouraging the employees** to maintain a psychological state of preparedness for any sudden change if ever occurs. From helping them to developing new knowledge & skills, working on the psychological state is a never-ending process and **requires continuous attentio**n of human resource managers.

5. *Keeping up with the technological advancements*

   An accurate evaluation of the new technology and providing **training** to the existing employees based on it, becomes a daunting task as it sometimes leads to **attrition and retrenchment** which results in lowering the motivation of employees.

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IN-TEXT QUESTIONS

10. The responsibilities of HRM managers are now expanded to

    a. Tasks b. Organizational Strategies

    c. Goals c. None of the above

11. Which is NOT one of the competencies of human resource managers?

    a. Leaders b. Strategic Managers

    c. Tech Savvy d. Outdated Knowledge

12. _____gave the 10Cs of the human resource management in the year _____. Choose the correct option

    a. Joshua Stuart in 1997 b. Alan Price in 2007

    c. Alan Price in 1997 d. Joshua Stuart in 2007

1.6 INDIAN LAWS RELATED TO THE HUMAN RESOURCE MANAGEMENT

The laws related to the human resource management (or labour laws) are inspired by British laws. The widespread perception is that Indian Labour laws (or human resource laws) are outdated and inflexible. However, India as a country, has implemented various labour laws catering to industrial relationships, wages, working hours, equality & empowerment of women, and social security. As an HR manager, one should know the following Indian labour laws.

1.6.1 Laws related to industrial relations

These laws help in establishing cordial relationships between management and human resources (or labour). There are specifically three laws pertaining to the industrial relations:

1. *The Trade Unions Act, 1926*

   The law was passed even before independence, and it stated that all trade unions should be registered under this act.

2. *The Industrial Employment (Standing Orders) Act, 1946*

   This law acts as a medium of communication between labour and management.

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3. *The Industrial Disputes Act, 1947*

   This act allows the government to interfere in the conflict if required.

1.6.2 Laws related to wages

The two pioneer laws under this section are:

1. *The Payment of Wages Act, 1936*

   The objective of this law is to make sure that certain groups of employees get regular income without any unauthorized deductions.

2. *The Minimum Wages Act, 1948*

   This law ensures the minimum rate of wages to all types of employees as well as labour

1.6.3 Laws related to working hours

The following laws help the employees/workers/labours to protect their health:

1. *The Factories Act, 1948*

   This law acts as a safeguard for workers to protect their health and provides safety at the workplace.

2. *The Shops and Commercial Establishments Act, 1961*

   This act is also in similar lines with the factories act. But it deals with the IT (Information Technology) and ITES (Information Technology Enabled Services) sector.

1.6.4 Laws related to equality and empowerment of women

1. *The Maternity Benefit Act, 1961*

   This act provides benefits to all women employees working in certain organizations. This act specifically aims at empowering women.

2. *The Equal Remuneration Act, 1976*

   This act encourages organization to pay equal remuneration to men and women. This is an anti-discrimination act that focuses on *equal pay for equal work*.

1.6.5 Laws related to social security

1. *The Workmen's Compensation Act, 1923*

   The act makes employer responsible for any mishap occurring to an employee while working. It allows employees to receive compensation for injuries arising out of accidents during work.

2. *The Employees State Insurance Act, 1948*

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The objective of this act is to provide financial relief to the employees in case of any emergency.

Please note that only a few important labour laws have been mentioned in brief. Please refer Taxman Labour Laws, 2019 edition for deeper understanding on the labour laws.

IN-TEXT QUESTIONS

13. One of the employees' unions of your organizations have started protesting for their unfair demands. As a manager, you feel that the government can provide better decision and solutions in this scenario. Which act would allow government to sort out this tussle?

    a. Trade Union Act b. Maternity Act

    c. Industrial Dispute Act d. Industrial Employment

14. Aman and Naina are working in the ACG company as HR managers at the same level. However, Naina's annual package is 6 lacs lower than that of Aman's. Which law can help Naina for her remuneration?

    a. Equal Remuneration Act b. Maternity Act

    c. Trade Union d. Employee's State Insurance

15. The full form of SWOT is:

    a. Strength, weakness, opportunities, tasks

    b. System, weakness, opposition, threats

    c. System, weakness, opportunities, threats

    d. Strength, weakness, opportunities, threats

1.7 SUMMARY

After reading this lesson, all students should be able to answer **what is human resource management, and why is it important?** An adequate understanding of this would help upcoming managers to not commit any hiring mistakes while hiring personnel for their organization. The section on the new human resource manager will help the students to work

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on the key competencies that are required for **strategizing and creating high performance work systems.** A little snippet on the Indian labour laws will help students to comprehend **employments laws**.

1.8 GLOSSARY

Strategy: A course of action the company can pursue to achieve its strategic aims.

Strategic Aims: Strategic aims are nothing but organizational objectives.

Benchmarking: The practice of comparing business models with industrial best standards and practices.

Competitive Advantage: Any factor that allows an organization to differentiate its product or services from those of its competitors to enhance market share.

Attrition: The involuntary or voluntary departure of employees from the organization.

Retrenchment: An involuntary firing of employees due to the replacement of labour with technological advancement.

Mission Statement: Summarizes the answer to the question, "what business are we in".

Employee Awareness: A level to which an employee knows certain policies, situation, documents, or any other important information specific to his/her organization.

Interpersonal Skills: Interpersonal skills are "the skills we use every day when we communicate and interact with other people, both individually and in groups"

1.9 ANSWERS TO IN-TEXT QUESTIONS

1. A	**10.**B
2. B	**11.** B
3. D	**12.** C
4. C	**13.** C
5. C	**14.** A
6. A	**15.** C

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7. A **8.** D **9.** D	

1.10 SELF-ASSESSMENT QUESTIONS

Discussion Questions:

1. Explain the concept of human resource management. Discuss major contemporary issues associated with the concept.
2. What are the basic differences between line and staff managers? Explain with an organizational example.
3. Define key competencies of the new human resource manager.
4. How HR managements concepts are relevant to other department in an organization?

Individual/Group Activity:

1. Working individually or in groups, develop an outline showing how trends like workforce diversity, technological innovation, globalization, and changes in work have affected the college or university you are attending now. Present in the class.
2. Working individually or in groups, interview an HR manager. Based on that interview, write a short presentation regarding HR's role today in building competitive organizations.

Application Case:

India Cleaning Centers

Priyanka Sharma graduated from State University in June 2010, and after considering several jobs' offers, decided to do what she always planned to do – go into business with her father, Amar Sharma.

Amar opened his first laundromat in 1995 and his second in 1998. The main attraction of these coin laundry businesses was that they were capital rather than labour intensive. Thus, once the investment in machinery was made, the stores could be run with just one unskilled attendant and none of the labour problems one normally expects from being in the retail service business.

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Notwithstanding, Amar had decided by 1999 to expand the services in each of his stores to include the dry cleaning and pressing of clothes. He embarked, in other words, on a strategy of 'related diversification' by adding new services that were related to and consistent with his existing coin laundry activities. He added these for several reasons. He wanted to better utilise the unused space in the rather large stores he currently had under lease. Furthermore, he was, as he put it, "tired of sending out the dry-cleaning ad pressing work that came in from our coin laundry clients to a dry cleaner 5 miles away, who then took most of what should have been our profits". To reflect the new, expanded line of services, he renamed each of his two stores Indian Cleaning Centres and was sufficiently satisfied with their performance to open four more of the same type of stores over the next 5 years. Each store had its own site manager and, on average, about seven employees and annual revenues of about $500,000. It was this six-store chain that Priyanka joined after graduating.

Her understanding with her father was that she would serve as a trouble-shooter/consultant to the elder carter with the aim of both learning the business and bringing to it modern management concepts and techniques for solving the business's problems and facilitating its growth.

Questions:

1. Make a list of five specific HR problems you think Indian Cleaning will have to deal with in future.
2. What would you do first if you were Priyanka Sharma?

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LESSON 2

HUMAN RESOURCE PLANNING: HIRING, RETAINING & DOWNSIZING

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STRUCTURE

2.1 Learning Objectives
2.2 Introduction
2.3 Human Resource Planning (HRP)
  2.3.1 Nature of HRP
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  2.3.3 Steps in HRP
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2.9 Answers to In-text Questions

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2.1 LEARNING OBJECTIVES

After reading this lesson you will be able to:

- Understand the importance and concept of human resource planning in managing human resources.
- Understand the process of Human resource planning.
- Understand how to maintain a balance between Human Resource Supply and Demand
- Understand the concept of downsizing and retention and will be able to analyse conditions where they need to be used.

2.2 INTRODUCTION

Human Resource or manpower may be defined as the total knowledge, skills, creative abilities, talents and aptitudes of an organization's workforce, as well as the values, attitudes and beliefs of the individuals involved. It is the sum total of inherited abilities acquired knowledge and skills represented by the talents and aptitude of the employed person. Thus, Human Resource includes not only human beings but also their knowledge, skills, attitudes, aptitudes etc. Human resource is considered the most dynamic resource of the organization. Other factors are useless without their effective use by the Human Resources Hence, proper management of such a vital resource in an organization is inevitable for organizational success. With that view let us understand the concept of Human Resource Management.

Human Resource Management may be defined as that activity in an enterprise which strives to mould human resources into an effective organization, provides an opportunity for maximum individual contribution under healthy working conditions, promotes individual development and encourages confidence and understanding between the employees and the employers and between the employees themselves.

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Primary to any managerial process are the functions of management. Among these functions Planning is the vital function of management in any organization. The major focus of planning is majorly on important tasks like product development, methods of production, procurement of raw materials, machinery tools etc. implementation of the methods of production, sales and marketing, quality maintenance and so on. In addition to these, some focus is now being placed on planning the manpower of the organization, led from the increasing people centrism in organizations. In commercial and Industrial undertakings, planning has been focused on profit taking, procurement production, marketing, quality control, and recently on manpower. Manpower has now been recognised as the intellectual asset, that needs to be procured wisely and managed effectively in order to utilise them optimally for maximum benefits to the organization. Human Resource is not only a resource that needs to be planned but is important as one of the most important factors that is needs for execution of all other organizational plans. an important part of the overall planning of an organization. HRP is essential to realise all other plans and putting them into action in order to achieve organizational goals.

2.3 HUMAN RESOURCE PLANNING:

In a narrow sense HRP may be defined as the replacement planning which encompasses the analysis of labour turnover and recruitment policies and developing models for planning recruitment and promotion of employees. But broadly, HRP is a process that can be realised in two phases, in the first phase by projecting future manpower requirements and in the second phase by developing manpower action plans to accommodate the implications of projection. Thus, manpower planning works for ascertaining objectives, policies and programmes that will help in developing, utilising and distributing manpower for the achievement of organizational goals.

In the words of Vetter "In the process of Human Resource Planning, management discuss and finalise strategies for an organization to bridge the gap between existing manpower condition to its desired manpower condition."

2.3.1 Nature of Human Resource Planning:

(i) Manpower planning is forward looking in nature. It aims at ascertaining the future manpower needs of the organization both in number and kind.

(ii) Human Resource Planning is an integral part of corporate planning. Without a corporate plan, there can be no manpower plan.

(iii) HRP is a continuous process due to changing demand and supply

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(iv) It presents an inventory of existing manpower of the organization to ascertain the status of the available personnel and to discover untapped talent presently available with the organization.

(v) It helps in determining the surplus & deficit of manpower by comparing the total manpower needs with the present supply of manpower.

(vi) HRP is helpful in case future needs exceeds presently available talent, organizational programme for recruitment and training begins. And, if the presently available talent exceeds the future needs, organizational programmes of transfer, deployment, discharge etc. begins.

ACTIVITY

Considering yourself as a Human Resource Manager, in case of surplus of employees in your organization, what actions will you take? Enumerate the suitable steps in sequence.

2.3.2 Objectives of Human Resource Planning:

The main objective of any Planning is to achieve something or the other by doing it according to the planned way. So is the case with Human Resource Planning, it is a process aimed at procuring and managing human resource in such a way in an organization that it maximizes its gains and make it more competitive in nature. To be more specific about objectives of manpower planning are as follows:

1. Forecasting future requirements for manpower in an organization for its goal achievement.
2. Calculating the manpower surplus and deficit in the organization.
3. Analysing the effect of technology on the human aspect of an organization.
4. Analysing favourableness of conditions for expansion and diversification related decisions.
5. Managing and optimally utilising human resource of organization.
6. Ensuring that the human resource needs are timely fulfilled with the adequate quantity and quality of human resource.

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7. Ensuring insubordination of HRP with the overall organizational planning.
8. Directing to take necessary actions in case of surplus or deficit of human resource.
9. Developing foundation for conducting Management Development Programmes as and when required.

2.3.3 Steps in Human Resource Planning:

The process of human resource planning involves the following steps:

1. **Deciding objectives of HRP:** The main purpose of Human Resource Planning is to maintain a balance between human resource demand and supply. Through effective planning the future enterprise needs should be assessed in advance so as to increase preparedness of the enterprise in terms of manpower availability. Also, planners need to be extra careful while making assessment of availability and requirements of human resource in the organization, in order to take correct decisions and develop right strategies.
2. **Inventory Management:** The management of deficit and surplus of human resource can be smooth if the organization will be able to manage its human resource inventory. From the existing skill in the inventory people can be trained, placed, developed and utilised as and when required, cutting down the cost of hiring and procuring new set of skills as the requirements occur. It is even helpful in developing management succession plans or calculating replacements, the need of which may arise due to retirement, resignations etc.
3. **Demand forecasting**: Demand is created when there appears a gap between 'what is' and 'what should be'. To foresee the demands of human resource, current manpower analysis needs to be done by department with major emphasis on functions, occupation that needs to be filled, level of skills or qualification required. On the basis of a detailed analysis appropriate decisions can be taken to satisfy the human resource demands of the organization.

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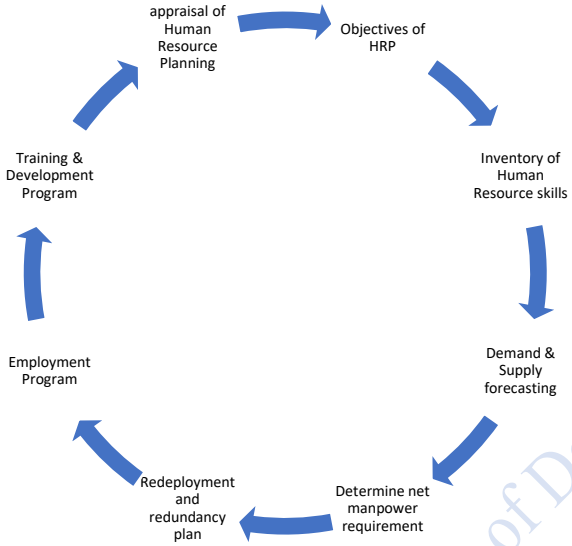

Factors influencing future manpower demands are:

a. **Employment Trend Analysis**: The manpower planners must make a thorough analysis of employment trends i.e., employments conditions in the organization during past five years. This in return will help understanding stability or instability of people in the organization, this will also clarify that whether the trend has expanding or contracting.

b. **Replacement Need Analysis**: In an organization there can be various reasons for replacement, such as death, retirement, resignation and termination of employees. An analysis of the same may help in finding better replacements for vacant positions.

c. **Productivity**: Organizational productivity is closely linked with productivity of people in the organization. Therefore, caution needs to be taken while making hiring decisions as a wrong hire may have an adverse effect on the overall productivity of the organization.

d. **Growth & Expansion**: Growth and expansion of any organization needs more human resource. This need should be carefully analysed in advance so as to have adequate quantity of human resource that favours the decision regarding expansion of organization.

4. **Supply Forecasting**: Whatever is the demand, it can be fulfilled only with an adequate amount of supply. Therefor they carry equal importance in case of human resource

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forecasting. There are specifically two sources of supply of human resource- Internal and external. Both are utilised depending upon the nature and type of demand. Internal supply is considered to be more important in comparison to the external sources. It is so because of accessible availability. It comprises of the employees working in the organization who can be promoted or transferred to fill up various vacant positions as and when required. The only thing needed is the evaluation and tallying of needs with available supply of personnel to understand their suitability. Tools used for supply forecasting is HR Audit and Replacement charts This would require an evaluation of the present personnel abilities, strengths and weaknesses, so as to gauge their suitability for different jobs. In order to estimate the internal supply of personnel, it is necessary to conduct HR Audit and prepare replacement charts in advance.

a. **Human Resource Audit**: Process of HR audit systematically examines the executive personnel or managers leading to the creation of management inventories and for non-managerial employees it leads to the preparation of skill inventories.

b. **Replacement Charts:** It clearly shows that who will replace whom in the long run. They are prepared for listing key positions in the organization and indicating time when it is likely to fall vacant. Also list the most likely candidates in the organization who ca suitably fills vacancies and the time when they are ready for promotion.

5. **Gap Analysis**: Gap is what lies between supply and demand. Manpower planning experts can identify this gap by comparing demand forecasts with supply forecasts. With the help of which they will be able to assess either deficit or surplus of human resources in future. In case of deficit, decisions need to be taken regarding procurement of human resource i.e., recruitment from outside whereas in case of surplus, redundancy, redeployment, transfer or retrenchment can be the solution. Gaps can also be in the form of knowledge, skills and aptitudes. If the employees are found to be deficient of some specific skills or knowledge, they can be trained on the other hand employees with higher skills may be diverted into more enriched jobs. As soon as these gaps are identified, plans are prepared, and appropriate decisions are taken to bridge these gaps.

6. **Redeployment and Redundancy Program**: On estimation of surplus manpower, a decision regarding redeployment/retrenchment of such personnel needs to be taken.

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Redeployment may include the following measures:

(a) Transferring personnel from the departments having surplus manpower to those having shortage of manpower.

(b) Transfer in sister concerns

(c) Creating ad hoc projects for accommodating surplus staff,

(d) Providing adequate training to personnel and place them in other projects.

Redundancy/retrenchment programme includes the following measures:

(a) **Voluntary Retirement:** Volunteer Retirement Scheme (VRS), introduced by The Government of India. It is also termed as 'Golden Handshake'. With the objective of solving the problem of overstaffing in public sector undertakings including nationalised banks, this scheme was introduced wherein management provide cash rewards to those employees opting for VRS in addition to normal retirement benefits. Hence this is called "Golden Handshake". This aims at solving the problem of an excessive supply of human resource over its demand.

(b) **Compulsory Retirement:** In contrast to golden handshake there exist the concept of ''Iron Handshake'. Under this scheme, the retirement is not volunteer but compulsory, here management spot the surplus employees and discharges them from service. Discharged employees do not receive any cash or non-cash benefits other than normal retirement benefits hence, the name 'iron handshake'.

(c) **Attrition:** In a lot of incidents every day in organizations, employees decide to leave their current organizations. It may be due to various personal and professional reasons. These positions are kept vacant till it needs to be filled. Such ban on employment can be implemented organization, department or job wise.

(d) **Layoffs:** It can either be temporary or permanent. A temporary layoff can be because of sloppiness in business, machinery or power breakdown or the recent pandemic that we all went through. Ones the conditions are back to normal, workers are called back. Permanent layoff is due to shut down or winding up of the company.

(e) **Leave of absence without pay:** Many a times employee prefer to be on leave without pay rather being jobless. Therefore, this technique is also used to helps company cut the labour cost and the employee to pursue his/her self-interest of fulfil other personal responsibilities while being on leave without pay.

7. **Employment Plan**: Above was done in case of surplus of manpower but is case of deficit, there has to be decisions regarding employment of people to fill the gap. For

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this decision to be effective major emphasis should be on the quality and quantity of manpower to be employed. These decisions will lead to processes like recruitment, selection, placement, transfer, promotion etc.

8. **Designing Training Programme:** In many cases what is mostly required to fill the gap between human resource requirement and availability is the skill only and not a new hire. This requirement can be fulfilled to an extent by just training people in such a way that they can harness their skills to be utilised for new projects and assignments. Hence, employees in the organization must be given appropriate training for their and organization's benefit. Development programmes should also be designed and conducted for them so that enrich their knowledge. Long-term

9. **Appraisal of HRP**: An appraisal of Human Resource Planning process must be made to check its effectiveness. Deficiencies must be pointed out corrective actions should also be taken whenever it is feasible and necessary to remove the deficiencies in manpower planning. An appraisal of the existing manpower plays will also serve as a guide in the future manpower planning.

IN-TEXT QUESTIONS

1. Manpower planning is _____ looking in nature.
2. Human Resource Planning identifies gaps in existing manpower in terms of their quantity and talent. True / False
3. Right Estimation of manpower requirements is the objective of:
   a) HRD b) Human Resource Policy
   c) Recruitment Process d) Human Resource Planning
4. Examination of number of employees during past five years is _____ trends.
5. Planners can identify _____ by comparing demand forecast with supply forecast.

2.4 QUANTITATIVE ASPECT OF MANPOWER PLANNING

The analysis of manpower planning leads to its two broad aspects, viz. quantitative aspect and qualitative aspect. The former relates to the determination of the right number of personnel required for each job in the organization and the later relates to specifying the quality of

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personnel in terms of laying down the educational, professional qualification, work experience, psychological traits, etc. We will now discuss the quantitative aspect of human resource planning which consists of the following aspects:

(i) **Demand forecasting:** estimating future manpower needs by reference to corporate and functional plans and forecasts of future activity levels.

(ii) **Supply forecasting:** estimating the supply of manpower by reference to analysis of current resources and future availability, after allowing for wastage.

(iii) **Determining manpower requirements:** analysing the demand and supply forecasts to identify future deficits and surpluses.

(iv) **Productivity and cost analysis:** analysing manpower productivity, capacity utilization and cost to identify the need for improvements in productivity or reductions in cost.

(v) **Action planning:** preparing plans to deal with forecast deficits or surplus of manpower, to improve utilization and productivity to reduce manpower costs.

(vi) **Manpower budgeting and control:** setting manpower budgets and standards and monitoring the implementation of the manpower plans against them

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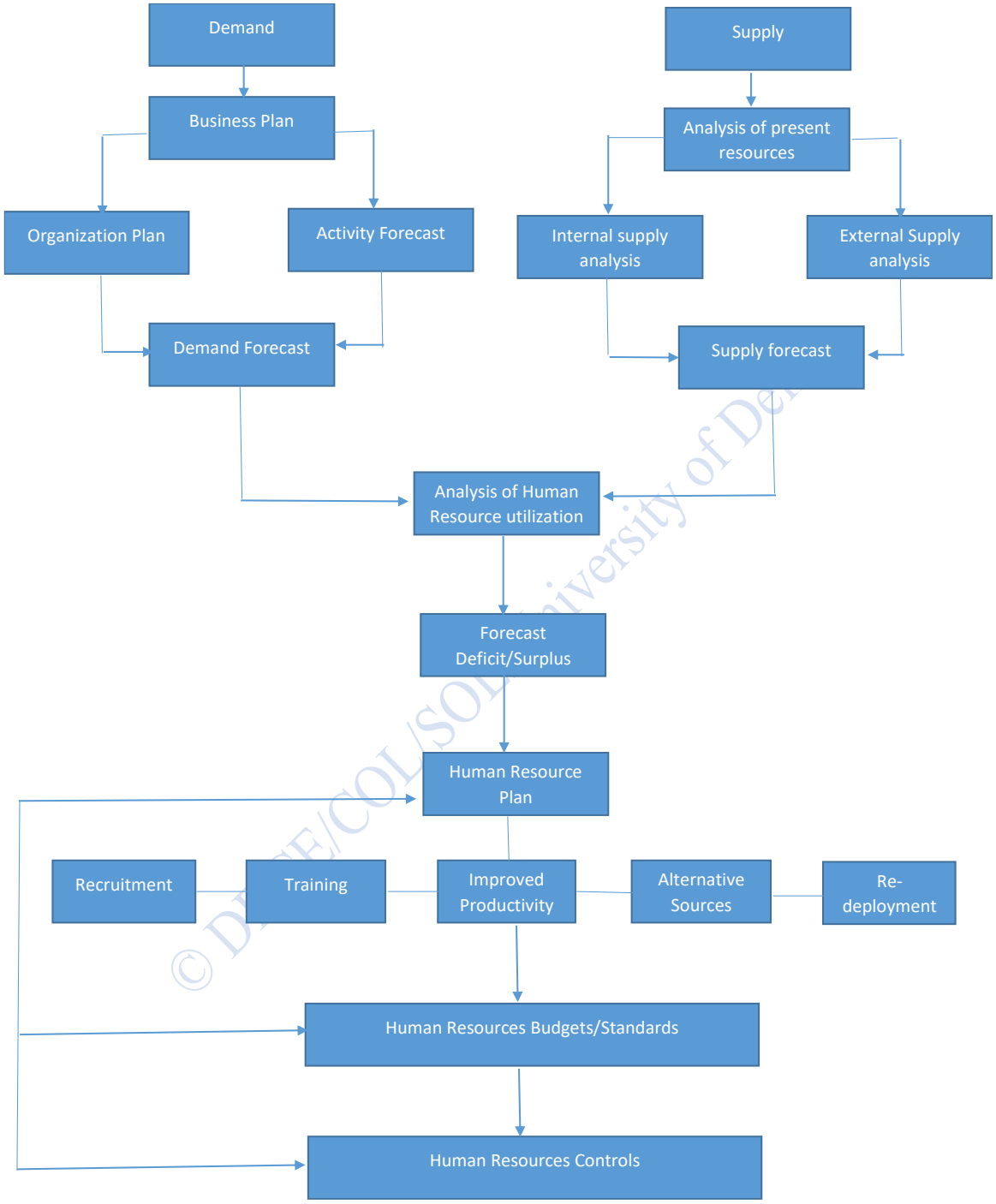

Fig. 2.1 Human Resource Forecasting

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2.4.1 Demand Forecasting:

Demand forecasting is the process of estimating the future quantity of manpower required. The manpower forecasts should be based on the annual budget and long-term corporate plan, translated into activity levels for each function and department. Only a well-conducted Demand forecast may lead to an accurate estimate of the human resource requirement leading to the most appropriate decisions.

There are three basic demand forecasting methods:

a. Managerial Judgement.

b. Statistical techniques, including ratio trend analysis and econometric models.

c. Work study techniques.

In many cases, a combination of the above techniques would be used. Now, let us discuss the above techniques in detail:

a. **Managerial Judgement:** The most convenient method of forecasting used in smaller companies is managerial judgment. In this method discussions and brainstorming sessions of managers come into play. Managers try to analyse their upcoming departmental workload and on the basis of that decide upon their future requirements for human resources. It might be done on a 'bottom up' basis with line managers submitting a proposal for approval by top management.

Alternatively, a 'top down' approach can be used in which company and departmental forecasts are prepared by top management, which is thereafter reviewed and discussed with the departmental managers. Guidelines for departmental managers should be prepared indicating broad company assumptions about future activity levels which will affect their departments.

b. **Statistical technique:** Under this head there are two methods viz Ratio-trend analysis, most commonly used statistical manpower forecasting and Econometric Model, more complex and less used technique.

   (i) Ratio Trend Analysis: It is carried out by studying past ratios between the number of direct and indirect workers in a manufacturing plant, and forecasting future ratios, having made some allowance for changes in organizations and methods. This technique, although crude, is easy to understand and use. Its value depends upon accurate records and realistic estimates of future activity levels and the effect of improved performance or changed methods.

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(ii) Econometric Model: To build an econometric model for manpower planning, it is necessary to analyse past statistical data and to describe the relationship between a number of variables in a mathematical formula. The variables affecting manpower requirements may be identified under headings such as investment, sales or the complexity of the product line. The formula could then be applied to forecast movements in these variables to produce manpower forecast. This is a complex process only for large organizations.

c. **Work Study Technique:** In order to calculate that how long operations should take the amount of labour required, this technique is used by applying work measurement technique.

2.4.2 Supply Forecasting:

Supply forecasting measures the quantity of manpower that is likely to be available from within and outside the organization. The supply analysis covers:

1. Existing manpower resources: The basic analysis should classify employees by function or department, occupation, level of skills and status. The aim should be to identify from this analysis 'resource centres' consisting of broadly homogeneous groups for which forecasts of supply need to be made. From the management perspective of their succession planning and preparation of management development programmes, it may be equally important to know how many people with potential for promotion exist and where they can be found. The analysis of current resources should look at the existing ratios between different categories of staff. Recent movements in these ratios should be studied to provide guidance on trends and to highlight areas where rapid changes may result in manpower supply problem.

2. Labour Wastage: Labour wastage should be analysed in order to forecast future losses and to identify the reasons for people leaving the organization. Plans can then be attached to the problems causing unnecessary wastage and to replace uncontrollable losses. The manpower planner therefore has to know how to measure wastage and analyse its causes.

3. Internal promotions and transfers: The supply forecast should indicate the number of vacancies that will have to be filled to meet the demand forecast. Vacancies arise because people leave. In order to fill these vacancies, the first strategies to think about should be internal promotions and transfers as it has various benefits, as it will enable the organization to make optimum utilization of resources and it even saves cost of training new hires in the organization.

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4. Effect of changing conditions on work and absenteeism: This assessment should cover factors operating within the firm such as changes in normal weekly hours of work; overtime policies; holidays; retirement policies; policies for hiring part-timers and shift system. Trends in absenteeism should also be analysed to trace causes and identify possible remedial actions.

5. Sources of supply: Internal sources of labour include the output from established training schemes or management development programmes and the reservoirs of skills and potential that exist within the organization. Besides that, external sources of supply are also equally vital source of supply of human resource. The factors which can have an important bearing on the supply of manpower are listed below:

Local Factors:

i. Population densities within reach of the company

ii. Current and future competition for labour from other employers.

iii. Local unemployment levels.

iv. The traditional pattern of employment, and the availability of people with the required qualification and skills

v. The output from the local educational system and government or other training institutes

vi. Availability of part-time labour

vii. Local housing shopping and transport facility

viii. Attractiveness of area or company.

National Factors:

i. Trends in the growth of the working population

ii. National demands for special categories of manpower

iii. The output of the universities, polytechnics and professional institutions.

iv. The effect of changing educational patterns

v. The impact of national government training schemes

vi. The impact of government employment regulation.

2.4.3 Problems in Human Resource Planning:

(i) **Identity Crisis:** Many managers as well as Human Resource specialists do not understand the Human Resource Planning process completely. There can be little doubt that unless the Human Resource specialist develop a strong sense of purpose, they are more likely to fail.

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(ii) **Lack of support from top management:** Human Resource Planning cannot be fruitful without top management support. As planning is always said to happen at the top level, it needs complete support from them so that it should flow down to the other levels and are executed in its true sense.

(iii) **Insufficient initial efforts:** Any sort of planning requires initiation, and so is the case with Human Resource Planning. After a plan is initiated, it flourishes slowly and gradually by placing things in place, developing a full proof plan and then executing it well. Without initiation human resource planning may not come in its required shape and form to benefit the organization.

(iv) **Resistance from employees:** Manpower Planning is very often resisted by employees and trade unions. What lead them towards this is their feeling that if this planning increase it will result in higher workload and may also restrict them from bargaining. This also drive them to feel that it would lead to widespread unemployment, especially for unskilled labour.

(v) **Coordination with other Managerial function:** Planning is always more fruitful and effective when done in consultation with others. Similarly, HRP if done after understanding departmental requirements also through a thorough discussion and consultation with the departmental managers, it would be much better.

(vi) **Expensive and time consuming:** Human Resource planning is mostly resisted by the employers because of the expense associated with it and high time-consuming quality which in turn increases the overall cost of manpower.

(vii) **Uncertainties:** Planning is always done for future, and future is always unpredictable and uncertain. There are various factors like absenteeism, labour turnover, technological transformations and market fluctuations that feed this uncertainty, that becomes the biggest constraints to Human Resource Planning.

(viii) **Insufficient Information:** Planning cannot dwell in the absence of vital information. If there will be insufficient information regarding HR requirement and availability, human resource planning cannot be done effectively.

2.4.4 Guidelines for effective Human Resource Planning:

(i) **Organised Effort:** Human Resource Planning function should be properly organized. A separate cell, section, or committee may be constituted within the Human Resource Department to provide adequate focus, and to coordinate the planning efforts at various levels.

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(ii) **Support of top Management:** Planning cannot come to the execution stage without top management. It is essential to ensure the necessary resources, cooperation, and support for successful Human Resource Planning.

(iii) **Adequate Initial Effort:** Human Resource Planning fails because of lack of sufficient initial effort. To be successful, human resource planning should start slowly and expand gradually. Development of accurate skill inventory and preparation of replacement charts are an integral parts of manpower planning.

(iv) **Coordination with other Management Functions:** To be effective, human resource planners must coordinate with other management functions rather than being totally absorbed in their own specialized areas keeping themselves aloof from the other operating managers.

(v) **Integration with organization plans:** Human Resource Planning must go hand in hand with the organizational objectives, as the basic objective of HRP is to procure such human resources in the organization that can contribute to the achievement of organizational goals. An important requisite for this is open communication between planners. The organization lacks such integration will fail in planning constructively.

(vi) **Involvement of Operating Managers:** Human Resource Planning must happen at all levels and departments of the organization. It is not only the task of the Human Resource department. The involvement of all operating managers can make the process much more constructive in nature

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CASE STUDY

RovoNov Testing Ltd. has planned for computerization of nearly 50% of the production operations and control. It has taken care of all resources in the computerization plan including human resources. The present inventory of human resources and future requirements of the production department were specified as given hereunder:

Category of Human Resources	Present Inventory	Requirements after computerization	Surplus
Chemical Engineers (Operation)	15	8	7
Chemical Engineers (Maintenance & Control)	10	6	4
Mechanical Engineers (Maintenance)	2	2	0
Supervisors	10	2	8
Operators	30	10	20
Quality controllers	5	1	4
	72	29	43

The Human Resource Planners suggested the redeployment of chemical engineers in their newly started sister concern, i.e., Lamant Textiles Ltd. and retrench surplus employees of all other categories. They also recommended to the management that there was no need for any other action plan.

The computerization was over by the end of 2001. When the management wanted to start the production on the newly computerized process, they were shocked to note that not many employees in the production department were suitable for the new positions and the information supplied by the Human Resource Planners in this regard did not match the reality.

Questions:

1. What is the main problem in this case?
2. Who is responsible for the present state of affairs?
3. What measures would you suggest dealing with the problem?
4. How can the interests of surplus staff be protected?

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IN-TEXT QUESTIONS

6. Human Resource Planning does not facilitate succession planning in the organization. True / False
7. _____ is the process of estimating the future quantity of manpower required.
8. Which of the following is not associated with Human Resource planning?
   a) Information b) compensation
   c) Integration d) Welfare
9. _____ is the measure of quantity of manpower that is likely to be available from within or outside the organization.
10. Identity _____ is one of the major problems of HRP.

2.5 DOWNSIZING

Downsizing involves organizational restructuring which results in decreasing the size of the organization and often results in a flatter organizational structure to respond more rapidly to the pace of environmental changes. Downsizing as a strategy has been adopted throughout the world to achieve operational economies and increase efficiency to be able to survive and grow in the uncertain environment. In the context of human resource management, downsizing involves elimination of certain jobs with a view to improve work efficiency. The organization reduces staff exceeding its need. As a result, some of the employees get separated from the organization.

Downsizing may become necessary due to the following reasons:

(i) An organization might suffer from overstaffing due to faulty human resource planning.

(ii) A change in man-machine ratio may occur due to technological advances.

(iii) An organization may start outsourcing some of its business functions. As a result, people employed in these functions become surplus.

Downsizing may create a feeling of insecurity causing low morale and high stress among employees. Employees may feel that they are paying the price for mismanagement. Moreover, when competent employees leave the organization, downsizing may erode the skill base.

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2.5.1 Role of HR Manager in Downsizing:

(i) HR Manager must ensure proper communication to minimise the negative effects of rumours and ensure that individuals are kept informed with factual data.

(ii) In order to sell the idea of downsizing to the employees, HR manager has to convince trade unions and win their support for downsizing.

(iii) HR manager must also deal with the actual layoffs. He must have programs to assist the laid off employees. When informed about layoff, employees face many uncertainties about service pay, retirement benefits, search for alternative job, transition assistance etc. These uncertainties need to be anticipated and taken care of.

Downsizing of workforce is generally implemented through Voluntary Retirement Scheme (VRS). Under this scheme, the organization and its employees enter into a mutual agreement under which employees agree to voluntarily retire on payment of agreed compensation by the employer. VRS has been recognised as GOLDEN HANDSHAKE because of the benefits for both employees and employer.

An organization may resort to voluntary retirement scheme involving handsome compensation to employees to get rid of surplus staff. VRS involves separation of employees based on mutual agreement between the organization and its employees. VRS is not new to Indian corporate sector as it has been practised in the past though the magnitude was not large enough to attract attention.

2.6 EMPLOYEE RETENTION

Rightsizing an organization is important but retaining human assets in it is even more important as 'a bird in hand is better that two in the bush', i.e., retaining existing talent in the organization is much better than hiring new ones. Employee Retention refers to the various policies and practices which let the employees stick to an organization for a longer period of time.

2.6.1 Importance of Employee Retention:

1. **The cost of turnover:** Increased turnover leads to increased cost due to new hiring and training of people in replacement of those who have left the positions vacant and work incomplete for the organizations to deal with. In order to avoid this cost of turnover, employees must be retained in the organizations.

2. **Loss of Company knowledge:** With people moving out of the organizations, their skills, knowledge, expertise also move out, and regaining the same becomes a difficult

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task for the organizations. Human Resource which is also referred to as intellectual assets must be retained into the organization as much as possible.

3. **Interruption of Customer service:** In service industries many a times person rendering services highly matters as the customers establish rapport with them and wants to be served by them in future as well. In such a scenario if they will leave the company, it may also lead to losing the customer as well.

4. **Turnover leads to more turnover:** Many at times it is observed that a person moving out of the organization can influence other too to take such steps, leading to mass resignations increasing the overall turnover of the organization. This may be due to dissatisfaction, discontent, grievance and so on. In such case the root cause needs to be found out in order to sort it out.

5. **Goodwill of the company:** Too many people leaving the organization can go in the bad name of the company losing its reputation and goodwill, which is vital for organizational growth and success. Hence, this needs to be dealt with in an efficient manner.

6. **Regaining Efficiency:** Efficiency ones lost takes too long to gain back. Efficiency in terms of knowledge, skill, experience if will be lost with the people turning out of the organization will again require a lot of time, cost and energy to be regained. Therefore, retention of employees is given importance in the organizations.

2.6.2 Employee Retention Strategies:

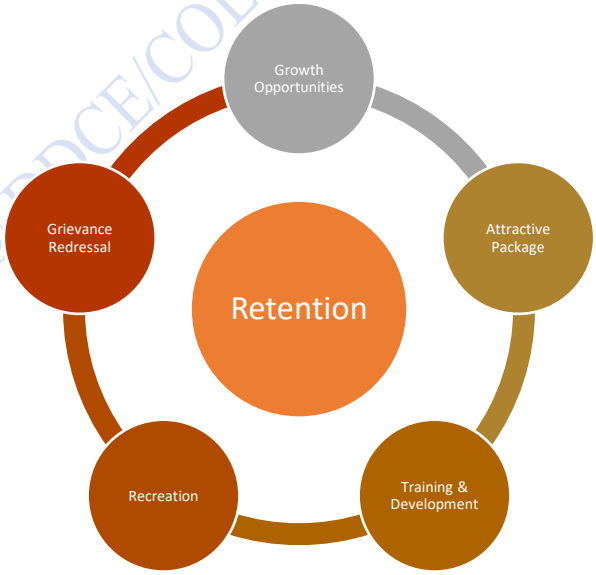

Fig 2.2 Employee Retention Strategies

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In addition to above there are many other important things that can be taken care of for higher retention:

1. Most important is to hire the Right Person at the Right Place
2. Empower the employees
3. Make employees realize that they are the most valuable assets of the organization
4. Have faith in the employees, trust them and respect them
5. Furnish them with crucial information
6. Keep providing them feedback on their performance
7. Recognize and appreciate their performance
8. Keep their morale high
9. Create a conducive environment for them to work

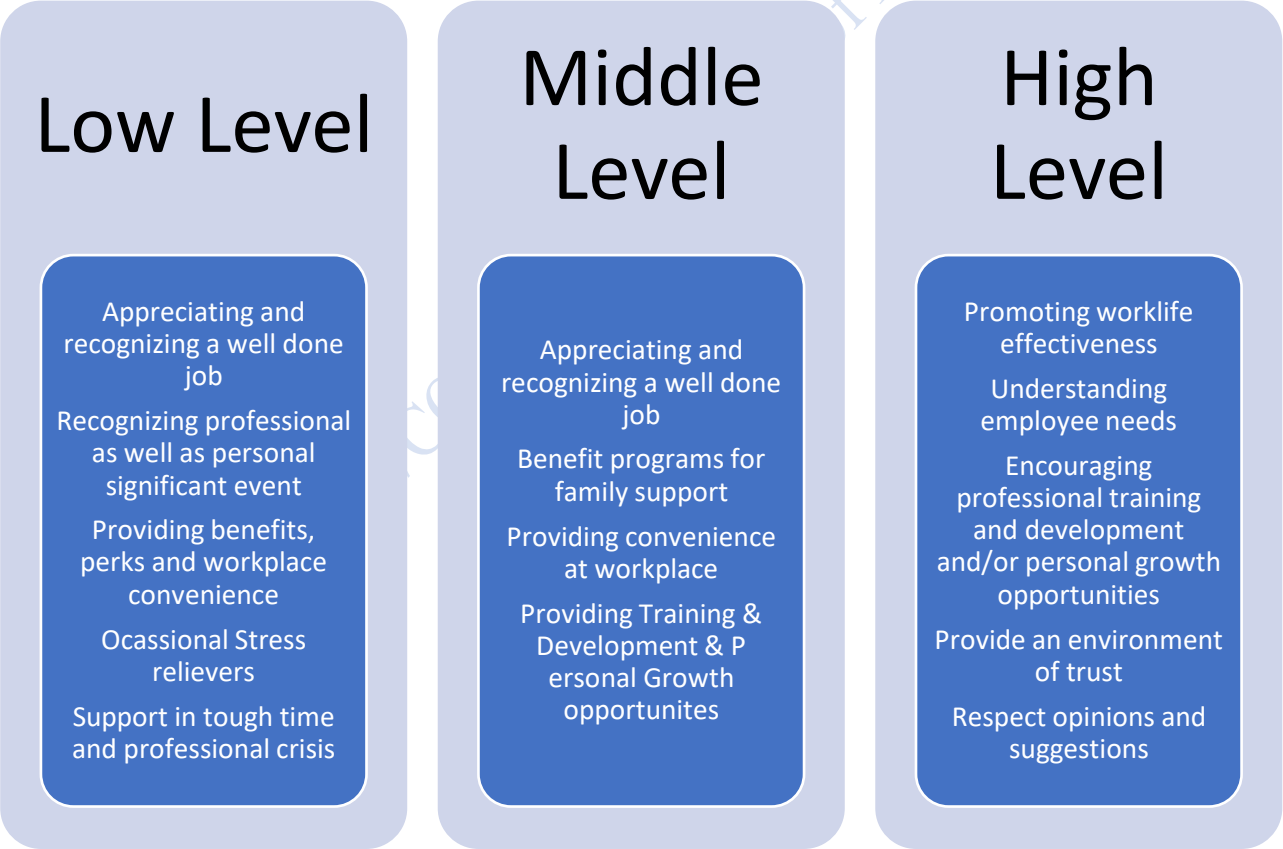

Fig. 2.3 Retention strategies at various levels.

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IN-TEXT QUESTIONS

11. _____ involves organization restructuring resulting in flatter organizations.
12. Downsizing of workforce is generally implemented through _____.
13. VRS is also termed as IRON HANDSHAKE. True / False
14. _____ is the process in which the employees are encouraged to remain with the organization for maximum time.
15. Which is not one of the retention strategies:
    a) Growth Opportunities b) Authoritative environment
    c) T&D d) Recreation

2.7 SUMMARY

For an organization it is very necessary plan each and every function, activity, process etc. as it is only effective planning that leads to its effective execution. Human Resource being such a vital asset for any organization, its management needs planning too. Human Resource Planning forms a base for various other important processes viz. recruitment selection, deployment, retrenchment and so on. For correct planning it is very important to be aware of the present state of affairs in the organization, hence, demand and supply forecast of human resource are referred to as the most important tools for human resource planning. Through this analysis surplus or deficit of human resource is calculated which works as reference for decisions regarding recruitment, hiring, retention, downsizing, retrenchment etc.

2.8 GLOSSARY

Forecast: To say what will probably happen in the future.

Quantitative: Connected with the amount or number of something rather than with how good it is.

Downsizing: To reduce the number of people who work in the company in order to reduce cost.

Retention: The action of keeping something or of being kept.

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2.9 ANSWERS TO IN-TEXT QUESTIONS

1. Forwards	9. Manpower Supply
2. True	10. Crisis
3. Human Resource Planning	11. Downsizing
4. Employment Trends	12. VRS
5. Gaps	13. False
6. False	14. Employee Retention
7. Demand Forecasting	15. Authoritative environment
8. Integration	

2.10 SELF-ASSESSMENT QUESTIONS

5. Define Human Resource Planning and outline the steps in the manpower planning process.
6. Briefly discuss the quantitative aspect of Human Resource Planning.
7. How are the requirements of manpower determined in a large organization? Discuss.
8. "The logical approach to staffing begins with a careful assessment and planning of current and prospective requirements of human resource". Comment.
9. Explain the concept of Downsizing. Why is it conducted?
10. Explain the concept of Employee Retention. Explain its importance and strategies for maintaining it.

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LESSON 3

JOB ANALYSIS AND TALENT ACQUISITION

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STRUCTURE

3.1 Learning Objectives

3.2 Introduction

3.3 Job Analysis

- 3.3.1 Concept of Job Analysis
- 3.3.2 Job Description
- 3.3.3 Job Specification
- 3.3.4 Comparison of Job Description and Job Specification
- 3.3.5 Uses of Job Analysis
- 3.3.6 Process of Job Analysis
- 3.3.7 Techniques of Data Collection for Job Analysis

3.4 Downsizing and Retention

- 3.4.1 Downsizing
- 3.4.2 Retention

3.5 Talent Acquisition and Recruitment

- 3.5.1 Talent Acquisition
- 3.5.2 Recruitment

3.6 Selection and Induction

- 3.6.1 Selection

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3.6.2 Induction

3.7 Summary

3.8 Glossary

3.9 Answers to In-text Questions

3.10 Self-Assessment Questions

3.11 References

3.12 Suggested Readings

3.1 LEARNING OBJECTIVES

After studying the lesson, the students will be able to:

- Get acquainted with job analysis, job descriptions and job specifications.
- Learn the various techniques for data collection for job analysis.
- Explain the steps involved in recruitment process, selection process and the induction.
- Understand meaning of talent acquisition and downsizing.

3.2 INTRODUCTION

This lesson will be very helpful for the future job seekers and job providers. In this lesson we will be learning how to tackle the problem of over staffing, how we will hire the new employees, how we will be creating a fit between the right people and the right job. We will be gaining knowledge about how the job analyser analyses the job, develops job descriptions, and prepares job specifications. We will also learn how can retain the talented employees so that they do not leave our organization. We will be looking at various internal and external sources of recruitment, whole process of selection. And lastly, we will also see how we should orient the new employee in the organization.

3.3 JOB ANALYSIS

3.3.1 Concept of Job Analysis:

Job Analysis is the process of collecting data for a particular job which will distinguish this job from the other jobs in the organization. It involves collecting the data which will guide about the skills, knowledge, abilities, and qualifications required for the job. Job analysis also

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instructs about the tasks, duties, and responsibilities related to the job. The management will collect the data related to the job and then will analyse it.

The meaning of the terms involved in the Job Analysis:

a) **Job-** Job means grouping of tasks, positions involving some duties, responsibilities, knowledge, and skills.

b) **Position-** Position is the collection of tasks and duties regularly assigned to one person.

c) **Duty-** Duty is the related to sequence of tasks to be performed.

d) **Task-** It is a specific activity which has a process and few steps.

e) **Occupation-** Occupation is grouping of jobs.

f) **Job Family-** Job family consists of jobs of similar nature like all jobs of doctors.

Job Analysis has two by-products which are Job Description and Job Specification. The purpose of analysing the job is to develop the differentiation between the various jobs so that not job is same in the organization as it will lead to duplication of work. Job analysis involves studying the aptitude required, skills required, level of understanding required for a particular job. Also analysing the physical and mental characteristics required by the job holder for the job like personality, confidence, learning skills, communication skills, etc.

3.3.2 Job Description:

Job Description talks about the requirements of a particular job which is necessary before advertising any vacancy. It is a detailed facts about the job which consists of content related to the job likes roles and responsibilities of the job. It is a factual written document giving descriptions about the job.

Details which can be included in Job Description are as follows:

a) **Name or the Title of the Job-** Like Manager, Financier, CEO (Chief Executive Officer), CFO (Chief Finance Officer).

b) **Location of the Job-** It includes the name of the department for which the job would be advertised.

c) **Summary of the Job-** It will include the task to be performed in a summarised manner.

d) **Usage of Tools, Machines or Equipment-** Whatever machinery or tools or equipment will be used should be described in the job description as it will give indication about the job.

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e) **Nature of Relationship-** It should clearly indicate the nature of relationship of job with other jobs in the organization as it will give clearer picture about the job.

f) **Work Environment-** For interpreting the work environment, condition of work, condition of physical environment all should be written under job description.

3.3.3 Job Specification:

Job Specifications talks about the requirements of a job. It translates the job descriptions into physical characteristics which are necessary to perform a job. These are the minimum acceptable qualities of human beings which should be possessed for a particular job.

The Job Specifications include:

a) Mental Skills
b) Educational Qualifications
c) Training
d) Experience
e) Health
f) Personality
g) Creativity
h) Initiative
i) Aptitude
j) Interests

Job Specifications serve as a guide which helps the management in hiring right people for the right job. It acts as a parameter which needs to be fulfilled for the candidates and helps the management in judging the eligible candidates.

3.3.4 Comparison between Job Description and Job Specification:

S.No.	Basis	Job Description	Job Specification
1.	Meaning	Job Description talks about the contents of a particular job	Job Specifications talks about the qualities required for a job.
2.	Importance	It is important to define the job.	It is important because it aids in recruitment, selection, etc.

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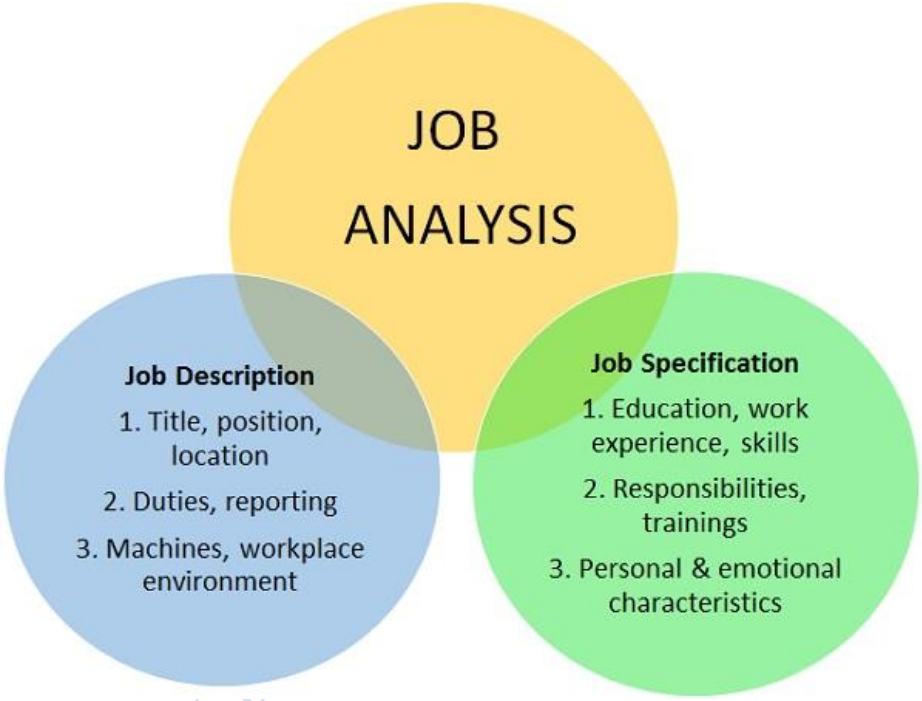
3.	Includes	It includes title, responsibilities, location of job, job summary, etc.	It includes qualifications, training, experience, etc.
4.	Precedes or succeeds	It precedes Job Specification.	It succeeds Job Description.



3.3.5 Uses of Job Analysis:

The Job Analysis is used in various fields which are given below:

a) **Human Resource Planning-** Job analysis helps in knowing the qualifications of the human resource which is required in the organization.

b) **Recruitment-** When job analysis provides the description of the job then it becomes easy to gather the application from the eligible candidates.

c) **Selection-** Job specifications help in hiring right people for the right job. It creates a fit between the prospective employee and the job.

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d) **Placement-** With the job analysis, the interests, knowledge, skills all these traits can be matched with the potential employees, and they can be hired and placed to the right positions in the organization according to their abilities.

e) **Training and development-** If the employees are clearly acquainted with what is expected from them then they can also indulge in some skill development and training.

f) **Job Evaluation-** Evaluating the job will help in fixing the compensation for that job. Job description helps in knowing the worth of the job to calculate the remuneration for the job.

g) **Performance Appraisal-** Job analysis gives the benchmarks or the yardsticks against which the performance of the employees can be judged. The standards can be matched with the actual performance of the employee, whether he is able to achieve the targets given top him or not.

h) **Employee Counselling-** The employees which are not able to cope with the present job according to the needs of the job then they can be guided and counselled to adopt another job which will relate to their domain.

i) **Job Design-** Job analysis helps in designing the jobs according to the specifications and descriptions. It also helps in re formulating some jobs.

j) **Organisational Design-** Job analysis helps in grouping and classifying different types of jobs which helps in building the structure of organization in terms of authority and relationship building.

k) **Safety and Health-** Lastly, job analysis helps in finding the work environment which guides any hazardous conditions of working or any unhealthy environment. There can be dust, heat or noise in the industry which can cause issues to the employees.

3.3.6 Process of Job Analysis:

There are number of steps in the process of Job Analysis which are discussed below:

a) **Organisational Analysis-** The very first most step in the process of Job Analysis is to find the number of jobs available in the organization to know the linkages and the relationship between them. It would help the job analyser to know the goals and the objectives of the organisation and in developing the jobs.

b) **Acquiring Knowledge about Jobs-** It is critically important to know all the job titles available in the organization because sometimes the titles which are similar are not related and vice-versa. After knowing the tittles, the analyser would fetch information

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related to different jobs. The information should answer what, when why and how about the job.

c) **Taking Samples for Jobs-** The analyser of course could not analyse all the jobs so he takes some jobs which will be acting as a representative of other jobs for analysing and judging.

d) **Gathering Information-** Now the question arises is who will collect all the required information. So, the analyser can take the help from trained officials from outside or can take help from the staff already working in the organization.

e) **Data Collection-** After this is decided that who is going to collect the data, the phase of data collection comes into picture. Now the data collection should involve the duties, tasks, role, responsibilities, etc. related to the job.

f) **Development of Job Descriptions-** The information which is gathered will be used to prepare a factual statement describing the roles and responsibilities which are required for performing a job.

g) **Preparation of Job Specifications-** The last step is to prepare the specifications for the job which will specify the physical and mental characteristics required to perform a job.

3.3.7 Techniques of Data Collection for Job Analysis:

There are some techniques which are used by the management for collecting the data for analysing the various jobs which are explained below:

a) **Questionnaires-** The questionnaire is a popular method of collecting data for analysing jobs. It is distributed to the employees and supervisors for fetching the information. It consists of questions related to the description of duties, working conditions, tasks, responsibilities, etc. This method would be impactful if the respondents understand the questions carefully and provide the answers with objectivity.

b) **Written Narratives-** In the organizations where the supervisors maintain detailed records of their tasks, timings of the task, this information can serve as written narratives. This method is little unsystematic and unorganised. This method should be coupled with other methods so as to fetch the correct details.

c) **Observation-** In this method, the analyser of the job observes the workers performing their tasks, duties, and responsibilities. After observing, he makes the notes for the same. But this method has limited applicability because observing every job is not an

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easy task. For example, observing the salesman would mean that the analyst should follow him wherever he goes to sell his products for several days.

d) **Log Records-** Under this method, job holders are provided with a logbook under which they need to enter every detail of the work performed. The type of tasks they have done, type of duties they have performed, starting time, and ending time of each work. But this logbook provides incomplete information because it does not consist of the type of equipment used, the type of machine used, and the type of tools used. And also, it suffers from one more limitation that is not everyone will maintain this logbook properly and enter every detail. This method is used for the jobs which are not easy to observe, like job of scientists, senior executives, researchers, etc.

e) **Interviewing-** Under this method, the job analyst interviews the employee and the supervisor of the employee to get the information about the job. From this method, the job analyst can easily get the information related to the job. Structured questions can be asked to fetch the information from the job holder and the supervisors. After this the job analyst can make judgements which information is useful for his job designing.

ACTIVITY

Suppose you are given the responsibility of hiring a financier for your company. Prepare the job descriptions and job specifications for the job of financier.

IN-TEXT QUESTIONS

6. The two by products of Job Analysis are _____ and _____
7. Observing is one of the techniques of data collection. True/False.
8. The _____ explains the characteristics of the job.
9. Job Specifications explains the roles and responsibilities of the job. True/False.
10. Does safety and health are
11. 5included in Job Analysis? Yes/No.

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CASE STUDY

A Case Study on Job Analysis

ABC Pesticides Company is 9-year-old pesticides making company in Kerala, decided to expand their business in 4 other states namely Jammu, Gujrat, Punjab and Maharashtra where the product is having good demand. They planned to approach farmers directly to understand their demands and also the dealers in the said state to establish the products.

Mr. Arjun is the head of HR department of the company. The senior executive told him to select four best candidates for marketing purpose who can sell company's product and capture good market share. Mr. Arjun started finding the best personnel for this task and found four candidates who have good experience and have good track record in top pesticides making companies. So, Mr. Arjun selected these four candidates and also introduced them to the senior executive and assigned them with their duties and responsibilities.

After a month, the senior executive was very disappointed with the performance of these candidates who have been placed. He called up Mr. Arjun and gave him the feedback about all those candidates. He told Arjun that only one candidate was able to bring the business from one state, rest of the candidates didn't add in the business anything and also, they are quitting. He also added that Mr. Arjun shouldn't be paid as he was unable to do his basic HR job.

1. What went wrong in the case?
2. Who is at fault the senior executive or Mr. Arjun or the three failed candidates?
3. How can the pesticides company come out of this issue?
4. What are the HR concepts that you can correlate with this case?

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3.4 DOWNSIZING AND RETENTION

3.4.1 Downsizing:

Downsizing refers to the process of reducing the number of employees in the organization. It involves terminating the contract of many employees at the same time. Downsizing is also referred to as Restructuring or Rightsizing. It leads to flat structure of organization which is more competitive and eligible to adopt to the threats and opportunities coming. It is a planned and deliberate action taken by management to reduce the number of staff in the organization.

During downsizing, many workers are waved off and others are forced to work in the environment which is not certain. Downsizing is a permanent reduction of the employees unlike the case of layoff which is a temporary elimination of employees. An organization can also give option of VRS (Voluntary Retirement Scheme)

There can be various reasons for downsizing-

a) Reducing the increased expenses of the organization.

b) Improving the company's overall operations.

c) Removing the unprofitable projects which will lead to termination of jobs.

d) Meeting the challenges of the environment.

e) Upgradation of technology due to which some employees become obsolete.

f) Changing the location of the business like moving the business from one place to another which will create difficulty for some of the employees.

g) Solving the problem of overstaff.

h) Reducing duplicate work.

i) To save the organization from recession like in the case of Covid.

j) To adapt to the latest technology.

k) Giving more concentration on core activities and outsourcing the non-core activities.

Measures taken by Human Resource Manager during Downsizing:

a) **Communicating with Employees-** HR manager plays a critical role during downsizing as he plays the mediating role between the management and the employees. He conveys the reasons for the termination of employees. If the manager will communicate everything positively then chances of negative word of mouth and rumours about the organization will get somehow reduced.

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b) **Gaining Employee's Union Trust-** The manager should gain the support of trade union by convincing them the need for downsizing. To tackle union can become a challenge for the management because the union can protest against the organization. In India, this policy is much opposed by the trade unions.

c) **Giving Outplacement Services-** The manager can help the displaced employees in finding alternate jobs by referring them in other organizations or by finding them other jobs or by helping them in preparing resume according to the industry's requirement or helping them with career counselling.

d) **Looking at Other Possible Alternatives-** The HR manager should try to convince the top-level management that downsizing should be the last option, first try other alternatives which can help in overcoming the problem of over staffing. The various alternatives can be:

i. Reducing the number of work hours of all the current employees which will lead to cost reduction and the termination of employees will not be required.

ii. If the number of employees is more in one department, then they can be shifted to some other department which in understaffed.

iii. Giving the option of VRS to the employees.

iv. Laying-off employees which mean temporary elimination of the workers for some period of time so as to cut down the cost.

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ACTIVITY

You are working as the HR manager in ABC company, due to Covid your business has faced recession. Earlier the company had 120 employees but now the production of the company got reduced. So, what all other alternatives can you take except permanently eliminating the workforce?

3.4.2 Retention:

Acquiring talent is not only the challenge faced by the organization, but the bigger challenge is to retain those employees with the organization for a longer period. There are lots of opportunities for talented people out there also the problem of poaching and raiding is going

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on there in the industry. If we will not provide the employees with job satisfaction and with all the facilities, then they may switch to a job with higher pay and higher facilities.

Measures for Retention of Talent:

a) **Acquiring Right Talent-** It is very important to employ the right people for the right job as if they will properly fit in the job then they would feel more satisfied with their work. If there is a misfit between the employee and the job then that employee should be transferred to the department where he fits well according to his interest, qualifications, and skills.

b) **Providing Attractive Remuneration-** If the management wants to retain their current employees, then it should provide them with good compensation packages so that they cannot be easily poached.

c) **Encouraging the Involvement of Employees-** When the management engages their employees in the decision-making, planning, and formulating of strategies then the employees feel that they are being valued and they are a vital part of the organisation. This will increase the loyalty and the commitment of the employees towards the organization.

d) **Challenging Projects-** Providing the motivated employees with meaningful and challenging projects makes them feel satisfied and increases their dedication towards their work and organization.

e) **Recognising Performance-** When the employees are recognised for their work, they feel being valued in the organization because their work is getting appreciated and praised. This will improve their relationship with the management.

f) **Job Security-** For retaining the employees, the very simple step a management can make is to provide the employees with the job security. Some employees prefer secured jobs even if they are offering little less pay than the unsecured jobs. So, if the employees feel job insecurity, they may leave our organization for a secured job.

g) **Career Development-** The employees at higher positions want professional growth also with the personal growth. So, the organization should try to inculcate some sort of training programmes for such employees so that they can advance in their careers simultaneously with their work schedule.

h) **Positive Work Environment-** Last but not the least, the organization should provide the employees with positive and cordial work environment. The atmosphere of the workplace leads a great impact on the effectiveness and the efficiency of the employee.

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The management should understand work-life balance of employees and provide an atmosphere with great communication, trust for each other and cooperation among all.

ACTIVITY

Imagine you are the manager of the company, and your rival company is poaching your talented employees.

What all measures will you take to retain your employees?

CASE STUDY for Retention

Attracting and Retaining Talent at ABC Company

ABC Company is a diversified advertising agency company with more than 21,000 associates in the U.S., Canada, and the UK. Relatively early in its growth cycle, the company realised that the requirement to create a lean, engaged, and productive workforce. Given the turbulent environment in which it operates, ABC Company realised the need to align its organisational design and staffing to meet current and future business requirements while accommodating rapid and unexpected changes. To meet this challenge, ABC Company developed an integrated workforce-planning framework using a cross functional team that homed in on both the staffing mix and staffing dynamics of the business. Using multi-dimensional scenario modelling, optimal mixes of internal and external human capital could be determined- laying out the number of positions available at each level for Marketing, Operations, IT and Staff groups. The modelling helped identify which groups should focus on attracting talent at any given time and establish ceilings on attrition rates by allowing for greater control over promotion rates. The impact on the company has been positive and measurable. Not only has ABC Company been able to better maintain stable executive headcount, but it has also broadened its control over staffing issues and set a floor for promotion rates. The latter has had a positive effect on retention of talent.

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3.5 TALENT ACQUISITION AND RECRUITMENT

3.5.1 Talent Acquisition:

Talent Acquisition is the function of the human resource department which involves finding the people which can be hired. The talent acquisition is the work of top-level management. It is related to making strategies and plans about how to proceed with the acquisition of new talent in the organization. It involves inviting applications from eligible candidates and then choosing the right people for the right job. It is the process of hiring, deploying human resources and providing them with fair compensation. It is the process which involves:

- Recruitment
- Selection
- Induction
- Training

Talent acquisition is important from the viewpoint of the organization because if the employees will be less or more in number it would be a problem for the organization. If the number of employees is less in number, then it would hamper the work and the growth of the company. If the number of employees is more than it would increase the unnecessary cost of the company. Also finding the right personnel is vital as lots of time, effort and money are involved in the process of hiring any employee. We will be learning the meaning of the terms, recruitment, selection and induction in the next section of the lesson.

3.5.2 Recruitment:

Recruitment is the process of bringing pool of applications. It involves making people apply for the vacant positions in the organization. It fosters attracting various suitable candidates to enable the organization to choose the best one among them. Recruitment is a positive process which involves finding the prospective employees for the current or future position of job opening. For recruitment process various sources have to be identified through which personnel can be attracted. This process of searching different sources is known as process of Recruitment.

Recruitment process precedes the selection process and is related to making all the applications available at a single place for management to choose the suitable candidate. For

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collecting various applications, the human resource department advertises the vacancy in various sources so that people can apply.

Process of Recruitment-

a) Identification of various sources from where personnel can be attracted.

b) Analysing their feasibility and viability.

c) Choosing the appropriate source which will provide us with the desired candidates.

d) Inviting applications from the candidates for the vacant positions.

The scope of recruitment is widespread, and the prospective and potential employees can be invited from various internal sources and external sources.

Internal Sources- Internal sources of recruitment means when we recruit the employees which are already working in the organization. Sometimes, the candidate which is required by the organization is easily available inside the organization only. So, there is no need to hunt the employees from outside sources.

There are three types of internal sources which are given below:

a) **Transfer-** Transfer means when an employee is shifted from one job to another, one unit to other or from one shift to another which carries same set of responsibilities, compensation, and same designation. It is generally done so that the problem of over staffing can be overcome. Transfer is a horizontal shift of the employee in the job status. For example, a manager of a company is shifted from its Mumbai branch to Delhi branch.

b) **Promotion-** Promotion means when an employee is shifted to a job with greater set of responsibilities, higher compensation and with higher position. Promotion is a vertical shift of an employee in terms of job status. The existing employees may be given some sort of training for getting promoted to higher positions or higher designations. Promotion acts as a motivating factor for the employees to work harder in the organization. For example, promoting an eligible Assistant Professor to the vacant position of Associate Professor.

c) **Re-employment of Ex-employees-** Re-employment of existing employees means employing the people who was working with the organization in the past but left the organization due to some personal reasons. It is cheaper for the organization to employee the ex-employees as the company already have a data of them and the organization knows them too well.

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Advantages of Internal Sources:

a) The internal candidates have all the insider knowledge about the organization.

b) Promotion will boost the motivation among the existing employees.

c) Promotion will lead to the increased efficiency among the existing employees as they have a motivating factor to work upon.

d) Training costs will be reduced if the existing employees will be promoted to the senior designations.

e) When the internal sources are used then the capabilities of employees can be used in the best possible manner.

f) The cost involved in recruitment through internal sources is very low.

Limitations of Internal Sources:

a) Young blood cannot be found out from the internal sources which act as a demerit of recruiting through internal sources.

b) Better talent which can be hired from the external sources cannot be achieved if we rely on internal sources only.

c) Employee mobility is reducing which is little healthy for the organization.

d) There can be partiality in promoting the employees to higher positions. For example, the manager will give promotions to his favourites regardless of their inability for that position and not promoting the deserving candidate because he doesn't like a particular employee.

e) Growth of the organisation becomes limited as fresh talent is not hired from the external sources.

External Sources- External sources of recruitment means when we hire the employees from outside the organization. Sometimes, the suitable candidates are not available inside the organisation, so the organization must search the external sources like through advertising or placement agencies, etc.

There are various types of external sources which are given below:

a) **Direct Recruitment-** Many organizations are approaches by some unskilled workers checking whether they can get employment there. Also, some organizations give recruitment at factory gate, it means whenever there is more work, or many workers have taken a leave together than these workers can be called to fill the gap. These

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unskilled workers can be kept at temporary basis, and they are also known as Budli Workers.

b) **Casual Callers-** In many reputed organizations, qualified people also approach by sending their CV. These people can be called whenever the need arises and are also called Unsolicited Applicants. The organization can maintain a file of these applications so that whenever vacancy is there, these people can be called.

c) **Advertising-** Advertising the vacant position has become a fashion these days as it helps in getting applications from world-wide. The advertisement can contain the minimum qualifications necessary to appear for the interview which will weed out some unsuitable candidates.

d) **Employment Exchanges-** There are some employment exchanges made by government under which government has also made it mandatory top fill some vacancies through these exchanges.

e) **Placement Agencies-** Like employment agencies there is a network of private companies which provide personnel. These professional companies provide various categories of personnel to the organizations.

f) **Management Consultants-** Management consultancy firms specialise in providing the personnel, the also advertise the vacancy on the behalf of their clients (organizations). These consultants have a data bank of qualified personnel and specialises in providing top-level and middle- level executives.

g) **Campus Recruitment-** Campus recruitment is a very popular method of finding qualified personnel as in colleges they complete their degrees which makes them qualified for the job. The organizations can visit the institutions and can conduct interviews there to find the suitable candidates.

h) **Recommendations or Referrals-** The organizations prefer referrals of the existing employees as some knowledge of their background can be easily found. Also, the recommendation by some business friends, family also acts as a good source of recruitment.

i) **Labour Contractors-** Labour contractor b rings labour in the organization, while he also works in the same organization. But there is a limitation in this method that if the labour contractor leaves the organization, then the labour which he brought will also leave with him. So, this method is not very popular but used in construction industries even nowadays.

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j) **Web Publishing-** Nowadays putting advertisement on the internet has gained a lot of popularity. Even some websites are also meant specifically for job findings like www.naukri.com and www.jobstreet.com, etc.

k) **Telecasting-** When the organization posts the vacant position on television through some channels like Door darshan, this method is called telecasting. The advertisement should be with every details along with the job specification.

Advantages of External Sources:

a) When we use external sources, qualified personnel can be attracted.

b) When the advertisement is given in newspaper, the organization receives lots of applications and has a wider choice to choose from.

c) Fresh and young blood can be catered to when the organization hires the employees from the external sources which is not possible in the case of the internal source of recruitment.

d) If the organization caters to external sources, then the existing employees will work harder to prove their worth to the organisation.

Limitations of External Sources:

a) When the organization caters to the external sources for recruitment, it acts as a source of dissatisfaction among the existing employees.

b) The hiring from the external sources is a time-consuming process.

c) Also, the hiring the employees form the external environment is a costly affair as searching candidates needs investment in the whole procedure.

d) Uncertainty factor is there when hiring from external sources as there is no guarantee of finding the right person for the right job.

Comparison of Internal Recruitment and External Recruitment:

S.No.	Basis	Internal Sources	External Sources
1.	Meaning	Searching candidates from within the organization	Searching candidates from outside the organization
2.	Cost involved	It is economical in nature.	It is costly.
3.	Level of motivation	Existing employees become highly motivated.	Existing employees become highly de motivated.

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4.	Fresh Talent	Fresh talent cannot be found out.	Fresh talent can be found out easily.
5.	Time taken	It is a quick process.	It is a time-consuming process.

Recent Trends in Recruitment:

a) **Outsourcing-** When the organization hires the personnel from some outside agencies on temporary basis rand does not offer them job as employee, this process is known as Outsourcing. It means when we hire the personnel on lease. The agencies which outsource the personnel has a contract with these organizations. These organizations pay these agencies their payment and these agencies in turn pay the remuneration to the personnel. Under outsourcing, the businesses do not have to trouble themselves in finding the right candidate and does not need to give advertisements which is a time-consuming process and costly affair.

b) **Poaching or Raiding-** Poaching means giving employment to the personnel who are already employees with some rival organization. This can be done by giving them higher pay and more benefits than they are getting in their current organization. For example, the employees of Pizza Hut can be raided by the Domino's which will also bring the insider information of the organization along with the employee.

c) **Website or E-Recruitment-** With the digitalisation all around the globe, we can easily advertise our vacant position on the internet and the potential candidates can send their CV (Curriculum Vitae) through emails. The applications of candidates which seems to be suitable can be chosen from the various applications. This process is cheaper and takes less time. The organization can easily find the right people for the right job.

d) **Internships-** Internships refers to employing during the summer before graduation from college. These can be in some technical courses. Employer tries to find talented interns and can also give them job on their completion of training period if they work well.

e) **Walk-In Interview-** Under walk-in interview, the employer advertises its vacant position with a tag walk-in interview, it means anyone who is eligible for that vacant position can come and contact HR department and give interview. The candidate is also asked to fill the application form during the time of interview so that his details can be collected.

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ACTIVITY

Imagine you have been appointed as a recruiting manager in an Automobile Industry in India, how will you recruit for entry level positions in different departments.

Prepare a draft for the same in brief.

IN-TEXT QUESTIONS

11. Write down the two sources of external recruitment- _____ and _____.
12. Does employment exchange a part of internal source of recruitment? True/False.
13. Downsizing involves VRS. Yes/No.
14. Is promotion a part of internal source of recruitment? True/False.
15. _____is the process of gathering a pool of applications.

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CASE STUDY

The XYZ Company Recruitment Process

One of the most notable statements of the CEO of XYZ Company is that "XYZ Company invests in people." The main reason why people from different cultures, have been dreaming of being recruited and hired by XYZ Company is that the company offers possibly the most outstanding job compensation packages any normal employee could ever enjoy.

In order to attract the best employees, XYZ Company draws them by the promise of wealth and luxury, providing their employees with almost everything an employee could possibly need, from absurdly high compensations to extravagant and luxurious benefits like gourmet food, carwash, gym, snacks, exercise classes, dry cleaning services, car services, haircuts, oil changes, massages, check-ups and many more, all for free.

Nevertheless, the recruitment process was also far beyond ordinary. Several people who have had experience in the XYZ Company recruitment process narrates that the experience was totally nerve-wracking. One applicant who underwent interviews for XYZ Company has had five to seven interviews in one day for two to three straight days. That applicant claims that the interviews were really tough with some of the brightest people in the world, conducting the interviews filled with brain teasers, algorithmic problems, and IQ tests.

Another applicant who also have had experiences in the recruitment process of XYZ Company claims that his XYZ Company experience was one of the most nerve-wracking adventures of his life. The interviewers were looking for extremely bright individuals and so the recruitment method was filled with IQ tests, brain teasers, algorithms, data structures, and a lot of mathematics involved in it.

Questions:

1. How was the experience of the employees of the recruitment process at the XYZ Company?
2. Why the XYZ company was so popular regarding its recruitment?
3. How the XYZ company finds the most suitable candidate for the company?

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3.6 SELECTION AND INDUCTION

3.6.1 Selection:

Selection is the process of choosing the right candidate for the right job. It involves screening the various applications and from them choosing the best candidate which fits optimally for the required position. It is the process of differentiation which differentiates a candidate from the other based on skills, talent, and qualifications.

Selection is a negative process because it involves rejection. In the process of selection, the selection committee rejects the unsuitable candidates from the list of the candidates. There are various stages to weed out certain candidates for a job.

Selection is a vital process for the organisation as it involves lot of time and money of the organisation. It is the process including heavy investment. If the employer has chosen the wrong candidate for a job in consideration, then there will be a loss of time, money, and effort which was used during the selection period of the employee. Hence, a systematic procedure for selecting employee should be made by the organization so that right people can be employed.

Every phase in the process of selection procedure should be eligible in getting more and more knowledge about the various applicants or candidates. When the company will select right people for the right job then the employee will prove to be an asset for the business and lead the business to great heights.

The benefits for selecting right candidate are as follows:

a) **Rate of Absenteeism-** When right candidate is employees which is dedicated towards the organisation then he the rate of absenteeism will also get reduced.

b) **Labour Turnover-** When the employees feel satisfied with the organisation and they are valued then they do not think about switching their jobs and therefore, the labour turnover also gets reduced.

c) **Rate of Industrial Accidents-** When suitable candidate who have knowledge and skills about that job then the chances for industrial accidents will also be less.

d) **Job Satisfaction-** When employees have the job of their interest, and which is of their choice then they feel more satisfied with their jobs and contended towards the organisation. It will also increase their efficiency.

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e) **Motivation of Employees-** When the organization values their employees, listens to them, and treat them as asset for the business then the employees feel highly motivated to give their best for the organization.

Difference in Recruitment and Selection:

S.No.	Basis	Recruitment	Selection
1.	Meaning	Recruitment is the process of actively searching and finding candidates to apply for a specific position or job.	Selection is the process of choosing the right candidate among all candidates who have applied for the job.
2.	Nature	Recruitment is a positive process as it involves all candidates to apply for the vacant position.	Selection is the negative process as it involves weeding out the unsuitable candidates.
3.	Aim	The aim of recruitment is to make a pool of candidates that means bringing a greater number of applications.	The aim of selection is to choose the right candidate for the right job which matches the skills and qualifications required.
4.	Procedure	The organization advertises its vacancy through various sources and distribute the application from through which the candidate can apply in online mode and offline mode.	The organization makes the candidate to pass through various stages like filling form, employment tests, interview, etc.
5.	Contractual Relationship	No contractual relationship is made because there is only communication about the	A contractual relationship is made between employer and the employee as the

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		vacancies in the organization.	candidate is hired to perform services.
6.	Number of Candidates	There is no limit on the number of candidates applying in the process of recruitment.	There is a limit on the number of candidates getting selected in the process of selection.

When we have recruitment plan ready, and we have plenty of options to choose from then we can start with the process of Selection. The process of selection involves various steps to choose the right candidate to choose for the present job or for the future opening of the job. The responsibility for hiring people lies with the managers and supervisors but Human Resource Management also plays a critical role in helping the managers in the process of selection. HRM helps in providing the guidelines and defining the roles for which job openings are there. The process of selection is an expensive process because of the amount of money and time involved. The process of hiring involves screening out the various applications, then weighing the resumes which are more superior than the others.

ACTIVITY

Visit yours or another person's LinkedIn page. Consider the content from an interviewer's point of view. Should anything be removed or changed?

The candidates must pass through various stages during the process of selection. He has different hurdles in front of him and if he is not able to clear a hurdle then he won't be proceeded to the further stages.

The process of Selection included various steps which are given below:

a) **Preliminary Interview-** The first most step in the process of selection is the interview of the candidates. It is generally brief in nature and weeds out the unsuitable candidates in the earlier stage only. For example, the qualifications which is necessary for the job, or the experience required or some kind of training, all these are not possessed by a candidate then he stands unsuitable for further stages in the process of selection. He would be eliminated then and there only.

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The candidate who clears the interview will be allowed to fill the application form for more details of the candidate. This step helps the employer as well as employee.

The benefits of the preliminary interview:

i. **To Applicant-** Applicant does not have to pass through the long process of selection if he is unsuitable for a particular job then he will be saved from getting troubled by giving all the tests taken by the organization.

ii. **To Organization-** Organization can save its money and the expenses which would have been on the unsuitable candidate if the organization takes him to the remaining steps of the process.

b) **Screening of Application Forms-** After preliminary interviews the candidates which are still suitable for the vacant position can be provided with application form wither in the physical form or the form can be downloaded from the organization's website. The application form should be very simple and incorporate all questions which can fetch the details required of the applicant. The form is required to have a written record of the qualifications, experience, skills possessed and other qualities of the applicant.

Usefulness of Application Forms-

i. Application form give detailed knowledge about the candidate to the interviewer.

ii. The record can be collected in written from through application forms.

iii. It makes the processing of the applications an easy task.

iv. It helps in eliminating unsuitable candidates.

v. It also helps in taking the suitable candidates to the next stage of employment tests.

c) **Employment Tests-** These tests are mostly used by the organization to select the candidates for various jobs. These tests help in matching the right person for the right job. All the individuals are different from each other in the form of qualifications, skills acquired, mental capacity, potential to learn and their personality. S these various employment tests helps in knowing the candidate better.

The following are the employment tests which can be taken by the organization to select suitable personnel:

i. **Intelligence Tests-** These tests check the mental capacity of the candidates. These tests see the ability of the candidates to learn, to understand, to recall and to catch. These tests also check the reasoning and judgements made by the candidates in the given situations.

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These tests measure the logical ability of the candidates. There are different types of intelligence tests made by the psychologists, these can be verbal or non-verbal in nature.

ii. **Aptitude Tests-** Aptitude tests measure the potential of the candidates to learn and adapt any new skills which are required for the job. It checks whether there is capacity and motivation among candidates for learning. These tests help the organization in knowing whether the candidate will be able to adapt to the new situations and the problems which will arise in the business in the coming future.

iii. **Occupational Tests or Professional Tests-** These tests are also called as Proficiency tests, Performance tests or trade tests. These test helps in measuring the skills already possessed by the candidates. Proficiency tests are different from aptitude tests as the former measures the skills already acquired by the candidate while the latter measures the potential of learning new skill by the candidate. Trade tests take some sample of candidate's behaviour which will replicate his actual behaviour.

iv. **Interest Tests-** These tests measure the level of interest of the candidates in different areas. These tests help in finding the right job for the candidate according to his interests.

v. **Personality Tests-** These tests help in knowing the different personalities of the candidates. It reflects their interests, their qualities, their aptitude in a combined manner. It shows how much mature the candidate is, his emotional side and many more aspects which does not came out from the other tests conducted.

d) **Employment Interview-**After all the employment tests has been conducted, the candidates which clears these tests are called for the final interview. It would be conducted by the board members consisting of the Human Resource Manager and the people from other departments. This interview will check whether the candidate is suitable or not and also give him clearer picture about the role and responsibilities of the vacant position. In interview, there is a face-to-face conversation between the board members and the candidate. Apart from oral communication there is also constant observation regarding body language, confidence and situation handling of the candidate. The conducting interviews are very important for the organisation.

Importance of Interviews:

i. **Face-to-face Contact-** There is a face-to-face communication which helps in knowing more personality traits of the candidate.

ii. **More Information-** The candidate can also get more knowledge about the organization and the job and therefore improves understanding about the role of the job.

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iii. **Communication Skills-** The communication skills can be judged by looking at confidence, fluency, and smoothness in speaking.

iv. **Applicable in cases of Non-Elaborated Selection-** When the organization is not following all the steps like not conducting the employment tests then interview can really help in weeding out the unsuitable candidates and selecting the appropriate one.

e) **Reference Checking-** After the interviews, the candidates are asked to give reference details of some people. The details of the references include their name, address, mobile number. These details are necessary for investigation purpose and getting some more information about the candidate. The references can be previous employer, university's teachers, professors, known persons.

f) **Medical Examinations-** After all the tests have been conducted, interview have been taken and the references have been checked the selected candidates has to pass through medical examinations which will ensure that the candidate is physically apt for the job. Medical examination will help the organization in saving the expenses form hiring the medically unfit candidate.

g) **Appointment Letter or Job Offer-** Now, this is the last stage in the process of selection. When the candidate has successfully cleared all the hurdles in the process of selection, he will be provided with an appointment letter for joining the organization.

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ACTIVITY

A new HR manager has been appointed in the company and you are the assistant of that HR manager. You are given the task of preparing the manager for taking interviews. At the point when you offer assistance to manager, he says he has talked with many individuals and needn't bother with your assist in arranging the meeting with handling. At the point when you sit in the meeting with him, he poses improper inquiries that you do not feel truly evaluates the capacities of the competitors. How might you deal with this?

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CASE STUDY

The XYZ Interview Process

In 2013, Since XYZ company is known to be the ultimate recruitment and selection machine, its processes are also the most gruelling experiences an applicant could ever have. Usually, the interviews begin using the telephone. Once the phone interviews conducted have been successful, the applicant would be scheduled by the recruitment officer and be invited for a series of five to ten interviews in one day with ten different people. Some people who have successfully undergone this process, described it as the most excruciating employment experience of their lives as a lot of mental gymnastics were necessary to prove your skills.

There were many instances when the applicants were asked to write codes, brainstorm, role play or solve mathematical equations on the spot just to prove that they are highly skilled and competent. In other instances, the applicants are even tested of their marketing skills even though the position an applicant is applying for is highly technical. The interviewers seem to have control and power over the applicants letting them do everything just to prove that they are worthy for the position. Common questions involved computer network problems, Java programming and algorithms by which XYZ company is known for.

Moreover, other applicants can rate and share comments on another applicant which XYZ Company can track and use as another basis for hiring or not hiring an applicant. Overall, the process was a lengthy, tedious and nerve-wracking experience which can possibly traumatize anyone whose dream is to work for one of the most prestigious companies in the world. Nevertheless, the perks and benefits are limitless and are more than enough to compensate for such a tough employment experience.

Questions:

1. Was the interview process too time consuming for the organization?
2. How this system can be shortened and made simpler? Give your suggestions.
3. Does this process actually able to analyse the skills of the interviewee?

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3.6.2 Induction:

When the whole procedure of selection has been done, and the candidate is given appointment letter, then comes the turn for the induction process. Induction is the process in which the employee is introduced to the organization. It is the process of orientation where the employee is welcomed at made to feel at home in the organization. This process is the first communication between the new employee and the existing employees. It helps in building cordial relationship among all the employees.

The whole process of orientation helps the new employee in knowing everyone in the organization and to get adjusted smoothly with his colleagues. He also gets acquainted with the work environment. A senior employee has been delegated with the work of systematically introducing the new joiner to the whole organization. Every organization has different ways of orientation. Some companies show some small video depicting the company's past and the company's mission and future vision. The new joiner is also given information about the lunch break, washroom facilities, canteen facilities, tea breaks, etc.

The objectives of Induction are-

a) To build the confidence of the newcomer.

b) To give the new employee all the necessary information.

c) To develop cordial relationships among all the employees.

d) To develop a positive attitude of the new employee towards the organization.

e) To develop a sense of belonging to the organization.

Benefits of Induction-

a) It encourages developing two-way communication between the new employee and the management.

b) It helps in reducing the nervousness of the new employee.

c) It helps in knowing what the new employee is expecting from the organisation.

d) It fosters developing positive attitude towards the company.

e) It reduces the time of socialisation process.

Induction Procedure-

a) New employee has been provided with the timings and the place where he needs to work.

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b) When the new employee comes for the duty, the senior employee should meet him and welcome him.

c) All information related to working hours, number of leaves available, medical leaves should be conveyed to the employee.

d) After this an introduction to the department should be given in which he will work and to whom he will report should be told to him.

e) Some printed material related to information should also be provided to the employee apart from the oral communication.

f) The orientation programme should be conducted by the senior employee who is well versed with the organization so that he leaves a positive impression about the organization on the new employee.

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CASE STUDY

The Induction Process

XYZ company, a FMCG company recruited ten new employees. On the very first day of the introduction, the manager of the company introduces the new employees with the company. Also, the manager gave instructions to the new employees about the company's rules and regulations, the timings of the break, the dress code which needs to be followed in the company. The induction program lasted till lunch.

After lunch, the manager took all the employees on a guided tour in a company van to all the departments. Meanwhile, the employees were not given any work or training in the initial two days. And they were asked to acquaint themselves with each other. It will help them in knowing the company informally.

On the first day, the workers were extremely formal and amiable to one another. They asked their names and data about one another's instructive foundation and past work insight. On the subsequent day, they talked about their perspectives on different issues - public governmental issues, global governmental issues, social issues, changes in innovation, contamination, and business morals, etc. Assuming any individual offered any expression on any issue, individuals who concurred with him talked in his help. Most individuals who couldn't help contradicting him didn't stand up. Regardless of whether they communicated their conflict, they did not do it in a strong way and stayed away from contentions.

Following two days, the new representatives were given preparation for a week and afterward they were appointed work obligations and obligations. As they worked, connection among them expanded. A few representatives fanned sub-gatherings. Assuming contrasts in feelings emerged on any issue, workers contended fervently and were upheld by their sub-bunch. Following a couple of months, the representatives got comfortable with their work. They additionally understood the significance of collaboration and coordination in finishing the work without a hitch. The representatives additionally educated the significance of tuning in. They attempted to pay attention to their associates' perspectives and figure out their perspective. Thusly, the recurrence of brutal contentions diminished, and the workplace moved along. Every individual from the gathering had the option to straightforwardly communicate his perspectives. The gathering took choices solely after thinking about the assessments of the relative multitude of individuals. Since everyone partook in navigation and arranging, the gathering had little trouble in execution. The gathering finished any venture allocated to it effectively.

1. What is the type of group described in the above case?
2. How the group developed in company XYZ?

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IN-TEXT QUESTIONS

16. _____ is the process of choosing the right people for the right job.
17. Induction helps in creating two-way communication between the management and the employee. True/False.
18. _____ is the process of introducing the new employee to the organization.
19. Selection precedes Recruitment. True/False.
20. Recruitment acts as a base for the process of selection. Yes/No.

ACTIVITY

Suppose you are appointed as the HR Manager of ABC Company which is a fastest growing company in a FMCG industry. The company needs to hire some interns, so keeping this in mind explain the procedure of recruiting and selecting the personnel.

Write the steps in brief.

3.7 SUMMARY

This lesson taught us the job analysis, the two by-products of job analysis, recruitment process, selection process, induction process. We have also learnt the meaning of downsizing and how it should be introduced in the organization to face less resistance from the employees and how can we retain our talented employees in the organization.

3.8 GLOSSARY

Poaching- Hiring the employees of the rival companies by giving greed of money and facilities.

Compensation- All the remuneration given by the employer to the employee.

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3.9 ANSWERS TO IN-TEXT QUESTIONS

1. Job Description and Job Specification	9. Yes
2. True	10. Recruitment
3. Job Specification	11. Selection
4. False	12. True
5. Yes	13. Induction
6. Direct Recruitment and Web Publishing	14. False
7. False	15. Yes
8. Yes	

3.10 SELF-ASSESSMENT QUESTIONS

11. Considering yourself as a Human Resource Manager, answer the following question:

(a) What will your workforce look like when the "new normal" becomes the actual norm?

12. Consider yourself as an employee of the company and try answering the following questions:

(a) How likely are you to stay at this organization if you were to receive a 10% salary increase from another organization?

(b) How enthusiastically would you reapply for a job here?

(c) How likely are you to be working here in one year?

(d) How likely would you be to refer someone to work here?

(e) How likely would you be to recommend our organization's products or services to a friend or colleague?

13. An organization is planning to fill up vacancies in the higher positions from amongst the employees. Do you agree or disagree with the proposal? Explain. (Source: Book- Essentials of Human Resource Management by T.N. Chhabra and Monica S. Chhabra)

14. Even though interviews have been widely criticised, they are heavily used in selection of candidates for employment. Discuss why this selection device still rates high although we know it can provide unreliable information. (Source: Book- Essentials of Human Resource Management by T.N. Chhabra and Monica S. Chhabra)

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15. How is Job Analysis information helpful in human resource management? (Source: Book- Essentials of Human Resource Management by T.N. Chhabra and Monica S. Chhabra)
16. Describe the advantages and disadvantages of hiring an internal and external candidate. Give an example of when you do not think an external candidate should be considered for a position. (Source: Book- Human Resource Management by K Aswathappa and Sadhna Dash)
17. Discuss the significance of employment tests and describe any three types of employment tests commonly used in industry. (Source: Book- Essentials of Human Resource Management by T.N. Chhabra and Monica S. Chhabra)
18. Define Orientation and discuss its importance for the organization and the employees. (Source: Book- Essentials of Human Resource Management by T.N. Chhabra and Monica S. Chhabra)
19. "Job Description and Job Specification are the two by-products of job analysis." Discuss the statement. (Source: Book- Essentials of Human Resource Management by T.N. Chhabra and Monica S. Chhabra)

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LESSON 4

LEARNING, TRAINING AND DEVELOPMENT: PROCESS AND METHODS

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STRUCTURE

4.1 Learning Objectives
4.2 Introduction
4.3 Basic Concepts
    4.3.1 Learning
    4.3.2 Training
    4.3.3 Development
4.4 Learning Theories
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4.5.3 Person Analysis

4.6 ADDIE Model

4.6.1 Analyse

4.6.2 Design

4.6.3 Development

4.6.4 Implementation

4.6.5 Evaluation

4.7 Training & Development Methods

4.7.1 Coaching or Mentoring

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4.7.3 Modelling

4.7.4 Active Participation

4.7.5 Role Playing

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4.7.7 Simulation

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4.7.9 Game-Based Training

4.7.10 Internship

4.7.11 Sensitivity training

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4.8 Evaluation of Training & Development

4.9 E-Training & E-Development

4.10 Career Development & Succession Planning

4.10.1 Evaluate the organisation

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4.10.2 Assess the organisation's status in development of resources

4.10.3 Assess current opportunities

4.10.4 Identify potential staff to mentor

4.10.5 Identify training gaps

4.10.6 Develop an integrated program

4.11 Case Study

4.12 Summary

4.13 Glossary

4.14 Answers to In-text Questions

4.15 Self-Assessment Questions

4.16 References

4.17 Suggested Readings

4.1 LEARNING OBJECTIVES

- To understand basic interrelated concepts like learning, training, and development.
- To understand different applicable learning theories.
- To know and learn to apply different available T & D techniques.
- To understand the concept of succession planning and the transitioning T & D in the virtual world.

The application-based approach is followed by adopting activity doing method and case study approach is followed to ensure a better understanding of the concept of the learner and develop his problem-solving skills.

4.2 INTRODUCTION

The chapter first discusses the basic understanding of the concepts like difference between Learning, Training, and Development. The learner may have layman idea about these concepts. But before understanding different aspects of Training and Development, it's important to learn to differentiate between these concepts.

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This lesson would help the learner to comprehend the different learning theories and its applications. Learner could differentiate between different techniques of training and know which is the most suitable one to apply under a particular situation. One would learn about ADDIE model and the TNA concept. The lesson will develop the understanding on the changing role of T&D approaches in the e-learning environment.

The last part of the lesson discusses contemporary issues like e-training and e-development concepts. The latest research on the concept of succession planning is shared with the readers and it is discussed that how succession planning can be achieved. To gauge the understanding of the reader on the subject, the relevant case study is shared towards the end of the chapter.

4.3 BASIC CONCEPTS

The concepts like 'Training', 'Learning', and 'Development' appears to be synonymous to each other but there is actually a wide difference across these terms. The differences can be understood by comprehending the meaning of these concepts. These terminologies are explained as follows:

4.3.1 Learning:

Learning refers to permanent change in the behaviour of an individual or an organization as a result of an experience. There are three aspects of learning: change in behaviour, permanent change, and experience. Learning involves changing of the status quo position which can be through acquiring new skills or changing of the existing way of doing things. The change is not brief or temporary but is imbibed. It becomes a normal course of reflex action of an individual. The third aspect is experience. This change in behaviour can be after experiencing a better way of doing thing or new skills that can be acquired by way of learning by doing approach or a mere observation, and reading can also create learning.

There are different perspectives on learning. But over years it has emerged as a long-term orientation that emerges as a result of various formal and informal on the job and outside job experiences. Learning may not happen just through formal training or seminars or workshop programs. But it can happen through informal interactions and through different work and personal life experiences. It is also not a concept that is limited to the individual level. But learning can be acquired at the team level as well as at the organisational level.

The changing nature of work requires individuals, teams, and organisations to have continuous learning. Increased customer demands, changing technology, and increasing complexity of the jobs require learning to be a continuous part of the system. Learning can cause change in

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cognitive skills, behavioural outcomes, and affective results like attitudinal and motivational changes.

4.3.2 Training:

Unlike learning which can be voluntary, training is a planned effort by an organization towards enhancement of current knowledge, on the job skills, and changing of the existing behavioural patterns of the employees so that they can be successful in their current jobs. In other words, training is a practical education imparted to enable better functioning on the job. Training has more focused outcomes and is short term oriented.

Training is not an intuitive process. There is a science involved in designing a right training program. Training when designed systematically yields positive results. Effective training occurs when employees learn required knowledge, skills, and attitude (KSAs) to do the job in the best possible way. Research shows that employees have a favourable attitude towards training if they are included in its designing process or when they voluntarily chose it rather than made to attend under compulsion. Training also adds value only when employees get the opportunity to apply the newly learned skills and behaviours on their jobs. If trainees continue doing what they were doing earlier than the entire training gets redundant and is easily forgotten.

Transfer of training is a crucial problem faced after the training programs where in the training acquired is not applied to the job. Post training climate particularly supervisory support determine the transfer of training. Peer support also has a positive effect on the transfer of training to the job. In the post training environment constant coaching, knowledge repositories, and debriefs can be used as powerful tools of reinforcing learned training to the job.

4.3.3 Development:

Development focuses on the personal and professional growth and is not restricted to the enhancement of job-related skills. Development involves making the maximum benefit out of the available opportunities. It is neither restricted to a formal institutional set up and nor time bound. It can happen anytime, anywhere, and at any place. It focuses on enhancing employee and not just his job performance.

One can say that both training and development leads to learning. These concepts are different yet connected to each other. These three concepts are complementary to each other. Training is a mechanical phenomenon whereas development involves changing the thinking, actions, and behaviour. Development is a lifelong concept. Training and learning are also different

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concepts. Every training may not lead to learning and learning can happen without any training also. But learning is a desired outcome of training.

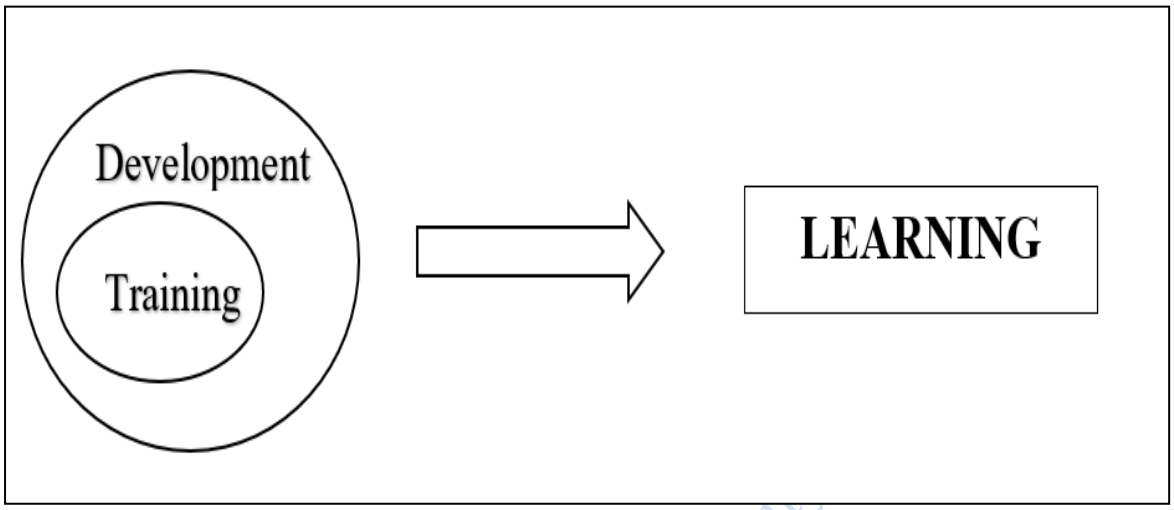

Figure 1: Understanding basic concepts, (source: Self-developed by the author)

IN-TEXT QUESTIONS

12. _____ concept is restricted to the enhancement of job-related skills.
13. Training & Development involves learning. True / False
14. KSA stands for Knowledge, _____, & _____:
    a) Skills & Attitude b) self-actualization & Attitude
    c) Skills & Aptitude d) Self-development & Aptitude
15. Learning can happen without training. True / False
16. _____of training is a crucial problem.

4.4 LEARNING THEORIES

Different theories have evolved over a period of time as given by different researchers from time to time. Some of the most prominent learning theories are discussed as followed:

4.4.1. Cognitive Learning Theory:

Learning is dominated by the thinking process that takes place inside the mind of an individual. Jean Piaget has an important contribution to the cognitive learning theory. According to him learning is a process of assimilation, accommodation, and equilibration. Assimilation involves

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acquisition of knowledge into existing mental structures. Accommodation is altering the existing mental structures that contradict with the new experience. Finally reaching to the state where there is no conflict between new and existing knowledge is called as equilibration. It believes in the formal education system and the requirement of professionals' help and assistance. In this process learning is to be internalized by memorizing the content and reproducing the syllabus on demand that has been taught to the student. It involves acquiring, internalizing, storing, and retrieval of the information by the student.

4.4.2. Behaviourism Learning Theory:

The theory involves discussion on classical conditioning and operant conditioning. As per classical conditioning approach, the natural reflex actions can be reinforced as a response to a particular stimulus. This theory evolves from the experiment conducted by Ivan Pavlov on the dogs where they were conditioned to salivate at the ringing of a bell. The second is the operant conditioning that is based on the belief that reward can reinforce a positive behaviour. Skinner studied the behaviour of rats where they learnt that pressing lever in the box would give them food. The operant conditioning approach is based on the use of rewards and punishments to control the majority of human behaviours.

4.4.3. Social Learning Theory:

Albert Bandura pioneered the concept of social learning theory that he developed after studying the behaviour of children. He observed in his Bobo doll experiment that children can be influenced by just observing the behaviour of others. Bandura extended the behavioural theory by adding the concept of observational learning. Children will be most likely imitating the behaviour that they see is positively reinforced. Attention, retention, reproduction, and motivation are the four components of social learning theory. Many of the daily behaviours may not be noted. Attention is the foremost thing for imitation to take place. After observing the behaviour, it has to be retained and remembered. Every behaviour learnt could not be imitated. The modelled behaviour needs to be demonstrated. The last is the motivation. If there is a reward associated with the demonstrated behaviour, then it is most likely to be performed.

4.4.4. Experiential Learning Theory:

David Kolb gave the concept of experiential learning theory. It is the combination of grasping and transforming the experience that results in knowledge creation. Kolb proposed the four elements of an experiential learning cycle: Concrete learning, Reflective observation, Abstract conceptualization, and active experimentation. The first is the encountering stage, where the person experiences a new situation or may reinterpret an existing notion based on a new experience. Reflective involves pondering about what is already known. It reflects on

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incongruency between existing knowledge and new knowledge. Based on the experience, the person may form a new idea or change his existing thinking leading to abstract conceptualization. Finally, the new knowledge is applied by the learner in the active experimentation stage.

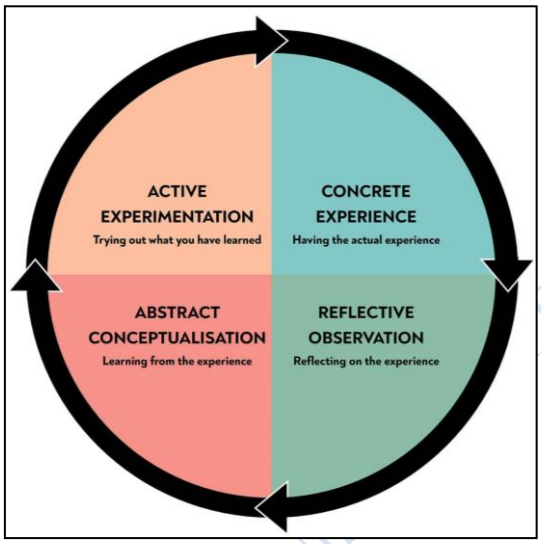

Figure 2: Experiential learning cycle, (source: https://www.simplypsychology.org/learning-kolb.html)

4.4.5. Happenstance Learning Theory:

The theory proposed by John Krumboltz states that the human behaviour is based on many learning experiences arising from both planned and unplanned situations that the individuals encounter. Some of the situations may be within the control of an individual and some may be out of control. The consequences of these different situations are difficult to predict and thus called as happenstance. From the education perspective, theory suggests that every child has their own starting point. Every individual can have their own level of success bar. Individual achievement needs to be focused on over group achievement. Students learn best from their own actions and learning should be an enjoyable process.

4.5TRAINING NEED IDENTIFICATION (TNA)

Identification of the needs for which the training program is required is the very first step of designing any training program. It involves three components: job-task analysis, organizational analysis, and person analysis. These three components are explained as follows:

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4.5.1. Job-task analysis:

This involves determining critical requirements of a job and understanding different KSAs required for performing that job. Training designing process involves task analysis to determine what training program is best suitable for job? Humans cannot retain everything. There are limitations to one's cognitive skills. This step enables trainers to know what is required to be known and remembered by the trainees so that the focus could be done on those areas. This also requires team-task analysis that identifies different coordination patterns among the work groups. This will also help in deciding which set of groups of people should need to attend the training together.

4.5.2. Organizational analysis:

This step involves determining the preparedness of the organisation to be able to conduct the training program. It refers to analysing the culture, strategic priorities, and resources that can be provided by the organisation. Training has to ensure that organisational needs are addressed. This would require determining the organization's core competencies and knowing the critical jobs and functions in the organization. Social supporting environment also need to be examined for the effectiveness of the training program. There should be a learning supporting environment for the training to be successful.

4.5.3. Person analysis:

This finally involves deciding if the employee is having the required skills and knowledge for performing the assigned task. What are the skills that he is lacking and should form the basis of the training program? Many demographic variables also need to be considered such as age, diversity in the organisation. Training can vary from an individual to individual. Age is considered to be positively associated with the training time and negatively correlated with training performance. Sufficient time must be given to the aged employees and more structured and self-paced training models might work for the older employees.

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IN-TEXT QUESTIONS

Identify theories associated with each example:

21. Mother rewards his child with chocolates after he cleans the room. Child starts cleaning the room on his own every time his mother is around to get the chocolate.
22. A child is told that white object in the kitchen is a cooker and should not be touched as it is hot. As the Child walks towards the next white object in the room, which is fridge, he remembers that white objects are hot and should not be touched.
23. A younger child imitates the dancing style of his elder brother on seeing that he is being appreciated by others for his dance form.
24. John was used to working in an offline environment and always thought that the job can never be performed remotely. During Covid-19, he learnt to work online effectively and now prefers to do the remote working.

4.6 ADDIE Model

Before we understand different training and development techniques that are adopted by managers across different industries, lets first understand the ADDIE model. ADDIE framework stands for analysis, design, development, implementation, and evaluation. This model enables managers to follow a consistent training and development process. Using this model managers can also monitor and evaluate the effectiveness of the program in fulfilling various learning objectives. Details on each phase of this model are as follows:

4.6.1. Analyse:

This stage involves setting of the learning objectives. Based on prior training programs also the learning modules can be designed. This involves determining the skills sets required for the job, existing knowledge level of the people, and the resources that can be provided by the organisation.

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4.6.2. Design:

This phase sets the tone for the entire training program. Based on the learning objectives, the training strategy is decided. Method to be followed for the delivery of the content, type of material to be gathered are the decisions to be made during this stage.

4.6.3. Development:

Once the layout of the training program is set, next step involves developing the lectures, content, and required training material. A small training test can also be done to check the working of the program and its effectiveness in achieving the desired goals.

4.6.4. Implementation:

This involves implementing the designed and developed training program. Any gaps between what is desired and what is actually achieved are identified and analysed for future improvements.

4.6.5. Evaluation:

The learning problems faced by the trainees, and the new learning opportunities are identified and analysed during this stage. The main purpose of this phase is to refine and improvise the future training programs.

Figure 3: ADDIE model, (source: https://doi.org/10.1108/14777281111125363)

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4.7 TRAINING & DEVELOPMENT METHODS

There is a wide variety of methods to choose from for the training and development purposes. But the adoption of these method is context specific and need to be adjusted to the specific needs of the target organisation. Some of these techniques are discussed below:

4.7.1. Coaching or Mentoring:

Coaching is a very effective technique for modifying managerial behaviours in a direct and personalised manner. It is a customized training program given on a one-to-one basis and over a period of time. It is generally given in helping out employees with specific problems, or to

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prepare the employee for any new work assignment. This technique is generally used for a continuous and generalized training program.

4.7.2. Lecture:

There is a single flow of information as it is transmitted from the instructor to the learner. Learning is dependent upon the knowledge and experience of the trainer. However, this method puts a cognitive burden on the learner. The knowledge is to be acquired, integrated, and retained. The pace of every learner also varies from person to person. An improvisation of this method is lecture-cum-demonstration method in which the lecturer reemphasizes information by putting the same into action.

4.7.3. Modelling:

In this method, the new behaviour is acquired by observing others performing the same task. Videotapes can be used for imparting instructions to the trainees. This helps in enhancing the confidence level among trainees. This technique also enables old learners to understand how to perform the task.

4.7.4. Active Participation:

This is like a trial-and-error approach where the learners learn by actually performing the task rather than just observing someone performing it. This approach is based on self-discovery and learners can learn at their own pace.

4.7.5. Role-playing:

Trainees are supposed to assume a character and play like that character in a particular scenario or a series of scenarios. It is quite an effective method in changing the attitude of people by encouraging brainstorming. It is found to be very effective when subjects take the point of view opposite to their own and express this opposing viewpoint to others. Role-playing is often used to teach skills such as negotiating, grievance handling, buying and selling and effective communication.

4.7.6. Job Rotation:

The employee is made to experience working on other jobs while he is still working on a given task or a project. This can be effective for career development of the employee and can assist in the employees' quick promotion. This training method also helps in reducing job burnout and leads to effective management of existing staff members. This also helps in dealing with the employee's absenteeism. When an employee is on leave other employee trained on the same job can take over. This can also help employee realise his different capabilities and areas

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of interest. But this type of technique might not be suitable to all type of industries especially where highly specialised workforce is required. Employees may also feel disgruntled and overburdened with frequent job rotations.

4.7.7. Simulation:

The real-life conditions are imitated, and trainees are repeatedly made to have a multisensory experience of this simulated environment. It is used when there is high cost involved and the real-life task is risky to handle. It involves mirroring of a real-life situation. It might be suitable for industries such as aviation sector (training of pilots), driving schools, and medical industry (training surgeons). The technique minimizes errors and can be used in creating a team of experts.

4.7.8. Case Study method:

It is a narrative description of real-life incidents relating to the organization. Trainees are required to propose a number of viable solutions to a given case. This is used for developing analytical, reasoning and problem-solving skills. This method can be used to boost learner's motivation level. This method requires lower cost and trainee need to have the core knowledge of the subject.

4.7.9. Game-based training:

It is an interactive approach of training. Trainees are made to compete in various decision-making tasks that helps them in finding alternative options and also experience the consequences of their actions. Such techniques enable faster & longer retention of knowledge. Trainees while learning skills are also able to apply the knowledge at the same time and so learn by doing approach. This makes training a fun process and keeps the employees engaged in the training process. For example, taking quiz sessions in between of the lectures or making employees compete on simulators. This method helps in improving teamwork, leadership style, and communication skills while playing the games.

4.7.10. Internship:

The trainees learn to do work on the job but with certain restrictions and with less or no pay. It involves giving a practical work related to student's field of study. It helps in the career development of the students. Students get the benefit of insights into real work experience, constant support and guidance from the mentors, constant feedback, develop professional contacts, and get new experience and work skills.

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4.7.11. Sensitivity training:

Sensitivity training is also known as laboratory or T group training. In this, an unstructured group is created to make people aware of themselves and their impact on others. Participants are encouraged to freely communicate their thoughts and feelings in an open, unstructured manner. It helps employees to be more sensitive and work more harmoniously and responsibly. It makes the trainees aware of constructive and correct emotional actions and behavioural patterns.

4.7.12. Apprenticeship training:

It is a combination of classroom and on-the-job training where the trainee called the "apprentice" work under the guidance of a skilled instructor. Traditionally, it is used in skilled jobs, such as those of plumber, welder, craftsman, carpenter, etc. It is a long-term method of training aimed at preparing the workforce to meet the growing need of the industry.

4.7.13. Understudy:

In this, the superior gives training to his subordinate as his understudy or assistant. The subordinate learns through experience and observation. The main objective of this method is to prepare the subordinate to handle full responsibilities in case the supervisor is absent or leaves the organization.

4.7.14. Vestibule training:

It is "near-the-job" training that takes place away from the factory or production area on machinery or equipment that closely resembles the actual ones used on the job. Experiences trainers are responsible for upskilling the employees and training them. The main advantages of this training method are that it is effective when many people are to be trained for the same job, it removes the pressure on employees to produce while learning, disturbances to production at the actual workplace is minimized and workers can get over their nervousness at work before they join the actual workplace.

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IN-TEXT QUESTIONS

Suggest a most suitable training & development technique in the following cases:

10. For the training of Law students.
11. Doctoral student working on a research project.
12. A newly joined employee in a hotel where his job is to keep the rooms tidy and taking care of the need of arriving customers.
13. Senior teacher has to impart training session to a newly joined teacher in the college.
14. Learning to develop an animated cartoon movie.
15. Training surgeons for difficult surgeries.

4.8 EVALUATION OF TRAINING & DEVELOPMENT

This is the most crucial stage of any training program that determines the overall effectiveness of the program. It refers to the systematic assessment of the fact that training objectives are achieved and is able to enhance the job performance. Through evaluation of training & development programs organisations can know if an alternative training program is required to be designed. Evaluation provides feedback to the trainees, trainers, and the organisation and helps in deciding if the program can be replicated to the other organisations or employees.

This effectiveness of the training and development program can be assessed through the reactions of the employees (feedback survey), understanding acquired by them (small test after the session), changing behaviour (changed behaviour on the job), and outcomes (higher sales). Most of the organisations use trainee's reaction and learning as a tool to decide the effectiveness of the training program.

Experimental design can also be used in training evaluation in which trainee performance can be compared with the performance of others who were not trained. The experimental group consists of employees who received training and the control group consists of employees who did not receive any training or intervention. Members of both groups should be drawn randomly. At the conclusion of training, performance of both groups is compared and if the performance of the experimental group is improved substantially the training program may be rated effective.

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4.9 E-TRAINING & E-DEVELOPMENT

Training and development programs have expanded beyond the traditional classrooms. The just-in-time technology now requires providing just-in-time training. Cost effectiveness, timely availability of content, and flexibility are the major drivers of e-training programs. The term 'e-training' refers to training involving technology. It can be face-to-face or even purely online. Augmented Reality (AR) and Virtual Reality (VR) technology like 3D objects, videos, sounds, and images can be applied in training of aviation personnel. For example, pilots while being in air may encounter technical glitches and would need immediate just-in-time learning tools. In such scenarios Learning on Demand (LoD) instruction manuals containing 3D images and videos of the aircraft can be very useful. E-content and different applications can enable the government to aware the citizens about development of smart cities. Applications ranging from agriculture, education, to health care and safety can be shared with people. E-training can encourage e-governance where people can be encouraged for online payment of taxes, online documentation work, online bill payments, etc.

Since 1995, the enrolment of students has multiplied in the distance education courses. Research shows that course content, video size, age of the participant, and environment simulator are the factors having a great influence on the online training program. Satisfaction of participants increase when the content is in narrative form rather than being in numbers or a technical format. Young individuals are also found to recall content over a web module more than the older participants. The e-content should be presented with a large video display, limited use of coloured text, and large letter size. The philosophy to be followed while designing e-content is "less is more" and "keep it simple".

It is the support of the ICTs to learning and decision making that contributes significantly to the process of development. Technology enables both economic and social development by providing new opportunities to people. ICTs are ignored by the people who are fearful of the technology. Rather an integrated approach is required. Integrated approach requires identification of development objectives, identification of new information required to meet the development objectives, and identification of the crucial role of ICTs in meeting the information requirements. There are benefits of cost reduction, efficiency, and transparency gains through e-development.

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4.10 CAREER DEVELOPMENT & SUCCESSION PLANNING

Succession planning is the process of selecting the employees to fill higher level positions in the organisation. The process involves identification of the need of the senior managers. Then shortlisting the most suitable candidate to fill the senior manager position and ensuring that relevant core competencies are developed in the candidate for the job. The process provides job successors for the important executive positions from the existing pool of candidates. A sophisticated succession plan contains various components such as having a clear vision, a proper business plan, assessment of current situation, developing potential candidates, and implementing the plan. An effective succession plan can reduce the turnover rate, fulfil the career development aspirations of the employees, and can provide the competitive advantage to the organisation.

Leadership development and succession planning are the two sides of the same coin. Leadership learning and development should be coupled with succession planning as this can create a flow of talented successors from early stage of career of employees to being senior leaders and even headship. In United Kingdom, it was observed that there were leadership shortages in schools. Poor confidence among teachers, reluctance in taking up new professional assignments, and lack of career advice were the identified reasons for restricting teachers from their career advancement and achieving leadership progression. Culture related factors like teamwork, trust, commitment, and leadership support encourages leadership successors within schools. Teamwork needs to be created, a distributed leadership approach, and job rotation can help in succession planning. Techniques like coaching, role-modelling can also assist in the professional development of teachers.

The leadership development program should fit the organisation's culture and serve the long term and short-term objectives of the organisation. Managers can follow the following six steps for a continuous leadership development model in the organisation:

4.10.1. Evaluate the organisation:

The current state of the organisation needs to be evaluated. This involves understanding the policy, past practices, strategy, assessment of current resources, and knowing about the culture of the organisation. It has to be assessed if the right employees are available within the organisation for leadership roles and how their potential can be fully developed.

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4.10.2. Assess the organisation's status in development of resources:

This involves getting an idea about the financial resources and the priorities of the organisation. How much time the organisation is willing to give for the leadership development programs.

4.10.3 Assess current opportunities:

Staff should be provided different opportunities to stand out for leadership roles by engaging them in different work groups and committees of the organisation. Involve staff in the revision of company's policies and procedures. A staff meeting could be arranged where different individuals can present their case studies. A culture of continuous learning has to be developed.

4.10.4. Identify potential staff to mentor:

This refers to finding out the employee who has aspirations and potential to grow in his career. Identifying the person who can lead and bear the burden of the organisational responsibilities. This also involves assessing the value of the investment. The cost of training or coaching the existing member must be compared to recruitment of an outside person for the job.

4.10.5. Identify training gaps:

There should be five important traits in any case leader: leaders need to be aware about their changes in their external environment, seek out simple solutions to big problems, have a creative thinking, respects other team players and should drive engagement & commitment towards the organisation, and must have complete knowledge and experience to handle the situation. The training gaps based on these identified five traits can be identified and filled.

4.10.6. Develop an integrated program:

A comprehensive plan based on the cost assessment, judgement about the existing resources of the organisation should be developed. If required a sponsor for the program or the champion who can help out in the implementation of the leadership program should be hired.

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4.11 CASE STUDY

GoIndia Airline started its operations in the year 2016. After covid-19 pandemic and the rising turbine fuel has greatly damaged the profitability of the enterprise. Recently, the airline is also in news for maintenance issues, frequently engineering related concerns are being reported in the headlines. Ministry of State ordered a special audit of the airline to do a spot check on the airline. The audit results found that there is a deficiency of sufficient and suitably qualified engineers, and experienced manpower. To add to the existing problems, the competition has increased in the industry with the upcoming of new airlines. The attrition rate for the existing

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engineers and maintenance staff has been going up for the airline. Employees are lining up for interviews with the new airlines expecting not the salary hike but better growth opportunities. There are two categories of engineers being employed by the airline: Category A and B. Category A staff is cheaper and is responsible for simpler tasks like refuelling, tyre change, handling cockpit defects, etc. Category B engineers do major maintenance tasks in an aircraft and are paid higher. Category A employees are now demanding higher wages and better opportunities. The engineers are facing extreme burnout as they are working on double shifts at lower wages. This is creating safety concerns for the airline as maintenance and overhauling of the aircrafts is compromised.

Please suggest the following:

1. Suggest which type of training and development methods can be adopted by the airline?
2. Which learning theory is best suitable under the current situation?
3. Before organising a T & D plan, what are the factors that should be considered by the airlines?
4. What can be the best method followed for evaluating the success of the T & D program?
5. Is there an issue of succession planning that can be addressed? How?

4.12 SUMMARY

The chapter discusses the difference in the concepts of learning, training, and development followed by the detailed discussion on different theories of learning and methods of training and development that can be adopted by the organisations. The contemporary issues like e-training, e-development, and the need for succession planning are also elaborated.

4.13 GLOSSARY

Augmented Reality: A technology that involves computer generating image on the user's view of the real world.

Debriefs: Documentation of recent experiences that enables identification of what went well and what can be improved.

Learning Transfer: The extent to which learning on one task facilitates learning on a second task.

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Virtual Reality: An immersive experience of a simulated real-life environment.

4.14 ANSWERS TO IN-TEXT QUESTIONS

1.	Training	9.	Experiential Learning Theory
2.	True	10.	Coaching
3.	Skills & Attitude	11.	Internship
4.	True	12.	Modelling
5.	Transfer	13.	Lecture
6.	Behaviourism Learning Theory	14.	Simulation
7.	Cognitive Learning Theory	15.	Game-Based Training
8.	Social Learning Theory		

4.15 SELF-ASSESSMENT QUESTIONS

Please answer the following questions based on your understanding of this chapter:

1. Is there any difference between training and development? Please elaborate.
2. How can the organisation assess its training needs?
3. What do you understand by the ADDIE training and development model?
4. How can the effectiveness of a training & development program be evaluated?
5. Is it necessary to focus on succession planning? How is leadership development related to the concept of succession planning?
6. Explain the difference between cognitive and conditioning learning theories?

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LESSON 5

COMPENSATION AND REWARD MANAGEMENT

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STRUCTURE

5.1 Learning Objectives

5.2 Introduction

5.3 Concept of Compensation

5.3.1 Objectives of compensation planning

5.3.2 Need for and Importance of designing effective compensation plan

5.3.3 Factors influencing compensation

5.3.4 Theories of Motivation appreciating compensation

5.4 Compensation Management

5.4.1 Principles of compensation management

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5.4.3 Compensation management and other HRM functions

5.4.4 Components of compensation management

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5.5 Types of Compensation

5.5.1 Monetary Compensation

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5.5.3 Compensation Process

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5.5.5 Challenges in Compensation Design
5.6 Reward Management
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5.6.6 The significance of total reward
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5.9 Self-Assessment Questions
5.10 References
5.11 Suggested Readings

5.1 LEARNING OBJECTIVES

- To be familiar with the notion of compensation and its administration
- To elucidate the elements, types and theories of compensation
- To comprehend the relevance of compensation management in organisational HR strategies
- To classify the various components of compensation system

5.2 INTRODUCTION

The determination of monetary compensation rates is one of the most critical and challenging aspects of human resource management. Employee compensation decisions are critical to the success of any organisation because of the total operating costs, effective employee compensation management is critical from a financial perspective alone. Another rationale for studying compensation from an organizational point of view is to examine its impact on a wide range of employee attitudes and behaviours, and, ultimately, the organization's and its units'

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effectiveness. Compensation can influence employee attractiveness, retention, performance, job satisfaction, skill acquisition, cooperation, and flexibility. The remuneration that an employee receives in exchange for their efforts to the organisation is referred to as compensation. A good remuneration strategy encourages people to work harder and more zealously. Compensation policies should be well integrated with HRM practices. It also assists firms in establishing employment criteria that are relevant, realistic, and measurable.

5.3 CONCEPT OF COMPENSATION

"*Compensation is a comprehensive term which includes everything an employee receives in return for his work such as wages, salaries, allowances, benefits and services.* "

Cascio has defined compensation as "Compensation includes direct cash payments, indirect payments in the form of employee benefits, and incentives to motivate employees to strive for higher levels of productivity."

Dale Yoder believes, "Compensation is paying people for work."

Keith Davis stated, "Compensation is what employees receive in exchange for their contribution to the organization."

According to Edwin B. Flippo, "The function compensation is defining as adequate and equitable remuneration of personnel for their contributions to the organizational objectives."

Compensation is a form of trade in which both employees and organisations contribute something in exchange for something else. It is an essential consideration in human resource management decisions. Employees regard a pay package to be fair if it meets basic living needs while also saving some money for, possibly for retirement and recreation. HRM determines remuneration using strategies such as job evaluation and performance appraisal. Compensation is described as money received in exchange for labour performed, as well as a variety of services and benefits supplied to employees by an organisation. Designing an efficient compensation programme is a crucial function of organisational effectiveness in the globalisation period, where the corporate environment has become increasingly complicated and tough.

5.3.1 Objectives of compensation planning:

Compensation matters were frequently kept private in the past and were governed by individual employer preferences and choices. Employees now make their own judgments based on the

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remuneration package, and compensation policies are more transparent. Balancing salary costs and retaining personnel has become a significant challenge for organisations.

Edwin B. Flippo believes, "as far as the organisation is concerned, employee compensation programs are designed to do three things:

- To attract capable employees to the organisation.
- To motivate them towards superior performance.
- To retain their services over an extended period of time."

The objectives of compensation are:

- **Ensure Equity:** It covers income distribution by reducing inequities, raising the wages of the lowest-paid employees, protecting real wages, and the principle of equal pay for equal effort. Internal equity requires that remuneration be tied to the relative worth of a work in such a way that comparable pay is guaranteed for similar tasks.
- **Enhanced Efficiency:** Attempts to link a portion of salaries to production or profit, group or individual performance, skill acquisition and application, and so on. Preparations for efficiency are equitable if they appropriately reward performance, but inequitable if the incentive is perceived to be unfair.
- **Macro-economic stability:** An excessively high minimum wage would have a negative influence on employment numbers. Low inflation contributes to macroeconomic stability. Two of the many factors that influence economic stability are compensation and compensation policy. They either help or inhibit balanced and long-term economic development.
- **Efficient allocation of labour:** It relates to the idea of labour/employee leaving a position for a net benefit. This migration could be from one location to another, within or outside of an enterprise, or between two locations. Employers evaluate staff attrition while employees consider net gain.
- **Attracting competent personnel**: A competitive salary and other benefits helps an organisation attract qualified candidates.
- **Complying with regulations:** A good wage and salary system takes into account the legal challenges imposed by the government and guarantees that firms follow the law.
- **Controlling costs:** A practical compensation system assists the firm in obtaining and retaining employees at a fair cost.

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- **Enhancing administrative efficiency:** A well-designed good wage and salary scheme aids in the efficient management of human resource information systems.
- **Facilitating understanding:** The compensation management system should be really clear and understandable
- **Retaining employees:** When pay levels do not meet employees' expectations, attrition may rise.
- **Motivating desirable behaviour:** Compensation is likely to promote desired behaviours from employees and act as an incentive for behavioural adjustment and future.
- **Retaining talent:** Properly designed compensation helps in retaining the competitive employees in the organisation.
- **Self-assurance to the organisation** to compete in the employment market
- **Promote flexibility** in the pay structures offered to employees
- **To administer pay** equitably and consistently
- **Ensure achievement of organisational objectives** by aligning compensation with employee performance

5.3.2 Need for and Importance of designing effective compensation plan:

A company's most valuable asset is its human resources. To get the best out of each employee, pay and compensation must be handled exactly like any other function. It goes without saying that competitive remuneration will assist to attract and retain great individuals. It is now time to study executive and strategic compensation. Over time, compensation plans and procedures have evolved substantially. Traditional employees were relieved to receive their pay checks and little bonuses. They only needed to obey commands, carry out managerial orders, and produce outcomes to obtain job-related rewards. Their expectations were also low, but behavioural specialists have radically changed the scenario. As a result of the Industrial Revolution, work became monotonous, uninteresting, and exhausting thus comes the need to lure the talent with competent pay.

Compensation is one of the most critical components of human resource management, and it can make or break a business. A competent compensation plan can assist organisations in thriving and competing in their respective markets. Some of the benefits of offering a competitive wage plan to employees include:

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- Ensures equity
- Encourage desired behaviour
- Control HR costs
- Attracting competent personnel
- Adhere to regulatory requirements
- Enhanced employee motivation in the workplace
- Enhanced employee efficiency
- Increased productivity and profitability through employee loyalty
- Improves staff engagement and job satisfaction
- Enhanced organisational efficiency
- Aids in the retention of exceptional employees
- Goodwill in the employment market
- Improved industrial relations

5.3.3 Factors influencing compensation:

The main issue that any organisation faces is establishing a fair and equitable compensation system. This requires understanding of the various factors that influence compensation, such as the composition of decision-making bodies. The emphasis of an employee may be on higher pay to offset their increased cost of living and the price they demand in a competitive job market. One of the most common differences of opinion between employers and employees is compensation. An employee's pay is determined by the amount of effort he puts in, the nature of his job, and his competence. In addition, various other internal and external factors influence compensation directly or indirectly. Thus, the numerous elements impacting pay are as follows:

- **Labor supply and demand:** Wage rates rise when labour demand exceeds supply, and vice versa.
- **The ability to pay** refers to the employer's financial situation and willingness to pay the employee.
- **Employee's relative worth:** The maximum output that workers achieve on average based on their ability to execute. Compensation based on the employees' worth plays an important role in motivating employees to increase their worth too.
- **Cost of Living-** Wage rate changes can be caused by the cost-of-living index, considering that if the cost of living is high, wages and salaries will be higher.

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- **Government regulations** intended to provide justice and fairness in compensation payments.
- **Prevailing market rate:** Compensation rates set in accordance with competitors' wage levels in order to achieve both external and internal equality.
- **Psychological and Social Factors:** People feel that equal work should carry equal value and wages should be commensurate with their efforts.
- **Skill Levels Available in the Market:** There is a shortage of skilled workers in many parts of the world. The wage levels have to keep up to meet the needs of the industry's need-to-achieve workforce.
- **Employee union:** Wage levels are also influenced by trade unions' collective bargaining power.
- **Nature and worth of job:** Organizations base pay levels on the value of a job. Wages and incomes are greater in vocations that need mental strength, jobs with a lot of responsibility, positions that require innovation, and technical jobs.
- **Organizational strategy and attitude:** An organization's pay approach is heavily influenced by its business strategy; Companies that implement a defensive approach, for example, will maintain salary levels that are average or lower than the market standard.
- **Organizational culture:** Compensation decisions are influenced by organisational characteristics such as management philosophy, remuneration plans used by enterprises in the same industry, manner of compensation, equality criterion, performance appraisal, and so on.

5.3.4 Theories of Motivation appreciating compensation:

Theories, in general, provide a solid foundation and framework for implementing thoughts and ideas. These theories have created a number of excellent suggestions for providing a foundation for implementing compensation systems in businesses. According to Goodin, the employee compensation system is critical in efforts to improve human resource management. Every component of compensation has a behavioural purpose and seeks to meet a need and achieve a goal. It is necessary to understand some motivational theories in order to understand how compensation contributes to motivation.

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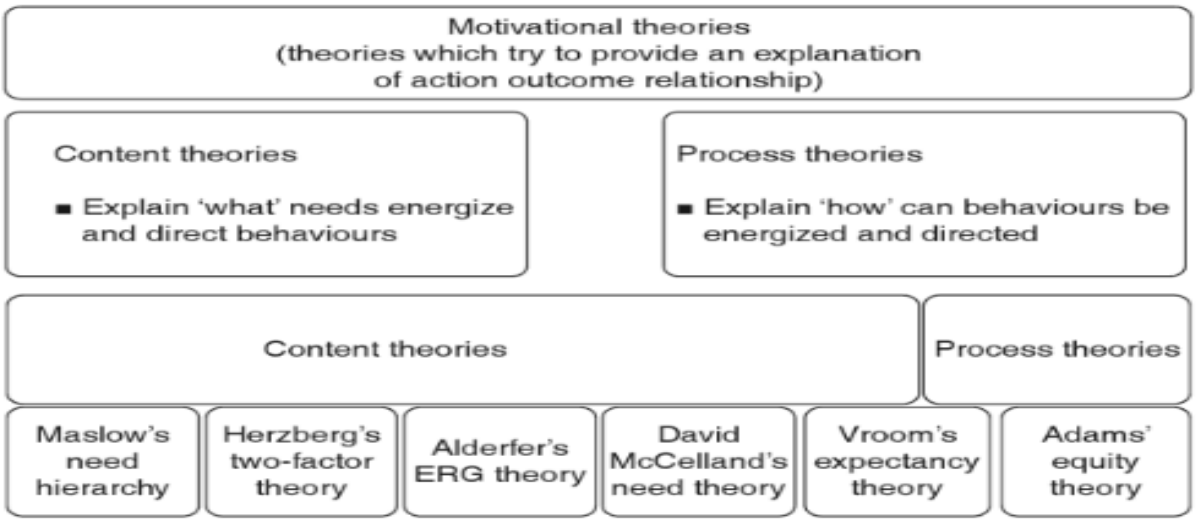

Figure 1: Motivational Theories

- **Need Hierarchy theory:** the base pay is a means of satisfying only the lower order needs like: Physiological, Safety and Social needs but it goes further. Therefore, the compensation has to be a perfect combination of monetary and non-monetary components in order to carter to the different needs of the employees.
- **Existence, Relatedness and Growth (ERG) theory:** According to ERG Theory, if a higher-level need is not met, a person may regress and seek to meet lower-level needs instead. For example, if an ambitious employee is not given possibilities for advancement, their motivation would suffer, and they may feel disillusioned. Thus, the form of compensation to be reimbursed for the employees' efforts in accordance with their expectations.
- **Herzberg's Motivation Theory:** also identified as the Two Factor Theory, identifies two elements that influence workplace motivation. These are both hygiene and motivating elements. If hygiene variables are not present, an employee will work less. If motivating stimuli are available, they will be encouraged to work harder. He stated that money is not the primary motivator for employees.
- **Equity theory:** According to this theory, employee perceptions of their contribution to the firm and what they receive in return impact how fair they believe their work relationships are. Employees will adjust their job behaviour to create equity if they perceive there is imbalance.

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- **Expectancy theory:** This idea is based on the assumption that human behaviour is driven by perceived requirements. This theory defines motivation strength as the value of the consequence of doing behaviour and the anticipated likelihood that the outcome would materialise as a result of the activity undertaken. The possibility that a certain behaviour will result in a specific first level consequence is defined as expectancy. Employees are asked to prioritise important personal goals and instruments in order to determine valence. The more certain employees are about their expectations, the more likely it is that their behaviour can be predicted properly.
- **Reinforcement theory:** The repercussions of an individual's behaviour, according to this theory, will affect the level of motivation.
- **Achievement motivation theory:** This theory distinguishes three types of basic needs: the need for power, the need for affiliation, and the need for achievement. The significance of these non-monetary requirements should not be underestimated when developing compensation plans.

5.4 COMPENSATION MANAGEMENT

"*Compensation management is an integral part of human resource management and helps in motivating the employees and improving organizational effectiveness.*"

Managing compensation is a complex process. An effective compensation management programme can be segregated into various sub-goals. These include equitable compensation based on relative work to the organisation; Payment consistency among comparable occupations; Individual capability and proficiency are recognised; Procedures for solving compensation issues logically.

5.4.1 Principles of compensation management:

In his book, "The Management of People at Work", D.S. Beach outlines seven principles of compensation management:

1. The organisation should have a defined mechanism in place for determining differential pay levels based on divergent job needs such as differing abilities, effort, responsibility, and working conditions.
2. An attempt should be made to keep the overall wage and salary levels of the firm in accordance with those obtained in the labour market or industry.

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3. Adequate precautions should be made to keep people separate from occupations. Although workers are compensated based on the rate of pay for certain duties, professional and executive people should be compensated based on their abilities and accomplishments.

4. Care should be taken to achieve equal pay for equal labour, subject to job flexibility; variances within a pay range may be acceptable.

5. A strategy for developing an equal process for recognising individual differences in ability and contribution, such as rate ranges with in-grade increments, wage incentive schemes, and a job promotion system, should be in place.

6. A mechanism for dealing with salary grievances should be established. This might be successfully represented in the enterprise's standard grievance procedure.

7. There should be no confidential wage issues, and each employee should have a clear grasp of his or her unique wage or salary structure. Adequate attention should be made to notify employees and, if applicable, unions about the mechanism used to determine wage rates.

5.4.2 Importance of Compensation Management

An effective compensation plan is vital for every business organisation since it provides an incentive for employees to stay with the company. A corporation benefits from structured compensation management in the following ways:

- It strives to adequately compensate employees for their contributions to the company.
- It sets a foundation for employee happiness and satisfaction, which decreases labour turnover and provides a solid organisation.
- It is meant to comply with several labour acts, avoiding difficulties between the employee union and management. This promotes a positive working connection between the company and the employees. It boosts employee morale, efficiency, and cooperation while also ensuring their satisfaction.

To summarise, compensation management is vital since it drives individuals to do better and demonstrate their excellence while also giving competent personnel with possibilities for growth and development.

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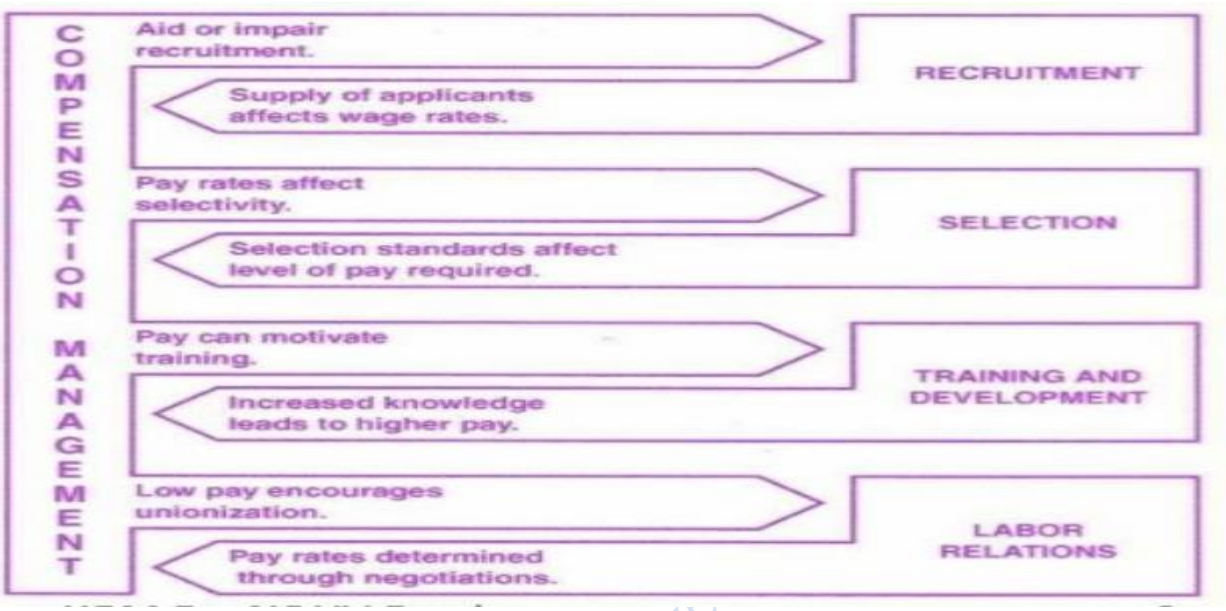
5.4.3 Compensation management and other HRM functions:



Source: NOUV Brosh

Figure 2: Relation between Compensation management and other HRM functions

5.4.4 Components of compensation management:

The full compensation process should proceed as follows: An organization's HR initiatives must be consistent with its entire business plan, and compensation strategy, as an essential component of HR strategy, comprises outlining what strategic HR objectives can be met. Compensation is designed and implemented in the organisation in accordance with the compensation strategy and inputs from the external environment and internal reality. If effectively designed, compensation leads the organisation to the targeted performance levels.

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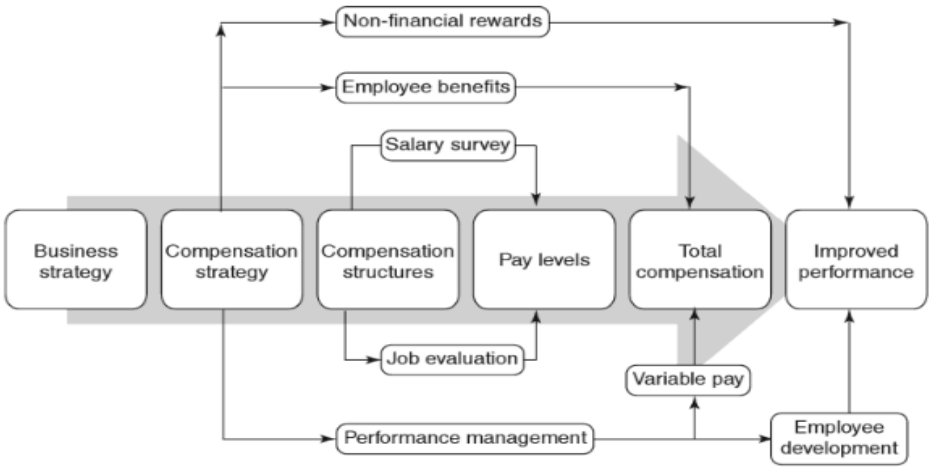

Figure 3: Total Compensation process

Compensation management is to equip employees with equal compensation based on their job nature, job position, and responsibilities. As a result, comprehension is split into compensation management components, they are:

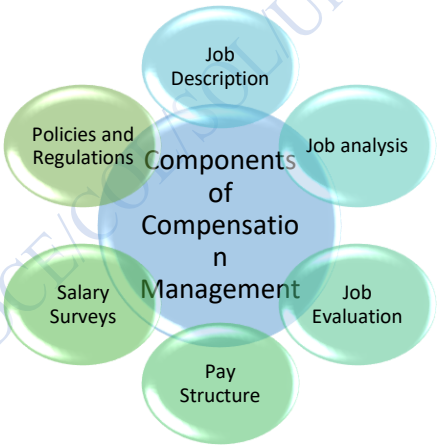

Figure 4: Components of compensation Management

1. **Job Descriptions:** A job description is an important component of both pay and selection systems since it outlines the functions and responsibilities of a position. Employment descriptions define out all the responsibilities, requirements, functions, duties, location, environment, and other features of the job. Work descriptions can be created for individual occupations or for entire job families.

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2. **Job Analysis:** The process of assessing employment in order to create job descriptions. It entails acquiring information on the incumbent's responsibilities. Interviews, questionnaires, and observation are all methods of job analysis. The job analysis process entails obtaining information about the incumbent's duties, the nature and conditions of the employment, and some basic qualifications.

3. **Job Evaluation:** It is a systematic method for determining the worth and value of each job within a company. Ranking, classification, factor comparison, and the point method are the four main strategies. To obtain a sensible job, remuneration organisations typically compare similar jobs to industry standards.

4. **Pay Structures:** The pay structure is designed in accordance with job evaluation. Most pay structures include numerous grades, each with its own minimum and maximum salary/wage and grade range. An organisation with a defined compensation structure aids in the development of human resource branding. It can also be used to standardise pay methods.

5. **Salary Surveys:** Conducting surveys to acquire market data is part of compensation management. Salary budget averages, inflation indicators, cost of living indicators, and typical salaries may all be included. Companies can either purchase the results of salary surveys conducted by survey suppliers or conduct their own wage surveys for a certain sector or geographic location.

6. **Policies and Regulations:** Government policies and regulations are another crucial component of compensation management since they describe all of an organization's rules and regulations, as well as its do's and don'ts. Furthermore, these decibels affect the operation and limitations of an organisation.

5.4.5 Job Evaluation Methods:

A job evaluation is a systematic way of determining the value/worth of a job in relation to other jobs in an organization. It tries to make a systematic comparison between jobs to assess their relative worth for the purpose of establishing a rational pay structure.

For example, how would one measure how well your staff performs its duties? How would you measure if an IT person is doing enough to justify his cost to the company? How would you measure if a Production in charge is effectively utilizing the resources? It is done through a process called job evaluation.

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Job evaluation and the methods you use are vital to determine employee output. Measuring productivity is relatively easy when there is a tangible output of measurable material. However, it can get quite tricky when that isn't the case.

The methods of job evaluations used to set compensation levels are point factor, factor comparison, job ranking and job classification.

1. **Ranking Method:** This approach of job rating rates jobs based on how valuable they are thought to be in comparison to other jobs. The market worth of the jobs is not considered. This approach is effective for smaller enterprises. Larger firms typically have more positions and might call for grouping the jobs. This approach, for instance, might be used if all level "A" personnel were put into one section, and the same for level "B" staff, regardless of what tasks their professions required of them.

2. **Grading/Classification Method:** Jobs are categorised using this form of job appraisal based on specific traits. One factor is the degree of expertise required to perform the task. The second factor is the responsibility an individual has while performing their work. The time required to complete this job evaluation approach is not as great as it is for the other methods on the list. Lists of qualities for the job are developed by the auditor. After that, he assigns ratings or classifications to the jobs.

3. **Point-Factor Method:** This type of job evaluation looks at particular aspects of the job to assess how much value they provide to a job function. These elements are broken down into other categories, such as abilities, obligations, and necessary work.

Then a numerical weight is ascribed to these factors. In order to determine the value of the occupations, all of the contributing elements or points for a certain work are summed together and compared to other jobs. This approach makes a job's internal value clear without taking market value into account.

4. **Factor Comparison Method:** Each component is given a monetary value rather than just a numerical weighting. Due of its complexity, this strategy isn't used by many businesses. The job values that are given to employees might also be difficult to convey because they are often arbitrary.

5. **Competitive Market Analysis Method:** A corporation uses a job evaluation approach to assess where it stands in relation to the competition. This implies that comparable employment on the market is taken into account, and the knowledge may originate through job ads. It's crucial to decide what your firm offers in terms of compensation

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because different companies within an industry may give varying salaries for the same function.

Organizations can better understand the demands of each role and what goes into maintaining employee pay satisfaction by using job evaluation methodologies. Employees are sure to appreciate it if a corporation makes the effort to assess the value each person offers and gradually improves that employee's salary in accordance with their effort or competence.

CASE STUDY 1

Compensation Management

Leena is a new human resource supervisor at a huge and modern Mumbai hospital. The hospital is a medium-sized institution with cutting-edge health-care services. It has a total of 500 employees, including 15 executives, 10 consultants, 20 managers, and 50 supervisors. There are 25 technicians, 200 nurses, and 180 administrative and support staff. The majority of these workers have bachelor's degrees in medical, paramedical, business, or liberal arts fields.

Leena graduated with honours from a prestigious college five years ago with a bachelor's degree in human resource management and began working at the hospital as an HR assistant. After two years on the job, she was promoted to HR specialist in recruitment. She is overjoyed with the advancement and intends to attend graduate school to get a Master of Business Administration with a concentration in Hospital Administration. While working as an HR assistant in the same company, she faced a variety of compensation administration issues and complaints, including delayed salary adjustments, wage distortions, an uncompetitive pay scale, and poorly constructed job analysis and job evaluation programmes. She also saw a high turnover rate, particularly in the technical and professional ranks, which she attributed to insufficient salary and benefits packages. Because the HR manager was often preoccupied with labour relations issues, she felt worthless and confused of what to do.

She also suspected that her country's low economic conditions, along with a subpar human resource management system, were to blame for these issues. She believes that now that she has the authority to make recommendations and influence management, she must devise a strategy for establishing a compensation system.

Question:

1. What do you think of Leena's suggestion? What other suggestions do you have for Leena to improve management?
2. What are the many considerations that organisations examine when creating a compensation system?

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5.5 TYPES OF COMPENSATION

According to R. S. Schular "Compensation is such an activity through which organization on the basis of its ability and within law reasonably assesses the contribution of employees directly and indirectly for the distribution of financial and non-financial remuneration."

According to Wayne F Cascio "Compensation which includes direct cash payments, indirect payments in the form of employee benefits and incentives to motivate employee to strive for higher level of productivity is a critical component of the employment relationship. Compensation is affected by forces as diverse as labour market factors, collective bargaining, government legislation and top management's philosophy regarding pay benefits."

Compensation is the entire amount of cash and non-monetary payments made to an employee. It is usually one of the most expensive expenses for organisations with employees. Compensation is more than just an employee's regular pay. It also includes a wide range of other pay and benefits.

Employee compensation administration is known as compensation management or wage and salary administration. It entails developing and implementing policies and programmes for wages, salaries, and other kinds of employee remuneration. Wage and pay administration's primary goal is to maintain a fair wage structure and labour cost structure. Compensation management is primarily concerned with providing fair, beneficial, and rational compensation to employees and employers. To comprehend how compensation works, it is divided into two components, each with its own set of objectives and expectations. The following are the numerous types of compensation in compensation management:

Direct monetary Compensation:

Financial compensation is a monetary payment offered to an employee in exchange for his work. Basic salary, bonus pay, incentives, overtime pay, commission pay, and variable pay are all included. Wages and wages are a significant component of the cost of conducting business. Salary is a fixed, non-incentive payment based on hours worked. Wages could be paid hourly, daily, weekly, or monthly. Incentives are a sort of compensation approach in which remuneration is linked to output or profitability. It could be related to an individual's, a team's, or an organization's overall performance. Bonuses, profit-sharing schemes, variable pay, and stock options are all examples of incentives.

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Indirect monetary Compensation:

Pensions, insurance, paid holidays and other benefits are examples of indirect monetary compensation. These are further subdivided into mandatory and voluntary benefits. A provident fund, a gratuity scheme, a health plan, maternity leave, medical leave, and other perks are examples of mandatory benefits that a business is compelled by law to provide to its employees. Voluntary benefits are optional and provided by the employer freely. These include unpaid time off, paid holidays, family-friendly benefits, retirement benefits, and so on. Employees can now take sabbaticals, work from home possibilities, health/life/accident insurance, company-sponsored education facilities, free transportation, subsidised meals, and free concierge services.

Non-monetary compensation:

These are psychological benefits offered to employees who have the impression that their abilities are valued. Employees at the senior and medium levels who prefer to work with cutting-edge technology want to be empowered. Aside from recognition and service awards, modern firms provide essential non-monetary incentives to their employees.

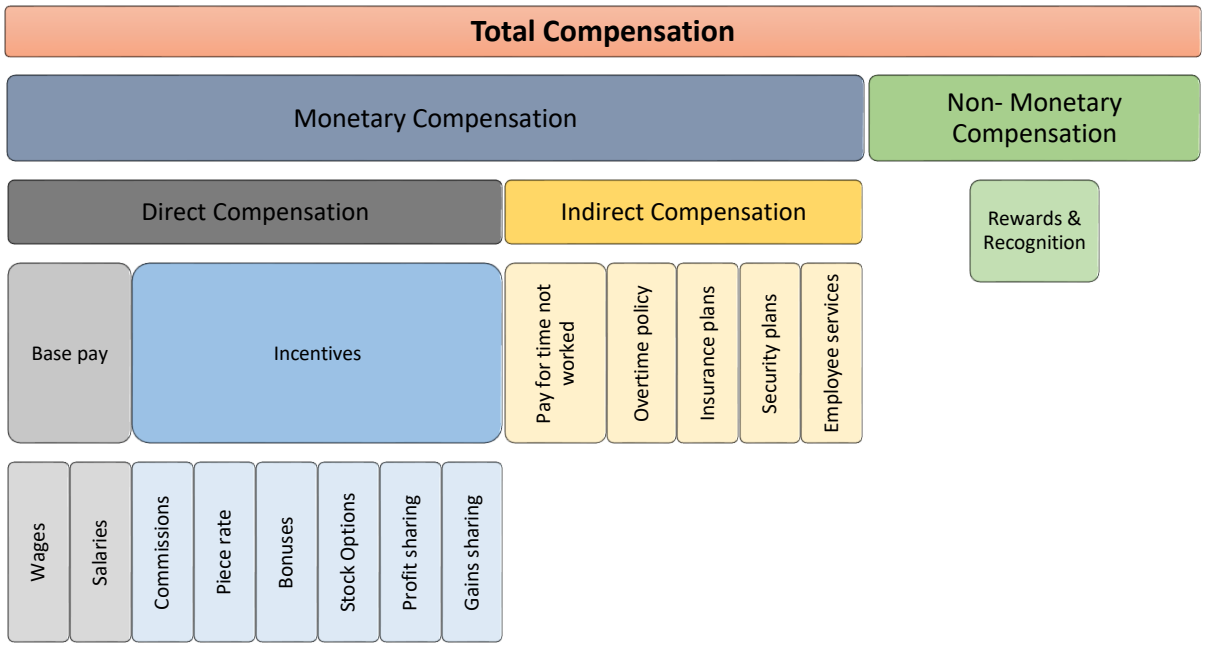

Figure 5: Components of Compensation

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5.5.1 Monetary Compensation:

1. Wages and Salary:

Wages and salaries are typically paid on a monthly basis, while wages are frequently paid on an hourly or daily basis, whereas in the case of pay, the number of hours worked is not taken into account. Wages and salaries are subject to annual raises. They vary each employment, based on the nature of the profession. They also vary each employee, based on the nature of the work, seniority, and merit. Employees in the same position, such as instructors, clerks, and so on, receive the same income; nevertheless, salaries may fluctuate from employee to employee when the number of hours worked varies.

2. Incentives:

Employees receive incentives, sometimes known as 'Performance based pay,' in addition to wages and salaries. Incentives are based on worker productivity or efficiency, sales achieved, profit made, or cost-cutting efforts. Individual reward schemes and group incentive schemes are the two types of incentive schemes. Individual incentive schemes apply to specific individual employee performance, whereas group incentive schemes apply to a group of workers who are obliged to fulfil a specified task collectively in a given period. The incentive money paid to the group is distributed equitably among the group members. Incentives are monetary or non-monetary benefits given to employees in exchange for contributing more efficiently. Piece rate wages are common in the industrial industry. The fairness of compensation is entirely determined by productivity rather than any subjective element. They are an excellent stimulator or motivator since they stimulate personnel to increase their efficiency and achieve the goal. The types of incentives are:

- **Profit sharing:** A typical incentive for employees to work efficiently, the organisation offers a share of the earnings to them. Profit sharing plans often require firms to set a percentage of profits as a target, and if profits exceed that target, the surplus profits are distributed to employees. It encourages employees to work efficiently in order to increase the company's revenues and share in the profits.
- **Co-operation / stock option:** Employees do not acquire ownership rights by sharing profits. Several organisations offer shares in management or participation in management paired with a profit share as an incentive to encourage efficient work from employees. The co-partnership is offered by the issuance of shares if a defined target is exceeded.

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- **Bonus:** one-time extra reward given to an employee in exchange for sharing good performance. Generally, when employees meet or surpass their targets, they are paid an additional amount known as a bonus. Bonuses are also given in the form of free international excursions, paid holidays, or gold, among other things. Some businesses have a bonus programme during the holiday season.
- **Commission:** a popular incentive given to employees who work in the sales department. In general, salespeople are paid a base pay in addition to their efforts. More orders imply a higher commission.
- **Suggestion system:** Employees are compensated under the suggestion method if the organisation benefits from the idea made by the employee. For example, if an employee offers a cost-cutting measure, the person is compensated for making the idea. it is a very good incentive to maintain employees' initiative levels high.
- **Productivity linked wage incentives:** These are wage rate plans in which higher wages are offered in exchange for increased productivity. In a piece pay system, efficient workers are compensated more than inefficient workers. Employees must perform effectively in order to get higher pay.
- **Retirement benefits:** To motivate employees, several firms provide retirement benefits such as pensions, provident funds, and gratuities. These incentives are appropriate for employees that require protection and safety.

3. Allowances:

Allowances are amounts of something that are authorised, usually within the confines of a set of rules and regulations or for a specific purpose. Other allowances are granted to employees in addition to their base income to help them meet their basic needs. Among these benefits are:

- **Dearness Allowance (DA):** a benefit given to employees to protect their real income from price hikes. Dearness allowance is determined as a percentage of base wage.
- **House Rent Allowance (HRA):** Employers who do not provide employees with living accommodations pay a house rent allowance. This allowance is calculated as a percentage of the employee's salary.
- **City Compensatory Allowance (CCA):** This is mostly granted to employees who work in metropolitan areas and other large cities where the cost of living is higher. For municipal employees, the city compensating allowance is often a predetermined monthly sum, such as 30% of base pay.

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- **Transportation Allowance/Conveyance Allowance (TA):** Some firms provide a transportation allowance to cover the employee's commute from home to work.

4. Fringe Benefits/Perquisites

Employee benefits include medical treatment, hospitalisation, accident relief, health and group insurance, canteen, uniform, recreation, and so on. In recent years, there has been a lot of emphasis on developing compensation systems that go beyond monetary compensation. We can assert that all aspects of pay management have a substantial impact on an employee's life. Pay-for-performance has grown in popularity among management and professional employees, particularly among executive and senior management. Money is the primary motivator for the majority of employees.

Perquisites are allowances granted to executives and other higher-ranking officers. They include amenities such as a corporate car, club membership, paid vacation, furnished residential bungalows, stock option plans, overseas trip benefits, and so on.

5.5.2 Non- monetary compensation:

1. **Awards –** include cash, gift certificates, movie tickets, family party and food coupons, travel discounts to popular destinations, and other items.
2. **Recognition–** includes Employee of the week, month and year awards presented at a colourful event has the potential to push staff to perform better. Individuals that make a positive contribution to society, go above and beyond the call of duty, or have an impact on business are recognised.
3. **Service awards –** A loyalty award is given to employees who have worked for the company for a certain number of years.
4. **Appreciation –** When an employee completes a task to the complete satisfaction of superiors, the acknowledgment of higher authority in the presence of colleagues is a quite certain reward.
5. **Challenging task –** The assignment of a difficult task to promising individuals has the ability to unearth dormant brilliance in those employees.
6. **Deputation for foreign assignment –** The selection of the top performers for training and significant overseas trips will definitely inspire them and raise their value and standing among their colleagues.
7. **Seeking consultation –** Consultation with key individuals on strategic issues and eliciting candid input has a tremendous impact on morale and positive energy.

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8. **Participatory opportunity –** Employee participation in decision-making would undoubtedly heighten up their interest and motivate them to contribute positively to the organization's goals, whether through a joint decision-making autonomous workgroup, consultative committees, kaizen management, collective bargaining, quality circles, suggestion committees, or other means.

9. **Power delegation and decentralization –** Employee empowerment through decentralisation of power, emphasis on accountability, and delegation of authority has the potential to awaken previously dormant potentials in employees.

10. **Conducting of refresher training –** Periodic training to renew employees' knowledge, skills, and competencies has the potential to empower and rejuvenate enterprises.

11. **Provision of a pleasant working environment** - The provision of a pleasant work environment, such as separate cubicles, the latest electronic communication gadgets, air-conditioned rooms, secretarial facilities, a comfortable desk and chair, pleasant interior decoration, clean drinking water, relaxation facilities, and so on, can assist employees in maintaining a pleasant mood and creating a mind-set for churning out quality work.

12. **Alternate work schedule –** Alternative work schedules, such as past time work, job sharing, flexi time, cancelled work hours, work from home, the possibility to work in day shift, and so on, contribute significantly to employee loyalty.

13. **Liberal holidays** – One of the most significant motivators for employees is the provision of various types of holidays and sabbaticals.

14. **Services for career counselling and mentorship –** The provision of career counselling and guidance coaching has the potential to inspire modern employees to realise their full potential.

15. **Conducting events** – Organizing numerous activities such as Independence Day, festivals, New Year's Day, sports events, literary events, Family Day, and so on fosters a sense of unity among employees.

16. **Status:** relates to a job's rank, authority, responsibility, recognition, and reputation. Managers can inspire employees with esteem and self-actualization needs by promising increased position or rank in the organisation.

17. **Organizational climate:** relates to the relationships between superiors and subordinates. These are the characteristics that define a company. These attributes have a direct influence on a member's behaviour. Employees are always motivated in a

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healthy organisational environment. A positive approach adopted by managers generates a better organisational climate, but a bad approach may spoil the climate.

18. **Career advancement:** Managers must give employees with possibilities for advancement. When there are prospects for advancement, employees enhance their skills and efficiency in the hopes of being promoted to a higher level. Promotion is a powerful stimulant or motivator that encourages people to achieve at their peak.

19. **Job enrichment:** Employees become bored while completing monotonous tasks. They want professions that provide variety and allow them to demonstrate their abilities. Employees are satisfied and motivated when they are given demanding jobs, job autonomy, and intriguing jobs. A profession that is interesting, enriching, and difficult in and of it is a great motivator or stimulant.

20. **Transparency** – Transparent performance appraisal reward system, award system, transfer system, career development practise promotion, and so on all contribute to a positive attitude toward the company.

21. **Job security:** It entails a long-term relationship between personnel and the organisation. A permanent or confirmation letter demonstrates work security. Although work consistency gives safety and security, it can also have a negative impact. Once hired, employees lose interest in their work.

22. **Well-developed communication system** – Conducting regular meetings, ensuring a free flow of communication, setting deadlines, establishing clear-cut regulations, well-defined policies, processes, and strategies, in-house news illuminating the dynamics in the firm and in the sector, and assisting staff in remaining optimistic in the facility

5.5.3 Compensation Process

With regard to present and future projections for monetary capacity, compensation management describes an organization's efforts to maintain a competitive compensation position within its local labour market. The environment, culture, business, and human resources strategies of the organisation all influence how compensation is managed. It includes several processes related to job appraisal, market rate analysis, and job analysis, developing and maintaining pay structures, paying for performance, skills and competence, and performance management, as well as the methods required to manage these activities.

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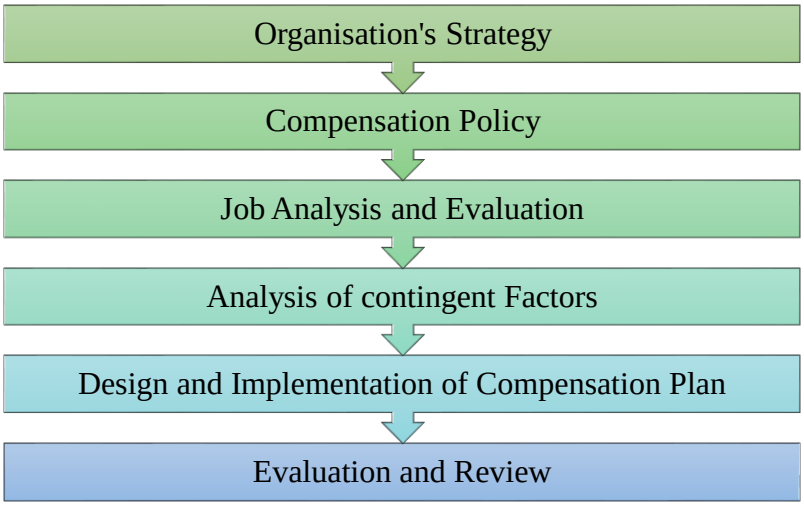

Figure 6: Compensation Process

Organisation's Strategy: Companies that operate in various market/product types with differing levels of maturity implement various tactics, corresponding compensation schemes, and a combination of various compensation techniques. As a result, it is clear that organisations adopt various tactics depending on the state of the market and match their pay plan and content to these strategies. An organisation can increase its business in a developing market by taking over, merging with, or acquiring other businesses in the same industry, or by combining both of these strategies. In a mature market, the organisation stabilises and grows by making the current investment more effective rather than by making new investments.

Compensation Policy: The basis for setting basic pay, bonuses, benefits, and various kinds of perks for different levels of employees is the compensation policy. The organisational philosophy about human resources and strategy should be connected to the policy. The foundation for job evaluation, which establishes the relative value of the various jobs within the organisation, is provided by job analysis.

Job Analysis and Evaluation: It is important to conduct a job analysis to ascertain the specifics of each position's functions, responsibilities, and accountability. Following an analysis of the jobs based on the statements in the job descriptions, the positions' worth is determined from multiple angles. When designing the compensation structure for various positions, an appropriate job evaluation technique is used to ensure internal equity.

Analysis of contingent Factors: The operation of the human resource management system is affected by a number of elements, both internal and external, while formulating compensation plans. The state of the labour market, cost of living, economic development, social

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considerations, pressure from trade unions, and numerous labour laws governing pay management are examples of external influences.

Design and Implementation of Compensation Plan: A company may be able to create a compensation plan that includes base pay with provisions for wage or salary increases over time, various incentive plans, perks, and perquisites. These are occasionally chosen by outside parties, such as pay commissions for government workers and public sector businesses.

Evaluation and Review: Compensation management should have a provision for evaluating and reviewing the compensation plan. A compensation plan is not a rigid and fixed one but is dynamic since it is affected by a variety of factors. If it does not work as intended, there should be review of the plan necessitating a fresh look.

5.5.4 Total Compensation equation

On the basis of the research conducted in the University of Michigan Business School on MBA students' expectations from their workplace, John E. Tropman devised a new concept of pay based on the total compensation equation with 10 variables. To recruit the greatest talent, this equation blends traditional salary with educational, emotional, and psychological benefits. It combines the monetary and non-monetary benefits to create effective, employee focused compensation package.

TC = (BP + AP + IP) + (WP + PP) + (OA + OG) + (EI + QL) + X

Wherein,

TC = Total compensation

BP = Base pay (salary)

AP = Augmented pay (one- time payment)

IP = Indirect pay (benefits)

WP = Works pay (employer subsidized equipment)

PP = Perks pay (special benefits)

OA = Opportunity for role advancement

OG = Opportunity for growth (training)

EI = Emotional income

QL = Quality of life

X = Any unique element

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5.5.5 Challenges in Compensation Design

1. **Establishing Fair and Equitable Remuneration:** Employee remuneration should be fair both internally and externally. Comparable remuneration for comparable work is referred to as internal equity. In other words, wage differences between positions should be proportional to differences in work value. External equality implies that a position's wage should be equal to the pay for a comparable job in another organisation. Payment is determined by job needs, employee performance, and industry levels, reducing favouritism and pay discrepancies.

2. **To Improve the Company's Public Image:** The wage and compensation programme seeks to portray a progressive employer while conforming to legal wage and pay regulations.

3. **Cost Control:** Labour and administrative expenditures can be handled in accordance with the company's ability to pay by utilising effective wage and compensation administration. It simplifies payroll administration and control. The company may plan and regulate labour expenditures in a methodical manner (payroll budgeting).

4. **Attracting Competent Personnel:** Wage and salary administration that is well-managed aids in the recruitment of qualified and diligent workers by assuring enough pay for all occupations.

5. **Clarity:** To ensure uniform and consistent application, wage and salary plans should be established explicitly in writing.

6. **To enhance the Union-Management Relationship:** Wages and compensation based on systematic job analysis and current pay levels are more acceptable to trade unions. As a result, good wage and salary management streamlines collective bargaining and pay talks. It lessens complaints about wage disparities.

7. **Wage Policy Development and Implementation:** Management should ensure that employees are aware of and understand the company's wage policy. Workers should be involved in the development and implementation of wage policies.

8. **Flexibility:** Wage and salary plans should be adequately adaptable or sensitive to changes in the organization's internal and external conditions.

9. **Retain Current Employees:** The corporation can retain its staff by giving a competitive wage. It can reduce employee turnover and boost employee loyalty.

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10. **In Both Interests:** Wage policies should be created with the interests of employees, employers, customers, and the community in mind.

11. **Increase Production:** Good wage and salary administration improves employee motivation and morale, which leads to increased productivity.

12. **Compensation Decision:** All pay, and salary decisions should be reviewed against the wage policy criteria.

13. **Periodic Changes:** Wage policies and programmes should be evaluated and altered on a regular basis to reflect changing needs.

14. **Consistent:** Wage and wage plans should be aligned with the overall strategies of the company. Financial planning should incorporate compensation planning.

15. Wage and salary plans should simplify and expedite the administrative process.

16. For compensation determination and administration, a **suitable database** and an **appropriate organisational structure** should be **constructed**.

CASE STUDY 2
Paid time off: Too Little or Too Much?

You recently completed an analysis of data for the current salary and benefits scheme. You discover that certain modifications should be done because the majority of your employees (120 in total) are dissatisfied with the services provided. In truth, the plan had not been amended in almost fifteen years, putting it out of date and in desperate need of updating.
One of the key sources of disagreement is the organization's PTO policy. Employees believe that the current system of sick and vacation leave provides too few possibilities.
"I frequently come to work unwell, so I can still have my vacation time for my holiday," one employee explains. "I have given nine years to this organisation, yet I only get three days more than someone who has just started," another employee complains. Here is the most recent PTO offer: 7 days for 1 year or more, 10 days for 5 years or more, and 14 days for 10 years or more

1. What cost concerns would you consider when modifying this component of your compensation plan?
2. What other factors would you examine while designing a new PTO plan?

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IN-TEXT QUESTIONS

1. Components of wage & salary are _____
   a. Basic wage b. Overtime wage c. Dearness allowances d. All of these
2. Job analysis is used in compensation to identify or determine _____
   a. Skills level b. Responsibilities c. Required level of education d. All of these
3. Job description identifies for a job _____
   a. Tasks b. Duties c. Responsibilities d. All of these
4. Compensation management is the establishment and implementation of sound policies and practices through _____
   a. Job evaluation b. Surveys of salaries and wages c. Both d. None
5. Compensation should be ____ to efficiency and result.
6. Payment by result is an _____ scheme.
7. Compensation is the money and other benefits received by an employer for providing _____
8. _____ is the method and practice of ordering the jobs with respect to their vale and worth to the organization.
9. _____ states the duties, responsibilities, and mandatory conditions of a specific job.

5.6 REWARD MANAGEMENT

In today's cutthroat economic environment, organisations are focusing on cost-effective quality improvements. A strong economy has also led to a competitive job market. Therefore, businesses need more from their employee's; those same employees want more in return. Programs for rewarding and recognizing employees are one way to encourage staff to alter their work habits and essential behaviour in the interest of any organisation. Thus, Reward management is concerned with the policies, strategies, and procedures necessary to make sure that people are valued and rewarded for their contributions to the accomplishment of organisational goals. It contributes to the overall climate and culture of an organisation, depending on how reward system is developed, administered and managed. Employees need rewards and compensation because it will help them meet their basic financial needs while also

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giving them a sense of job security and appreciation for their efforts. Reward system not only attaching value to the employees but also adding value to the employees.

When investing in human capital, which requires a reasonable return, it is appropriate to pay people differently based on their contributions. The reward management philosophy acknowledges that it must be strategic in the sense that it addresses more long-term issues regarding how people should be valued for what they accomplish. Reward strategies must flow from the business strategy, as must the procedures needed to implement them. Reward is a composite of all organisational mechanisms used to finally acknowledge behaviour and performance of employees. It includes all forms of compensation, non-monetary awards and training opportunities, recognition, promotions, working conditions, assignments etc. It is a part of enhancing motivation, loyalty and satisfaction emphasizing on career job security, opportunities, learning opportunities, recognition, achievements etc. It is more potential in focus to unleash the underlying potentials of employees, to secure command and control and create persistent commitment.

5.6.1 Types of Rewards:

1. Extrinsic rewards

Extrinsic rewards are those that aren't directly related to the job, like salary or working conditions. In their study, Gupta and Shaw (1998) came to the conclusion that monetary incentives are indeed effective. They adopted the stance that not all jobs are engaging and difficult by nature; in an ideal world, everyone would be intrinsically motivated and rewarded, but this is frequently not the case in workplaces. They came to the conclusion that because of the symbolic and practical value that money carries, it matters to the majority of us and motivates us. Money's symbolic value summarizes how we and others view it, whereas its instrumental value refers to the benefits we can obtain from exchanging it.

2. Intrinsic rewards

Intrinsic rewards are the intangible, non-financial benefits that come with a job, such as the tasks, interesting and challenging work, and training opportunities that are available to employees. Acknowledgment and praise are the most effective intrinsic rewards an employee wants to hear because they want to feel like they are contributing at work, and they get motivated to work more enthusiastically.

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5.6.2 Objectives of reward management:

In India, the main goal of employee rewards is to support the achievement of organisational, strategic, and immediate goals. This aids in guaranteeing the availability of qualified, competent, devoted, and highly motivated individuals. The majority of organisations in India believe that rewarding employees is the only effective way to encourage them to perform better.

- Reward employees for the value they create.
- To give employees sense of job satisfaction.
- Reward the proper actions to send the proper message about the behaviour and results that matter.
- Reward employees according to what the organization values and wants to pay for.
- Create a culture of performance in an organisation.
- To motivate employees and acquire their commitment towards organisation.
- Aid in attracting and keeping the top talent the organisation requires.
- Align reward practices with both organisation goals and employee's values.

5.6.3 Principles for setting proper reward management system:

Most organisations employ a variety of rewards. Money, trophies, certificates of achievement, public acclaim, official perquisites, special assignments, get-togethers, and other meaningful considerations are a few examples of recognition and rewards. The most prevalent ones are pay or salary, incentive programmes, perks and benefits, and awards. The majority of employees consider their pay to be the most significant reward for their labour and some employees might not actually be motivated by money. Surprisingly, there isn't any solid proof that higher salaries inevitably result in better performance. Therefore, the benefit of a well-designed reward management system will lead to increase in performance and motivation.

- **Operate fairly:** biasedness should not be there. All employees should believe they are treated fairly and are valued accordingly.
- **Apply rightfully:** People within the organisation are appropriately rewarded in comparison to others; job relativeness is measured as objectively as possible and equal pay is offered for work of equal value.
- **Preference of employees:** The rewards that are offered must appeal to the employees. Cash awards are preferred by many employees. Some employees enjoy having their

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names appear in the company newsletter. Others enjoy the attention that award ceremonies and public recognition.

- **Consistent process:** Pay decisions do not vary arbitrary or without explanation among employees. It should be a consistent process.
- **Transparent:** employees should be aware of the reward process. The system must be simple and easy to understand.
- **Performance standard:** Establish performance guidelines that the team can control.
- **Employee's involvement:** Include employees in the reward process and give them the authority to carry out the necessary tasks to ensure participation in the reward system.

5.6.4 Designing Effective Reward System:

While designing reward system four main points arises that- Whom to reward, what to reward, how to assess the rewards winner and how it should be given.

- **Whom to reward?**

1. Individual employees
2. Teams
3. The organisation
4. Outsiders like customers, suppliers, vendors etc.

- **What to reward?**

1. Performance at organisational level / Department level/ individual level
2. Speed and Efficiency
3. Loyalty
4. Innovation
5. Upholding values
6. Technical solutions
7. Learning
8. Good behaviour
9. Event management
10. Social concern etc…

- **How to reward?**

Rewarding employees depends upon organisation to organisation. It can be given at organisational level or department or individual level.

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- **How to assess?**

  Assessment can be done by the senior by assessing once performance project wise/ yearly basis, filling of survey forms or questionnaire can be filled by the team leaders or peer group depending upon the type of organisation.

- **What to reward?**

1. Empowerment
2. Recognition
3. Career growth
4. Development
5. Celebration and fun

5.6.5 Total reward system:

It includes both monetary and non-monetary components, such as salary, variable pay, a demanding work environment, employee benefits, growth opportunities, and so on. It encompasses both indirect and direct benefits, as well as internal and extrinsic rewards. Each facet of reward is connected together and addressed as an integrated and logical whole, including basic pay, contingent pay, employee benefits, and non-financial incentives, which include intrinsic rewards from the work itself. Total reward combines the influence of the two major reward categories:

1) **Transactional rewards**: concrete rewards resulting from pay and benefit transactions between the employer and employees.

2) **Relational rewards**: intangible rewards related to learning and growth and work experience.

   A whole reward approach is universal; confidence is not placed in one or two reward mechanisms acting in isolation; instead, every method in which employees can be rewarded and find job satisfaction via their work is considered. The goal is to optimise the combined impact of a variety of reward efforts on job commitment, motivation, and engagement.

5.6.6 The significance of total reward:

The idea of total reward basically asserts that rewarding people involves more than just giving them money. A total reward strategy, according to O'Neal (1998), is essential for addressing the problems brought on by hiring and retaining employees as well as for influencing

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behaviour: "It can help create a work experience that meets the needs of employees and encourages them to contribute extra effort, by developing a deal that addresses a broad range of issues and by spending reward dollars where they will be most effective in addressing workers' shifting values."

The advantages of a comprehensive incentive system are as follows:

- **Greater effect** - the combined impact of the many sorts of awards will have a deeper and longer-lasting influence on employee motivation and commitment.
- **Improving the job connection** - A total rewards approach to work makes the best use of both relational and transactional rewards.
- **Flexibility to accommodate employee's needs** –Milkovich and Bloom (1998) in their study stated that 'Relational rewards may bind individuals more strongly to the organization because they can answer those special individual needs'.
- **Talent management** – Relational rewards aid in the creation of a favourable psychological contract, which is much harder to replicate than individual pay practises and can act as a differentiator in the recruitment market. The company can develop into an "employer of choice" and "a great place to work," luring and keeping the talented individuals it requires.

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IN-TEXT QUESTIONS

10. _____ is a comprehensive system to compensate and reward employees fairly and consistently.
11. Which of the following is an example of a non-financial reward:
    a. Bonuses b. Commissions c. health insurance d. employee recognition programmes
12. A reward management strategy is essential for:
    a. Job evaluation b. Human resource planning
    c. motivating employees d. compliance with employment laws.
13. Performance-related pay systems:
    a. tie rewards to firm profitability b. are easy to implement and measure
    c. tie rewards to employee effort d. result in negligible increases in output
14. _____ result in negligible increases in output
15. Rewards may be of two kinds_____and _____rewards.

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5.7 SUMMARY

Compensation is a reward that the organization provides to employees. As a result, the parties must have a common understanding. Attractive remuneration allows a company to attract, retain, and motivate skilled employees. Employees examine the fairness of the link between their performance and the rewards associated with that performance. Remuneration is the single most important HR activity, with an impact on all other tasks such as recruitment, promotion, and job appraisal. Because employee compensation consumes a large portion of the corporate budget, a compensation package is an important component of the overall strategic HRM plan. Salary, bonuses, health-care plans, and other forms of compensation can all be included in a compensation package. The purposes of pay are to attract people to work for your organisation and to keep the ones who are currently there. Compensation is often used to encourage individuals to perform at their best and boost morale. Employees that are appropriately compensated are more likely to deliver excellent customer service, which can lead to organisational growth and development.

5.8 ANSWERS TO IN-TEXT QUESTIONS

1.	d	9.	Job Analysis
2.	d	10.	Reward Management
3.	d	11.	D
4.	c	12.	C
5.	Proportional	13.	C
6.	Incentives	14.	Wage rate
7.	Services	15.	Intrinsic, Extrinsic
8.	Job evaluation		

5.9 SELF-ASSESSMENT QUESTIONS

1. What are the fundamental concepts of compensation administration?
2. What kinds of compensation systems often inspire executives?

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3. Explain briefly the essential components of India's industrial wage system.
4. Compare and contrast performance bonus systems at the individual, group, and organisational levels. What similarities do they share? and/or Distinct?
5. "Compensation must fulfil the Intrinsic and Extrinsic needs of the employees" Discuss.
6. Explain the factors affecting compensation decision.
7. "Compensation programme must be fair to both the employer and the employees" Justify
8. Describe in detail the different steps in a compensation management process.
9. Assume your company is growing and wants to build a sales unit in another country. What compensation elements would you be concerned about?

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LESSON 6

PERFORMANCE MANAGEMENT: SYSTEMS AND STRATEGIES

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STRUCTURE

6.1 Learning Objectives

6.2 Introduction

6.3 Concept of Performance Appraisal

- 6.3.1 Definition of Performance Appraisal
- 6.3.2 Nature of Performance Appraisal
- 6.3.3 Objectives of Performance Appraisal
- 6.3.4 Significance or Importance or Benefits of Performance Appraisal
- 6.3.5 Limitations of Performance Appraisal
- 6.3.6 Comparison between Performance Appraisal and Job Appraisal
- 6.3.7 Steps in Performance Appraisal System
- 6.3.8 Essentials of a Sound Performance Appraisal System

6.4 Methods of Performance Appraisal

- 6.4.1 Traditional Appraisal Methods
- 6.4.2 Modern Appraisal Methods

6.5 Performance Management and Potential Appraisal

- 6.5.1 Performance Management
- 6.5.2 Potential Appraisal

6.6 Summary

6.7 Glossary

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6.8 Answers to In-text Questions

6.9 Self-Assessment Questions

6.10 References

6.11 Suggested Readings

6.1 LEARNING OBJECTIVES

After reading this lesson, the students will be able to:

- Understand the definition, nature, objectives, significance, and limitations of Performance Appraisal
- Interpret the Comparison between Performance Appraisal and Job Appraisal
- Learn steps in Performance Appraisal System
- Analyse the essentials of a Sound Performance Appraisal System
- Explain the Traditional Appraisal Methods and Modern Appraisal Methods
- Learn the terms like Performance Management and Potential Appraisal.

6.2 INTRODUCTION

In the last lesson we have learnt the meaning of job analysis, how to deal with the problem of over staffing, how to hire the new employees, how to create a fit between the right people and the right job. We have gained knowledge about how the job analyser analyses the job, develops job descriptions, and prepares job specifications.

Performance appraisal has turned into an extremely critical action in most of the undertakings. It gives information about past, present, and expected performance of the employees which is supportive in taking choices on determination, preparation and improvement, salary raise, promotion and transfer. These days a lot of cash is spent on performance appraisal by most organizations.

6.3 CONCEPT OF PERFORMANCE APPRAISAL

Individuals differ in their capacities and aptitudes. These distinctions are normal and cannot be dispensed with even by giving similar fundamental schooling and training to them. In this way, it is important for the top management to know these distinctions so the workers having better

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capacities might be compensated and some inefficient workers can be found and compensated accordingly. The worker may likewise prefer to know the level of his performance in contrast with his colleagues so he might improve it. Along with this there is a need to have reasonable performance appraisal framework to know the general value of every worker.

6.3.1 Definition of Performance Appraisal:

Performance Appraisal can be known by different names like merit appraisal, merit rating, progress rating and performance appraisal. In simple words, performance appraisal means evaluating how the employee is performing during the job and what is the scope for his development. The various authors gave the different definitions in their own words for performance appraisal. The definitions are given underneath:

According to **Beach,** “Performance appraisal is the systematic appraisal of the individual with regard to his or her performance on the job and his potential for development.”

According to **Randall S. Schuler,** "Performance appraisal is a formal, structured system of measuring and evaluating an employee’s job, related behaviour and outcomes to discover how and why the employee is presently performing on the job and how the employee can perform more effectively in the future so that the employee, organisation, and society all benefit."

According to **Heyel,** "It is the process of evaluating the performance and qualifications of the employees in terms of the requirements of the job for which he is employed, for purposes of administration including placement, selection for promotions, providing financial rewards and other actions which require differential treatment among the members of a group as distinguished from actions affecting all members equally."

According to **Dale Yoder,** "Performance appraisal includes all formal procedures used to evaluate personalities and contributions and potentials of group members in a working organisation. It is a continuous process to secure information necessary for making correct and objective decisions on employees. Performance appraisal from employee point of view - "A performance appraisal is meant to help employees realise their strengths and shortcomings and receive a compensation accordingly."

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ACTIVITY

At the point when you have gone through every one of the definitions by well-known authors, give your perspectives on the meaning of the performance appraisal.

6.3.2 Nature of Performance Appraisal:

The primary attributes of performance appraisal are:

a) **Evaluating Performance-** Performance appraisal is a course of assessing the performance of workers.

b) **Gaining Knowledge about Employees-** It is the assessment of a worker's strengths and weaknesses.

c) **Ongoing and Continuous Process-** It is a progressing or consistent cycle wherein the examinations are done intermittently as per a positive arrangement.

d) **Making decisions-** The fundamental reason for performance appraisal is to get data important for going with genuine choices like transfer, promotion and increment.

e) **Basis of Appraisals-** Appraisals of workers depend on clear cut criteria, for example,

- Capacity to accomplish the work.
- Quality and amount of result.
- Relations with bosses, companions, and youngsters.
- Individual characteristics like reliability, versatility, drive, authority, and so on.

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ACTIVITY

Assuming you have been given the opportunity what else focuses would you have included in the basis for performance appraisal?

6.3.3 Objectives of Performance Appraisal:

The performance appraisal program might be executed to accomplish the accompanying goals:

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a) **Determination of Wages and Incentives-** To give a record of every worker's performance to decide wages and motivation pay.

b) **Suitability of Employees' Jobs-** To recognize the workers who have been put on difficult tasks to move them to the positions for which they are more qualified.

c) **Identification of Employees' Strengths and Weaknesses-** To know the nature of performance of every worker and recognize their strengths and weaknesses.

d) **Training Programmes-** To plan training program to improve the nature and quality of work of staff.

e) **Knowing the Employees' Performance Level-** To work with the employee to make him realize his performance level and how can he improve on that.

f) **Finding Employees with Potential for Development-** To find workers who have sufficient potential for promotion and improvement.

g) **Helping in Decisions-** To act as the premise of work force choices like transfer and promotion.

Examples of Performance Appraisal Objectives-

1. Business (Work) related Objectives-

a. To have an overview regarding work done by employees.

b. To help the managers in allocating workers as per their ability, interest, fitness and capabilities

c. To further develop proficiency.

2. Communication Objectives-

a. To know what is generally anticipated of every employee regarding performance ana the future tasks.

b. To give criticism to workers with the goal that they come to know where they stand and can further develop their work performance.

c. To give training, guiding, and inspiration to employees.

d. To foster positive prevalent subordinate relations and accordingly lessen complaints.

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3. Organizational (Hierarchical) Objectives-

a. To act as a reason for choices like transfer and promotion.

b. To act as a reason for compensation and pay organization and considering pay increments and augmentations of workers.

c. To act as a reason for arranging reasonable preparation and improvement programs.

4. Career (Profession) Development Objectives-

a. To evaluate serious areas of strength in the working of the employees and proposing solutions for overcoming weaknesses.

b. To decide profession capability of every worker.

c. To design career related objectives and ways for improving every worker.

ACTIVITY

You are appointed as a chief in the ABC organization which is FMCG company, and you have been given the task of making goals for the performance appraisal which will occur in the approaching month. Thus, presently you should set up the one goal from each category given under:

a) Business (Work) related Objectives
b) Communication Objectives
c) Organizational (Hierarchical) Objectives
d) Career (Profession) Development Objectives

6.3.4 Significance or Importance or Benefits of Performance Appraisal:

The advantages of performance appraisal are as per the following:

a) **Periodic and Systematic Appraisal-** It assists the manager with assessing the performance of his employees. It likewise assists him with allotting that work to people for which they are the most ideal.

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b) **Guiding and Correcting Employees-** Rating helps in directing and adjustment of workers. The boss might utilize the consequences of rating with the end goal of helpfully directing the employees in the productive presentation of work.

c) **Recognizing Ability of Staff-** The capacity of the staff is perceived and can be satisfactorily compensated by giving them extra benefits in the form of promotion.

d) **Basis of Sound Personnel Policy-** Performance appraisal can be utilized as a premise of sound personnel strategy in connection to transfer and promotion. If the presentation of an employee is superior to other people, then he can be promoted, but if he is not working up to the yardsticks then he can be transferred to some other job.

e) **Effectiveness of Training Programmes-** Ratings can likewise be utilized to assess the adequacy of training programs. Weaknesses of workers are identified by performance appraisal and the training projects can be altered appropriately.

f) **Acts as Incentive-** Performance examination gives a motivating force to the workers to better their performance in a bid to work on their rating over others.

g) **Preventing Grievances and Developing Confidence among Employees-** Systematic performance appraisal will reduce the number of complaints and foster a certainty among the workers since they are persuaded of the unprejudiced premise of assessment.

ACTIVITY

What all benefits could be achieved through performance appraisal in your organization? Think and write down the advantages what you can imagine.

6.3.5 Limitations of Performance Appraisal:

The Performance appraisal may not yield the ideal outcomes in light of the accompanying inadequacies:

a) **Selection of Wrong Factors-** If the elements chosen for the appraisal are unessential, the consequence of performance appraisal will not be precise.

b) **Weightage to Different Qualities-** Different characteristics to be appraised may not be given appropriate weightage in specific cases.

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c) **Differences in Personality of Employees-** Some of the elements are profoundly distinctive like motivation, personality of the employees because of which the rating of the performance may not be on the same logical lines.

d) **Biasness in Appraisal-** Supervisors frequently don't have the basic capacity in evaluating the presence of their subordinates. Mostly, they are directed by their own feelings and preferences. So, the appraisals are probably going to be partial and biased.

ACTIVITY

Scrutinizing all the shortcomings during the process of performance appraisal, what all weaknesses do you consider can be there? Mention them.

6.3.6 Comparison between Performance Appraisal and Job Appraisal:

S.No.	Basis	Performance Appraisal	Job Appraisal
1.	Meaning	Performance appraisal means reviewing the work done by the employees and ranking them accordingly.	Job appraisal is assessing the value of a particular job in comparison to the various other jobs in the organization. It considers the value of each job to know the rational pay structure of each job.
2.	Basis	It thinks about the capacities and performance of people.	It thinks about the necessities of different positions with regards to sets of expectations.
3.	Purpose	The reason for merit rating is to assess the performance of people to take choices like salary raises, transfers, promotions, and so on. It likewise fills in as a rule for the administration to consider the kind of training which should be provided to the employees.	The motivation behind job appraisal is restricted that is to decide the value of the job based on requests made by a specific work on the normal labourer. This helps in fixing wages for various jobs.

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4.	Person vs. Job	Performance appraisal rates the employee and not the occupation as it is worried about surveying the capacities of the people. It estimates the value of various workers to the association.	Job appraisal examines the task to decide their general work and fix a pay level that are fair and even-handed.
5.	Policy Decision	It helps in making decisions regarding transfer and promotion.	It helps in making the wage policy of the organization.

6.3.7 Steps in Performance Appraisal System:

For fostering a powerful performance appraisal program, the accompanying steps ought to be followed:

1. **Assurance of Purpose-** Before any performance appraisal program is started, deciding its objectives is fundamental. The goal of the appraisal program might be either to assess the real performance of people in their current positions or to decide the capability of people to do higher positions or both. Now and again performance appraisal programs are related to explicit targets like promotion, transfer and promotion, salary raise, and so on.

2. **Laying out the Criteria of Performance Measurement-** Principles of appraisal ought to be positioned to quantify the presence of different people in their occupations. The guidelines of appraisal should be in clear-out terms and put in writing. The subordinate ought to be made to comprehend the principles which will measure the performance. The standards to be utilized for the estimation of performance will shift from one occupation to another. Some of the models which are usually utilized in modern enterprises are:

(i) optimum use of accessible assets,

(ii) productivity,

(iii) reduction in cost,

(iv) improvement in productivity,

(v) realization of big business targets, and

(vi) improvement in items and administrations.

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3. **Assurance of Frequency of Appraisal-** Performance appraisal is an ongoing process. Yet, in most of the organizations, formal appraisal programs are executed once or twice a year. The recurrence of appraisals will be not entirely settled by the goals of appraisal and the degree of employees to be assessed.

4. **Choice and Training of Appraiser-** For the most part, the appraiser or the evaluator is the superior of the individual to be assessed because he is generally acquainted with the individual concerned and his work. Yet, there are sure restrictions of appraisal by one individual on the grounds of the critical job of the appraiser. The appraiser might be one-sided towards specific attributes about which he personally does not know. To keep the biasness away, the proper training should be provided to the appraiser. In fact, opinion of two appraisers can be taken to have objective results.

5. **Planning of Appropriate Forms-** Since the aftereffects of appraisal are to be utilized for most significant choices like a transfer, promotion, and so on, it is fundamental to track performance appraisal. For this reason, appropriate forms should be prepared for appraising all types of employees, for example, supervisory, administrative, clerical, and managerial and operative. The items in the forms are determined by the purpose of appraisal.

ACTIVITY

Numerous new workers joined your organization, so in a similar setting you need to keep an appraiser. So, what steps you really want to continue in picking the ideal individual for the performance appraisal system. Mention them.

6.3.8 Essentials of a Sound Performance Appraisal System:

A sound arrangement of performance appraisal should satisfy the accompanying basics:

a) **Simple and Easy to Understand-** The presentation appraisal framework ought to be easy to work with and straightforward. At the point when the appraisal framework is concerned, employees may not comprehend it completely, furthermore, may check out the arrangement with doubt. The arrangement ought not to be very tedious.

b) **Fair and Uniform Appraisal System-** The performance appraisal framework ought to be performance-based, uniform and non-variable, fair, just, and even-handed. It ought

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to be guaranteed that the appraisers tell the truth, judicious and objective in their methodology, judgment, and social direction.

c) **Awareness to the Employees about the Goals and Objectives-** The employees ought to be made mindful of the presentation concerning objectives, targets, furthermore, conduct expected of them. An individual condition between the appraiser and worker must be created to accomplish common comprehension of the standards of assessment.

d) **Prepared in Consultation with Subordinates-** The appraisal framework ought to be conceived in a conference with the subordinates. This will expand their obligation to the arrangement and their comprehension of anticipated performance.

e) **Considering Prevailing Practices-** The examination framework ought to consider the appraisal works in different units in the business as well as the most recent reasoning on performance appraisal. It ought to fit into the design and tasks of the association.

f) **Creating a Reliable Appraisal Environment-** The top administration should establish an environment of dependable examination all through the association. Objective direction, open interchanges, common trust casual connections, and so forth are the essential components of such an environment.

g) **Designed to Achieve Specific Objectives-** The appraisal framework ought to be intended to accomplish explicit targets. The goals of the examination framework might be to assess current performance at work and to decide the potential for higher positions. Now and again, performance appraisal relates to explicit targets like a salary increase, training, promotion, transfer, and so on. The number of elements to be thought of and the information to be gathered ought to be tailormade to accomplish the goal of the appraisal.

h) **Appraisers should be Selected and Trained Properly-** The appraisers ought to be chosen and prepared appropriately so they have no private predisposition and have the fundamental abilities for the true assessment of workers. In request to objectivity in the examination, an individual might be evaluated by additional people autonomously.

i) **Provision of Appeals against Appraisals-** There ought to be an arrangement of requests against appraisals to guarantee certainty of the workers and their affiliations or organizations. The results of appraisal should be talked about with the rates so they might get a potential chance to communicate their sentiments on their progress reports.

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ACTIVITY

In your enterprise, you have fund that an unfair and biased measures of appraisal of performance have been take. How will you help them in taking corrective measures? Will you guide them to use essentials of a sound performance appraisal system?

IN-TEXT QUESTIONS

17. Performance Appraisal is an ongoing and _____ process.
18. The performance appraisal and job appraisal are same. True/False.
19. The Performance Appraisal should be fair and _____ in nature.
20. Proper training should be provided to the appraiser for appraisal of the performance. True/False
21. Does performance appraisal help in bringing confidence and motivation among the employees? Yes/Np

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CASE STUDY

Performance Appraisal at ABC Ltd.

Recently, three employees working at the Head Office have been denied annual increments due to comparatively low score. They have gone to the Chief Executive of the company expressing their dissatisfaction with the appraisal system and insisting that community service is not apart of their job, and it should not influence their ratings. The employees seem to organise a union and demand that annual increments should be granted automatically.

ABC Ltd. is a reputed advertising agency having 5 branches in different parts of the country. Its staff includes 180 operative employees and 35 executives. The company has a performance rating plan under which the staff members are checked at the end of each financial year by a committee of two executives by means of checklist method. The qualities considered are responsibilities, initiative, dependability, leadership potential, cooperative attitude and community service. After the performance is evaluated, the check points are discussed with the concerned employees by their immediate boss and are used to counsel them and arrange further training for them. The check points are also used for granting or withholding of increments of staff with poor performance and granting of additional increments to and promoting of deserving staff.

The Chief Executive feels that performance appraised is a dangerous source of friction and so it should be discontinued altogether.

Questions:

1. If you were the Human Resource Manager of the advertising agency, how would you solve the issue?
2. How far do you agree with the Chief Executive's view that performance appraisal should not be continued?
3. On what lines would you recommend improvement or changes in the performance appraisal system of the company?

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6.4 METHODS OF PERFORMANCE APPRAISAL

There are different strategies for merit rating which might be ordered into: (i) Traditional Techniques, and (ii) Modern Methods. The techniques contrast for different clear reasons. To start with, they contrast in the characteristics to be appraised. The characteristics may vary because of contrast in work necessities, factual prerequisites, and assessment of the management. For example, 'collaboration' may not be viewed as at all important by the management. Then, at that point, it is troublesome additionally to rate such factors as collaboration dependably. Second, they contrast the inclusion of who is being evaluated, e.g., chiefs, sales reps, and processing plant employees. Third, varieties might be caused because of the level of accuracy in the assessment. Lastly, they might contrast techniques used to acquire weightage for the different attributes.

To the extent that is practicable, merit rating ought to be founded on true factors; it ought to be a nonstop cycle and made at standard stretches. Any great strategy for merit rating ought to evaluate the accompanying individual characteristics of the employees:

(i) Knowledge of work.
(ii) Ability to accomplish the work.
(iii) Quality and amount of result.
(iv) Personal characteristics like constancy, versatility, drive, and so on.
(v) Special characteristics like certainty, administration, and so on.

6.4.1 Traditional Appraisal Methods:

Traditional methods are exceptionally old methods of performance appraisal. They are based on the methods of appraisal which are followed since years. Appraisal of workers is done based on principles of individual characteristics or characteristics like mentalities, judgment, flexibility, drive, reliability, authority, faithfulness, dependability, and information on work. and so on. There are six traditional methods which are talked about underneath:

1. **Confidential Report-** Under this, the appraiser is expected to record his impression of the individual being assessed in an unstructured manner. In any case, in certain organizations, remarks are expected to be gathered under unambiguous headings like nature of occupation, performance, reasons for explicit work ways of behaving, character attributes, and promotion needs. This framework is exceptionally abstract and has its legitimacy in its effortlessness and is still being used particularly in general society area and government offices.

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Majorly, there is no standard configuration for the confidential report. It relates to the performance, capacity, and working of the employee during the earlier year. Extremely easy-going feedback is found among evaluators while filling confidential reports of the employees working under them. No criticism is given to the worker being evaluated and accordingly, its validity is exceptionally low. The worker who is evaluated never knows his shortcomings and the open doors accessible for defeating them.

2. **Ranking-** Ranking is a team-oriented assessment strategy that includes the setting of workers in a position as per their work performance. It grants examination of all workers in any single rating group no matter what the kind of work is, all specialists are decided on similar elements also, they are evaluated on the general premise concerning their work performance rather than an individual appraisal of characteristics. Along with it, the best is put first in the position and the poorest possess the last position. The trouble with this framework is that the evaluator is asked to think about an entire man.

   Paired comparison is an improvement over simple ranking. Under this, each worker in is contrasted with other worker to figure out which is better in his work. The evaluator is furnished with booklets containing two names on each page. Clearly, the number of rank requests would be n(n-1)/2, where n is the total number of people to be thought about. Along with it, each employee is contrasted and each other worker in a similar work family.

***Fortune* 500 Focus (Contd.)**

In a forced distribution system, like the one used by GE, employees are ranked in groups based on high performers, average performers, and nonperformers. The trouble with this system is that it does not consider that all employees could be in the top two categories, high or average performers, and requires that some employees be put in the nonperforming category.

In a paired comparison system, the manager must compare every employee with every other employee within the department or work group. Each employee is compared with another, and out of the two, the higher performer is given a score of 1. Once all the pairs are compared, the scores are added. This method takes a lot of time and, again, must have specific criteria attached to it when comparing employees.

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3. **Forced Distribution-** A few evaluators experience the poor effects of a consistent mistake, i.e., they either rate all employees as incredible, normal, or poor. The forced distribution system is perceived to compel the evaluator to fit the workers being evaluated into pre-decided scopes of scale. It enjoys an upper hand over the matched examination framework in that at least two workers can be given equivalent appraisals. This framework depends on the assumption that workers can be isolated into five-point scale of outstanding, above average, average, below average and poor. In this framework, the appraiser is approached to disperse the employees into these classifications so that 10% of the men are in group 'outstanding', 20% 'above average', 40% 'average', 20% 'below average' also, 10% 'poor'.

   This strategy clearly gives the chance of judgment with respect to managers. Other than this, the framework is straightforward and direct. The goal of this method is to look out performance as an ordinary activity. Commonly, this strategy is not found in groups especially when the group is small.

4. **Graphic Rating Scale-** Under this strategy, scales are laid out for various explicit elements and characteristics. Five degrees are laid out for each variable and general definitions show up at focuses along the scale. For the most part, the evaluator is provided with a printed structure, one for every individual to be evaluated. The choice of factors to be evaluated on rating scale is a significant point under this framework. These are of two kinds:

   (i) qualities, like drive and reliability.

   (ii) commitments, like the amount and nature of work.

Since specific regions of occupation performance cannot be impartially estimated, all things considered, a realistic scale will proceed to utilize a combination of the two qualities and commitments.

Graphic rating scale forces a significant weight upon the superior. He should report and assess the presentation of his subordinates on scales including upwards of five degrees on maybe ten distinct variables. The primary downside of this framework is that the evaluator might be one-sided. In any case, one method is to leave space on the structure after each component and expect him to make sense of the justification behind his rating. Essentially, he is approached to give an illustration of the rate's way of behaving that justifies the appointed rating. Generally, appraisals will generally group on the high side under this framework. A supervisor might generally rate his subordinates high to keep them away from analysis.

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The graphic rating technique is straightforward and simple to utilize. It allows the statistical tabulation of scores in terms of measures of central tendency, skewness, and dispersion. It allows a ready comparison of scores among workers. The scores apparently tell the merit or worth of each person.

Employee Performance Appraisal
XYZ Company

Employee's Name _____

Title _____

Department _____

Please put an X in the area which best describes this employee's performance.

Attribute	Above Average	Average	Below Expectations
Dependable			
Shows problem solving ability			
Works well in a team			
Takes initiative			
Produces high quality work			
Shows leadership within department			
Communication ability			

Please provide specific comments which describe the ratings for each category.

_____

_____

_____

_____

_____

_____

_____

_____

Date _____

Signature of employee _____

Signature of manager _____

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5. **Checklist Appraisal-** Different statements are prepared in such a way that they portray different sorts of conduct of a person in a specific occupation. Every statement is joined to a scale value. During the hour of rating the workers, the supervisor simply remembers and check all statements. After all the values are attached to the singular qualities furthermore and appraisal up to this level is assembled on the rating sheet. Then the average is calculated, and employee is evaluated. The weighted checklist ought to be ready by the people completely familiar with the job and acquainted with planning. When this process is finished, appraisals are put on separate cards for future reference.

6. **Critical Incident-** A critical incident means when an employee exceeds or fails any requirement of his job. It addresses an exceptional way of behaving of an employee at work, concerning example:

(a) Resisted the implementation of change.

(b) Became upset about work.

(c) Refused to help colleague.

(d) Suggested an improvement in the work technique.

(e) Tried to get an individual specialist to acknowledge the administration's choice.

(f) Acknowledging new thoughts.

This strategy requires each manager to keep all such critical incidents in each employee's way of behaving which demonstrate powerful or effective activity and those which show the insufficient or unfortunate way of behaving. These are kept in an extraordinarily planned notepad which contains classifications for qualities under which different ways of behaving can be recorded. Instances of such sorts of occupation prerequisites for employees are judgment, learning skills, efficiency, precision of work, obligation, and motive. Day-to-day recording of these things is by all accounts fundamental because any other way, the boss might fail to remember the incidents with his subordinates.

The primary issue with this strategy is that the extraordinary incident occur so rarely that singular examination may not differ. It has been seen that often the workers have neither positive nor negative occurrences. In cases, where the basic occasion does not occur, rating an employee will be troublesome. Additionally, it might be hard for a manager to conclude what is a basic or excellent incident. Here again, the human choice might show up in recording the basic incident.

The limitations of the critical incident method are as per the following:

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(i) Outstanding occurrences may not occur consistently.

(ii) Negative occurrences are, for the most part, more observable than positive ones.

(iii) The manager may not record an incident right away and fail to remember it later.

(iv) It might likewise be extremely challenging for a manager to conclude whether an incident is basic or on the other hand not.

(v) This strategy requires close oversight which may not be liked by the employees.

7. **Essay Method-** Under the essay method, the superior composes a report about the worker which depends on his appraisal of the workers' performance. The superior constantly observes the subordinate and composes his appraisal in the report. While setting up a paper on the worker, the evaluator by and large thinks about the accompanying variables:

   (i) Job information and capability of the employee.

   (ii) Employee's qualities and mentalities.

   (iii) Employees interpretation about the organization's projects, arrangements, goals, etc.

   (iv) Employee relations with youngsters, colleagues, and managers.

   (v) Development needs of the employee.

   Essay appraisal is a non-quantitative method of examination. It gives a fair plan of data about the employee being assessed.

   Essay appraisal might experience the side effects of individual and human predisposition in view of likings or on the other hand disliking of the manager. An appraiser will most likely be unable to communicate his judgment in proper words and it will restrict the utility of examination reports.

8. **Group Appraisal-** Under the group appraisal technique, the workers are evaluated by an appraisal group, comprising their supervisor and three or four different people who have some information on their presentation. The gathering then, at that point, examines the guidelines of performance for that work, the real performance of the worker, and the reasons for their specific degree of performance and gives ideas for future enhancements, if any.

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This technique is without any trace of partiality since appraisal is done by multiple judges. Besides, it is an extremely thorough and basic strategy. The main disadvantage is that this technique is tedious.

9. **Field Review Method-** Under this strategy, the supervisors are consulted by a specialist from the HR or staff division. The specialists question the manager to acquire all the appropriate data on every worker and takes notes in his journal. Consequently, there is no evaluating structure with variables where appraisals are acquired. The specialists are generally grouped into three classifications remarkable, agreeable, and unacceptable. The evaluator questions the supervisor about the prerequisites of each work in his unit and about the performance of each man in his work. He tests to know how the employees are working and how can his performance be improved.

   The supervisor is expected to offer his perspective about the promotion of his subordinates, the level of the performance of each subordinate, his weaknesses, valid statements, capacity, promotability, and the potential game plans in cases requiring further thought. The questions are asked and responded to verbally.

   The progress of the field survey strategy relies on the capability of the questioner. If he knows his work, he can contribute essentially to precise examinations. The field audit technique lets the supervisors free from the tedious work of filling in examination structures. Superficial judgment can be eliminated.

Criticism of Traditional Methods:

The overall analysis of traditional performance appraisal systems is that they are as well abstract in nature since every one of them depends on the private judgment of the evaluator. Individual judgment is constantly exposed to partiality or bias from certain different regions. The appraiser will most likely be unable to pass judgment on the skill of the employees because of the absence of preparation.

As a result of the critical job of the supervisors under the traditional methods, performance ratings are much of the time subject to various blunders and shortcomings which are talked about underneath:

1. **Halo Error-** This sort of mistake happens when the evaluator permits one part of a man's character or performance to impact his whole assessment. It is the inclination of numerous evaluators to let the rating, they give importance to one characteristic excessively which impact their appraisals. Numerous managers will generally give an employee around similar ratings on all elements. This mistake can be perceived

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effectively on factor scales. The rating scale strategy is defective because the supervisor tends to concentrate on one single factor more than the others before going on the next. In this way, he can think about every one of the subordinates compared with a norm or to one another on every characteristic.

2. **Central Tendency Error-** This blunder happens when the evaluator is uncertain about the subordinates or has lacking data about them or is concentrating on the rating process. Because of these reasons, by and large, the evaluators are hesitant to rate individuals at the external closures of the scale. The evaluator realizes that he needs to assess his subordinates at intermittent spans. If the evaluator is new to the system or does not have adequate knowledge regarding the system in the organization, it would be difficult for him to evaluate the subordinates.

3. **Leniency or Strictness Error-** Managers tend to be simple evaluators, what is more, others tend to be strict in their appraisals. Tolerant or simple evaluators allot reliably high qualities or scores to their subordinates and severe or strict evaluators give reliably low appraisals. Both the patterns can emerge from changing guidelines of performance among managers and structure various understandings of what they see in worker performance. This mistake can be somewhat overwhelmed by teaching the supervisors and arranging meetings between them with the goal that they might reach settlement on exactly what they anticipate from their subordinates.

4. **Recent Behaviour Bias-** Often some evaluators assess people based on their performance in the new couple of weeks, a normal consistent way of behaving is not checked. Some workers monitoring this inclination show improved results when they feel that they are being noticed and the report of their presentation is to be arranged soon.

6.4.2 Modern Appraisal Methods:

There are some important methods of appraisal which the modern organizations use which are Managing by Objectives (MBO), Behaviourally Anchored Rating Scale (BARS), 360-degree appraisal. All these methods are explained underneath:

A. MANAGING BY OBJECTIVES (MBO):

Concept of Managing by Objectives (MBO):

The way of thinking of 'Management by Objectives' (MBO) was presented by Peter Drucker in 1954 and later created by different journalists like John Humble, Dale McConkey, George Ordiorne, Edward Schleh, and Douglas McGregor. Noticing that even many is critical years

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before 1954, goals were underscored by traditional administration authors like Fayol, Urwick, and Barnard.

John Humble defined overseeing by targets as a powerful framework that coordinates the organization's need to accomplish its objectives for benefit and development with the administrator's need to contribute furthermore, foster himself. Ordiorne likewise focused on that MBO isn't simply a group of rules, a progression of techniques, or even a set strategy for making do, however, it is a perspective about administration.

Features of Managing by Objectives (MBO):

The wide attributes of MBO are as per the following:

(i) **Operational Technique-** The Management by objectives is a practical technique. The objectives must be set in quantifiable or quantitative terms. As Drucker puts it, "Objectives should be functional, and they should be equipped for being changed over into explicit targets and explicit tasks. They should be fit for turning into the premise as well as the inspiration for work and accomplishment".

(ii) **Comprehensive Technique-** MBO addresses an extensive instrument of management. It is not just a tool of human resource management but an overall management technique for realizing the various objectives of the organization.

(iii) **Participative Management-** MBO underlines a participative way to deal with the management. The goals are set with the help of subordinates. MBO isn't just an agreement, yet the creation of objectives and their performance working together.

(iv) **Result Oriented-** MBO is performance arranged. That is the reason, its other name is Management by Results. This approach focuses on ends instead of means and is demonstrative as opposed to correctional in character. The presentation of an individual or unit is assessed as per the outcomes acquired.

(v) **Concentration on Key Result Areas-** The focus in MBO is on performance improvement in the areas which are of basic significance to the association overall. By distinguishing proof of key outcome regions, MBO guarantees that due consideration is given to the need regions which are significant for good performance and development of the association.

(vi) **Systems Approach-** MBO tries to coordinate the person with the organization and also, the association with its current circumstance. It looks to guarantee the achievement of both individual and undertaking objectives by making objective consistency.

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Benefits of Managing by Objectives (MBO):

The important advantages of MBO are as per the following:

(i) **Better Planning-** Overseeing goals includes laying out objectives and targets through the dynamic interest of the two bosses and subordinates. Such shared objective setting further develops objective clearness and results in reasonable designs to which the subordinates become committed. MBO makes goals coordinated towards these targets.

(ii) **Better Organization-** When objectives are revised under MBO, then the whole structure of the organization also changes and what all are expected from different position holders also changes.

(iii) **Means of Control-** MBO fills in for control. There is a sense of control in the organization which helps in fulfilling the goals of the organization.

(iv) **Higher Productivity-** There is an improvement in efficiency as everybody focuses on significant activities instead of wasting energy on less significant issues.

(v) **Better Appraisal of Performance-** The most common way of characterizing the outcomes anticipated lays out exact rules for the appraisal of performance. Clear comprehension of obligations or measures of assessment strengthens responsibility. MBO gives a tool for assessing the actual performance against pre-determined performance. An appraisal is result-arranged and not quality situated. An individual can likewise assess himself by the consequences of his own performance.

(vi) **Executive Development-** MBO encourages the long-term development of the executives in the organization. It calls for tracking down new techniques to think about arising circumstances. Thus, MBO is an instrument for the self-improvement of leaders. That is, every leader gets the information and abilities at work as a result of his meeting requirements of the performance.

Limitations of Managing by Objectives (MBO):

The MBO suffers from certain disadvantages which are discussed underneath:

(i) **Difficulty in Setting Quantitative Targets-** The executive by goals is fruitful if the goals are set in quantifiable terms. It is challenging to pass judgment on the performance of people where the goals cannot be set in quantitative terms. In this manner, it will not be possible to successfully carry out MBO.

(ii) **Emphasis on Short-term Goals-** Under MBO, objectives are set for a brief period, say for six months or one year. The subordinates might focus on their nearby objectives

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without really focusing on the long-range targets of the undertaking which is certainly not a solid indication of hierarchical proficiency and adequacy. Since the performance of the subordinates is to be evaluated after six months or one year, they will generally focus on their nearby targets.

(iii) **Resistance to Change-** The arrangement of MBO seems, by all accounts, to be straightforward, yet it requires changes in conventional reasoning and practices. By and by, it is frequently opposed by both leaders and operative workers.

(iv) **Lack of Training-** There is an absence of training and information on the part of the supervisors in executing the program. Many are inclined to sit down with the subordinate, direct the objectives and focus with no info allowed from the subordinate, and then, at that point, the request might be met in a predetermined time. No thought is given to any external elements over which the subordinate has no control or impact. In such circumstances, there can be no two-way correspondence due to the external forced goals.

(v) **Lack of Follow-up-** The absence of follow-up by the predominant at the fitting time is one more obstacle in the fruitful performance of MBO. The prevalent should get with the subordinate at the proper time. The subordinate is ready to precisely tell the chief what has been achieved and how. If the superior postpones the meeting, then the subordinate also starts taking the program lightly.

(vi) **Rigidity-** The management by objectives often presents inflexibility in the association. Since objectives are set after at regular intervals or one year, the superior may not like to alter in the middle between on account of fear of opposition from the subordinate. There may emerge a need to change the objectives at lower levels to accomplish the long-range targets of the venture. The director should deal with such a circumstance appropriately.

(vii) **Limited Application-** The management by objectives isn't fitting for all levels and for everybody. It is reasonable just that the two chiefs and subordinates feel great about taking part in it and are willing. The heavy demands made by it make MBO valuable generally to managerial and professional employees.

(viii) **Costly Process-** MBO is an expensive and time-consuming process. The setting and valuation of targets are finished over such a brief period that it will most likely be unable to accommodate sufficient connection among all superiors and subordinates in the association. MBO requires an extraordinary arrangement of investigation for which senior leaders don't have sufficient time.

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Steps in Managing by Objectives (MBO):

The following steps needs to be followed for MBO which are explained underneath:

1. **Setting of Goals-** The objectives of each subordinate for a predefined period are set up by the subordinate himself. Such objectives ought to be harmonious with the authoritative and departmental goals. The subordinate will fix the objectives for himself for a predetermined period which might be a half year or one year. He will likewise list the assets expected to meet the objectives. The objectives set somewhere around the subordinate are the beginning stage of overseeing by goals.

2. **Approval of Goals-** The superior will sit with the subordinate to talk about the objectives set. The objectives might be revised, if required. When this process is finished, there will be better opinions with his subordinate as to what is to be achieved by the subordinate. The concluded adaptation of goals and responsibilities regarding the subordinate ought to be diminished into writing to avoid any confusion. This record is named as the Key Result Analysis.

It will consist of the following data:

(i) The general goals of the subordinate's work.
(ii) The key targets he should achieve.
(iii) The present moment and long haul need of his work.
(iv) The norms by which his presentation will be assessed.

3. **Establishment of Check-Points-** The executive's goals represents the delegation of power to the subordinate to take care of his business. However, the superior should lay out specific checkpoints to check that authority is exercised properly, and necessary steps are taken to complete the job. This will help in monitoring the subordinate's performance.

4. **Periodic Review of Progress-** The superior should make an occasional survey of the progress in accomplishing the subordinate's objectives. For this, the superior should look for progress reports from the subordinate occasionally, say fortnightly or month to month. He ought to likewise contact the subordinate to distinguish the issues looked at by him and make suitable moves to solve the problem. Indeed, even the objectives might be checked to overcome difficulties in the. Continuous contact between the superior and the subordinate will guarantee that things do not go out of control.

5. **Appraisal of Performance and Counselling-** Formal appraisal toward the finish of the target period is done by the superior through appraisal of the subordinate's

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performance. Under this, accomplishments are examined and the goals of the subordinate.

Making MBO Effective:

The following guidelines can be followed for making MBO objective:

1. Top Management Support
2. Education about MBO
3. Active Participation in Goal Setting
4. Decentralisation of Authority
5. Orientation of Executives
6. Integration of MBO Programs.

CASE STUDY

Management by Objectives

The Branch Manager of a FMCG company attended a seminar on Management by Objectives. His enthusiasm was very high and was so excited about it. He then decided to introduce this concept in his next meeting with staff. The branch manager highlighted the key benefits of this technique and discussed the advantages which the branch can get with the application of this technique. He told his subordinates to think upon it so as to adopt this technique in the branch. However, introducing a whole new concept was not easy and it led to many objections and queries like- are the goals of the branch for the next year assigned by the chairman? So, there was no list of the expectations from the branch manager regarding this concept yet but he himself made his list of goals and objectives which the branch will thrive to achieve in the future.

When these goals were achieved, the executives were so impressed with the branch manager that he made such clear objectives and also achieved them with assurance. They were so impressed with his hard work and sincerity towards his branch. Now, he wanted every department to make his own goals and objectives which are verifiable and clear.

Questions:

1. Can the Branch Manager develop verifiable objectives when they have not been assigned to him by the Chairman? How?
2. Do you justify the Branch Manager's approach is setting goals? Give reasons for your answer.

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B. BEHAVIOURALLY ANCHORED RATING SCALE (BARS):

BARS is intended to evaluate the performance of employee on the pre-determined statements. Performance is assessed by asking the evaluator to record explicit observable work of behaving of an employee and afterward to contrast these perceptions and a "behaviourally anchored rating scale". Subsequently, the supervisor is in a situation to look at the employee's real way of behaving with the way of behaving that has not been set to be successful.

The Behaviourally Anchored Rating Scale (BARS) moves toward consolidating components of the traditional rating scales and critical incident method. Utilizing BARS, work ways of behaving from basic incidents successful and inadequate ways of behaving are depicted more equitably. This strategy utilizes people who know all about a specific task to recognize its major parts. They are approached to rank and approve explicit ways of behaving for each of the parts. BARS approach quits estimating abstract individual characteristics and on second thought measures perceptible, basic ways of behaving that are connected with explicit work aspects.

Development of a BARS requires the following steps:

(i) **Generate Critical Incidents-** Specialists who realize the occupation being assessed (work holders as well as managers) are approached to portray explicit delineations (basic occurrences) of compelling furthermore, inadequate performance.

(ii) **Develop Performance Dimensions-** These individuals then, at that point, group the incidents into a more modest arrangement of performance aspects (express 5 to 10). Each group (aspect, for example, good faith is in this manner characterized.

(iii) **Reallocate Incidents-** One more gathering of specialists who likewise know the work then, at that point, redistributes the first basic occurrences. They are given the group definitions and the basic occurrences and are approached to reassign every incident to the group they think it fits best. Regularly, a basic occurrence is held if some rate (normally half to 80%) of the second group assigns it to the same cluster as did the first group in step (ii).

(iv) **Scale the Incidents-** The subsequent group is by and largely requested to rate the way of behaving portrayed in the incident regarding how really or insufficiently it addresses performance on the fitting aspect (seven or nine-point scales are commonplace).

(v) **Develop Final Instrument-** A subset of the incidents (typically six or seven for every cluster) is utilized as conduct secures for each aspect.

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The benefits of BARS are as per the following:

(i) **Engagement of Experts-** Experts are engaged in developing the BARS. The outcome ought to in this way be a decent and precise measure of performance at work.

(ii) **Clarifying Performance-** The basic occurrences along the scale help to explain what is implied by incredibly great performance, normal performance, etc.

(iii) **Providing Feedback-** Critical incidents might be more helpful in giving criticism to employees than essentially educating them regarding their performance rating and not giving specific behavioural examples.

(iv) **Making Dimensions Independent-** Systematically clustering basic incidents into five or six performance aspects helps in making the aspects more autonomous of each other.

(v) **Consistent and Reliable-** BARS assessments appear to be somewhat steady and solid in that unique evaluators' appraisals of a similar individual will generally be comparable. This method isn't one-sided by the experience and assessment of the evaluator.

C. 360-DEGREE APPRAISAL:

The 360-degree appraisal includes the rating of an employee or administrator by everyone above, alongside, and below him. Corporates like General Electric India (GE), Reliance Industries Ltd. (RIL), Crompton Greaves, Godrej Soaps, Wipro, Infosys, Thermax, and Thomas Cook are utilizing this instrument to figure out bits of insight about their supervisors. Even though conveyed generally as a reality finding procedure, 360° appraisal is likewise used to plan promotion and reward framework in the association.

As per Milliman and others, "360-degree appraisal is the course of methodically gathering information on an individual's abilities, capacities and ways of behaving from an assortment of sources-the manager, peers, subordinates and even customers and clients".

Accordingly, the appraisal of a worker is finished by his superior, his peers, his subordinates, and clients or untouchables with whom he connects over his work performance. In 360-degree appraisal, other than evaluating the performance of the assessee, his different properties, for example, initiative, interpersonal skills, decision-making, customer orientation, values, and specialized capacities are likewise evaluated.

Components of 360 Degree Appraisal:

The components of 360-degree appraisal are portrayed as under:

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1. **Self Appraisal-** Self-examination is a vital piece of the 360-degree appraisal framework since it gives the worker an outright opportunity to take use his strengths and a valuable chance to evaluate his performance. In a deep-rooted framework, employees utilize the device of self-appraisal really and organizations likewise find that employees frequently are their own most grounded critics and show an exceptionally serious level of objectivity. Self-examination additionally gives an open door to the worker to communicate his vocation moves for what's in store. Nonetheless, this is just for social event data, and under the given hierarchical imperatives, it might not be imaginable to give the profession movement wanted by the worker. By the by, it is to the association's advantage to at least know on a direct premise the desires of its employees.

2. **Superior Appraisal-** This is, obviously, the main part of the 360-degree appraisal framework. In any case, here the centre is to give helpful criticism on the employee's performance and his improvement needs. It is the obligation of the better than guarantee that the employee puts forth objectives in the space of business performance as well as in the areas that are indispensable to the association. These are called corporate thrust areas and may incorporate relationship management, well-being, and quality development. If the superior finds the way of working of the subordinate inappropriate, then he might set standard which will act as yardsticks for him.

3. **Peer Group Appraisal-** Peers assume a significant part in the existence of an employee in the association. They can give the feedback of the employee attitude and the working. For better results, choosing the right peer group is essential for giving the true feedback. They should incorporate companions both from inside the division as well as from different divisions which are straightforwardly associated with the working of worker's specialty. The idea of interior clients comes conveniently here. Three to five interior clients ought to regularly be picked for peer appraisal. Peer examination should try to get feedback on:

   (a) employee's functioning style

   (b) awareness towards others

   (c) spirit of co-activity and joint effort

   (d) capacity to function as a colleague.

4. **Subordinates' Appraisal-** The most particular component of the 360-degree appraisal is the job of subordinates in appraisal. It implies two things. It, first and foremost, is a

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clear expression from the association that it empowers transparency, and that input is a two-way process. Furthermore, it is a foundational acknowledgment of the way that a worker's subordinates truly do play a crucial job in his appraisal. In this manner, the reason for subordinate's appraisal is to get a direct appraisal of how the subordinates see their superior to be as far as:

(a) designation of power

(b) directing and preparing subordinate

(c) inspiration of subordinates

(d) group building, etc.

Advantages of 360 Degree Appraisal:

There are various advantages of 360 Degree Appraisal which are given underneath:

(i) **Reveals Employee's Strengths and Weaknesses-** It uncovers the qualities and shortcomings of the employees.

(ii) **Gap can be Reduced-** The gap between self-appraisal and the perspectives of one's colleagues is decreased.

(iii) **Teamwork-** When peer group appraisal is considered for performance examination, cooperation flourishes.

(iv) **Initiation of Self-Change-** Inflexible administrators are compelled to start self-change.

(v) **Improving overall Quality of Staff-** It works on the by and large nature of the staff on the grounds that every part is helping the others to move along.

Drawbacks of 360 Degree Appraisal:

There are various limitations of 360 Degree Appraisal which are given underneath:

(i) **Biased Response-** Response from peers (colleagues) and subordinates might be one-sided.

(ii) **Ignored Goals-** Performance as far as achieving objectives is overlooked.

(iii) **Frustration among Employees-** Feedback might cause disappointment and resentment among the employees.

(iv) **Time-Consuming Process-** 360° examination is a complex and tedious appraisal procedure.

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Example of Performance Appraisal Types:

Summarised form of Performance Appraisal Methods:

Type of Performance Appraisal Method	Advantages	Disadvantages
Graphic Rating Scale	Inexpensive to develop	Subjectivity
	Easily understood by employees and managers	Can be difficult to use in making compensation and promotion decisions
Essay	Can easily provide feedback on the positive abilities of the employee	Subjectivity
		Writing ability of reviewer impacts validity
		Time consuming (if not combined with other methods)
Checklist scale	Measurable traits can point out specific behavioural expectations	Does not allow for detailed answers or explanations (unless combined with another method)
Critical Incidents	Provides specific examples	Tendency to report negative incidents
	Time consuming for manager	
Work Standards Approach	Ability to measure specific components of the job	Does not allow for deviations
Ranking	Can create a high-performance work culture	Possible bias
	Validity depends on the amount of interaction between employees and manager	

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Type of Performance Appraisal Method	Advantages	Disadvantages
	Can negatively affect teamwork	
MBOs	Open communication	Many only works for some types of job titles
	Employee may have more "buy-in"	
BARS	Focus is on desired behaviors	Time consuming to set up
	Scale is for each specific job	
	Desired behaviors are clearly outlined	

Difference Source: *11.2 Appraisal Methods – Human Resource Management*. (2016, March 22). Pressbooks. Retrieved October 21, 2022, from https://open.lib.umn.edu/humanresourcemanagement/chapter/11-2-appraisal-methods/

IN-TEXT QUESTIONS

16. The other name of Management by Objectives is _____.
17. Name any two traditional methods of Appraisal.
18. The full form of BARS is _____.
19. The 360-degree method is a traditional appraisal method. True/False
20. The Confidential Report is a traditional method of appraisal. True/False

6.5 PERFORMANCE MANAGEMENT AND POTENTIAL

6.5.1 Performance Management:

Performance management is a tool that incorporates recognizing and focusing on objectives, characterizing what is progress towards objectives, setting norms for estimating results,

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following promotion toward objectives, trading criticism among organizational parts, routinely evaluating progress, supporting viable objective arranged exercises, and intervening to make upgrades when required.

Performance management has other implications than performance appraisal which gives input about employees' job performance. Other than getting input, performance management also incorporates performance interviews, archiving of performance data, and use of appraisal data. These components have been talked about underneath:

1. **Getting Feedback-** It includes an orderly assortment of worker's performance information concerning the amount of result, nature of the result, the practicality of result, helpfulness, and so on. Such information should be gathered formally. It tends to be incorporated from performance reports documented by the employee and his boss, and furthermore reports of value auditors.

2. **Performance Appraisal Interview-** A sound appraisal framework ought to incorporate the post-appraisal interview. In this meeting, criticism on performance is given to the employee. The evaluator makes sense of his appraisals of the worker and the characteristics he has taken into thought for appraisal. The meeting likewise gives an open door to the employee to make sense of his perspectives about performance guidelines, rating scales, appraisals, the variables hindering his performance, and so on. The evaluator can give direction, training, and ideas to the worker for working on his performance.

The post-appraisal interview is intended to accomplish the accompanying goals:

(a) to tell the employee where he stands.
(b) to assist the worker with going about his business by explaining what is generally anticipated of him.
(c) to give an open door to the worker to remark upon his appraisal.
(d) to strengthen prevalent subordinate connections.
(e) to trade significant data for vocation promotion; and
(f) to advise the worker for additional turn of events.

Appraisal interview can be of the following types:

(i) **Tell and Sell Interview-** The motivations behind this interview are:

(a) to let the employee, realize how well he is doing,

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(b) to acquire the worker's acknowledgment of the assessment, and (c) to draw up an arrangement of progress for him.

It depends on the understanding that workers have few deficiencies, yet they should be persuaded about these inadequacies, the evaluator's appraisal, and ideas for development. The questioner requires tolerance, understanding furthermore, and the capacity to persuade the employee about his assessment and ensuing medicinal measures without utilizing his positional power. This sort of interview is fitting for youthful and new workers who are unpractised, unreliable, and need the counsel of the unrivalled. The predominant can deserve admiration because of his more prominent information and experience.

(ii) **Tell and Listen Interview-** The target of this interview is to impart the appraisal to the worker and afterward listen thoughtfully to his responses. Such a meeting is separated into two sections: The initial segment covers serious areas of strength for the worker's work performance, and the subsequent part is utilized to investigate completely the employee's sentiments about the appraisal. With the help of precautions, taking full advantage of pauses, and answering sentiments to show understanding are the abilities expected in this kind of interview. One benefit of this technique is that it makes a great connection between the superior and the subordinate. The subordinate fosters a positive mentality towards the superior. Another benefit is that it will generate support and correspondence.

(iii) **Problem-tackling Interview-** In this meeting, the point isn't appraisal but improvement of an employee. Hence, the questioner removes himself from his standard job as an appointed authority and places himself in the job of a partner. He doesn't convey (tell) the examination to the employee. He doesn't call attention to the areas of progress. Maybe he tries to copy the employee into contemplating working on his own presentation. He doesn't supply cures or arrangements in spite thinks about all thoughts on work improvement proposed by the employee. This process is done by capable inquiries.

3. **Archiving Performance Data-** The records of performance appraisal and performance interviews should be put away for use in the future. The HR supervisor ought to be capable to recover this data for taking faculty choice in the future. Such choices may include pay hikes, promotions, training, etc. For instance, assuming a worker is given or denied promotion, such choice should be supported by performance data.

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4. **Use Appraisal Data-** Performance management includes the utilization of appraisal information for taking sound staff choices. The areas of HRM where such information can be utilized incorporate the accompanying:

   (i) Validation of selection strategy.

   (ii) Training and improvement programs.

   (iii) Transfer and lay off choices.

   (iv) Promotional choices.

   (v) Compensation organization, e.g., the choice about stoppage or yearly increment, or giving development increases.

   (vi) Taking care of grievances.

6.5.2 Potential Appraisal:

For the most part, individuals acquire promotions based on their past performance. The previous performance is viewed as a decent mark of future work achievement. It would be ideal for this to be valid if the jobs are comparable. In any case, in real practice, the jobs that a task holder has done in the past may not be something similar that he expects an alternate work after his transfer or on the other hand promotion to another position. Past performance, in this way, may not be a decent sign of the reasonableness of a marker for a higher job. To overcome this deficiency, organizations should start the course of potential appraisal.

The potential appraisal is a means of surveying the secret characteristics of a worker for the motivation behind setting him up for releasing higher obligations in the future. The essential reason behind potential appraisal is that each individual has specific secret characteristics to changing extents. These characteristics might be an innovative creative mind, capacity to work in different climates, enthusiasm for high accomplishment, critical thinking, independent direction abilities, etc. This large number of characteristics comprise the capability of a person. It is through potential appraisal that this large number of characteristics are distinguished. These characteristics of an employee might be considered to foresee whether the worker is capable for taking higher responsibilities.

Objectives of Potential Appraisal:

The primary motivation behind a potential appraisal is to recognize the capability of employees to reach the top management positions in the organization and who can take the responsibilities of the higher positions in the hierarchy.

The potential appraisal can serve the accompanying goals:

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(i) To provide advice to the workers about their future possibilities.

(ii) To provide advice to the employees about how they should further develop their career possibilities.

(iii) To assist the organization in making the plan.

(iv) To refresh training programs occasionally.

Mechanism of Potential Appraisal:

Potential appraisal assumes the presence of obvious work or job depictions and work or job, i.e., characteristics expected to perform the job. The components that could be utilized for potential appraisal are talked about underneath:

(i) **Rating by Superior-** The capability of a competitor could be evaluated by the supervisor who is familiar with the competitor's work and furthermore his specialized capacities.

(ii) **Psychological Tests-** Administrative and conduct aspects can be estimated through various mental tests.

(iii) **Games-** Simulation games and activities (appraisal focus, business games, in-basked, role play, and so on) could be utilized to reveal the capability of the applicant.

(iv) **Performance Records-** Performance records and appraisals of the applicant on his past positions could be inspected cautiously on different aspects like drive, imagination, risk-taking capacity, and so on, which could assume a key part in releasing his obligations in a new position.

Benefits of Potential Appraisal:

Potential appraisal is being utilized by enormous business firms as it offers the accompanying advantages:

(i) **Identification and Grooming of Candidates-** The firm can distinguish and prepare possibilities for promotion to higher situations in the future.

(ii) **Career Planning and Development-** It gives significant contributions to vocation arranging and improvement.

(iii) **Better use of Human Assets-** It empowers the association to utilize its human resources.

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(iv) **Satisfaction of Needs and Aspirations-** It assists with fulfilling the necessities and desires of the workers with incredible potential.

(v) **Helps in Succession Planning-** It works with progression arranging by distinguishing talented staff who could involve in higher posts when the current occupants move out of the association.

IN-TEXT QUESTIONS

25. These are the types of Performance Management Interviews- Tell & ____ and tell & ____.
26. Potential Appraisal and Performance Management constitutes one and the same thing. True/False.
27. The Performance Management helps in getting inputs in the form of _____
28. Does Potential Appraisal help in succession planning? Yes/No.
29. Potential Appraisal help in career development. True/False.

6.6 SUMMARY

In the lesson we have learnt how important is the timely survey of the performance of the employees to provide them with just, equitable, uniform and fair wages and incentives. The regular survey of the employees' jobs also contributed widely to the growth of the organization. It helps in understanding the needs of the employees and also helps in taking various important decisions related to the job of the employees like increase in pay, transfer, promotion, etc.

6.7 GLOSSARY

Yardstick: It implies the guidelines set on an earlier premise.

Unprejudiced: It implies making a decision about anything fairly, with next to no earlier mentality.

6.8 ANSWERS TO IN-TEXT QUESTIONS

1. Continuous 2. False	9. False 10. True

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3. Uniform	11. Sell and Listen
4. True	12. False
5. Yes	13. Feedback
6. Management by Results	14. Yes
7. Ranking and Essay Method	15. True
8. Behaviourally Anchored Rating Scale	

6.9 SELF-ASSESSMENT QUESTIONS

20. Consider yourself as a Human Resource Manager and answer the following questions based on your knowledge of Performance Management:
    (a) What is the objective of your performance review?
    (b) Who should participate in your performance review?
    (c) What should you measure in your performance review?
    (d) What type of questions will you ask your team during your performance review?
21. Review each of the appraisal methods and discuss which one you might use for the following types of jobs and discuss your choices.
    a. Administrative Assistant
    b. Chief Executive Officer
    c. Human Resource Manager
    d. Retail Store Assistant Manager
22. Consider yourself as an employee of the company and answer the following questions:
    (a) Do you have everything you need to perform your job? Or what resources or support do you need from the department to reach your goals?
    (b) What are your long-term career goals, and how can the organization help you in achieving them?
    (c) Which of the organizational goals do you think are more aligned with your personal goals?
    (d) What is your biggest strength and weakness?

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(e) In what ways do you think you can contribute to the company?

23. Why is performance appraisal necessary in modern organisations? Discuss any two-techniques of performance appraisal.

24. What do you mean by Performance Appraisal? Discuss its benefits to an industrial organization.

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LESSON 7

INDUSTRIAL RELATIONS

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STRUCTURE

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- 7.2.2 Aspects of Industrial Relations
- 7.2.3 Objectives of Industrial Relations
- 7.2.4 Systems Approach to Industrial Relations
- 7.2.5 Environmental factors to Industrial Relations
- 7.2.6 Evolution of Industrial Relations
- 7.2.7 Answers to In-Text Questions

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- 7.3.1 Parties to Industrial Relations
- 7.3.2 The Workers' Association: Trade Union
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7.5 Industrial Harmony & Worker's Participation

7.5.1 Industrial Harmony

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7.5.6 Worker's Participation in Management in India

7.5.7 Success of Worker's Participation in Management

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7.6 Collective Bargaining

7.6.1 Significance of Collective Bargaining

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7.8 Glossary

7.9 Self-Assessment Questions

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7.11 Suggested Readings

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7.1 LEARNING OBJECTIVES

After studying this lesson, you will be able to:

1) Explain the concept of Industrial Relations and its emergence.
2) Elaborate the nature & objectives of Industrial Relations
3) Enumerate the stages of Evolution of Industrial Relations
4) Identify the three important parties and their roles in Industrial Relations
5) Explain the effects of environmental determinants on Industrial relations
6) Define Trade Unions and their emergence, its present condition and its future.
7) Understand the concept of Industrial Harmony and Worker's Participation in Management.
8) Understand the concept, significance & functions of Collective Bargaining

7.2 INTRODUCTION TO INDUSTRIAL RELATIONS

Starting from the medieval period, when the relations between the master and servant were not complex, moreover it was direct and personal hence it was easy to secure cooperation from the workers. Relations between them was easy as the masters were approachable, and they were enough to take workers out of their difficulties. Then the situation underwent a change with the emergence of factory system after England's Industrial Relations in the 18th Century. In this system the old philosophy didn't work as the workers faced many economic, social and psychological problems and what was majorly needed was their Welfare and Wellbeing. This gave birth to the concept of Industrial Relations to tackle with the workers insecurities and unrest at the industries as there was high need for cooperation between labour and employers.

The term Industrial Relations consists of two words "Industry" and "Relations". Relations co-exist with humans and Industry is a place where number of humans, initially unknown to each other, meet, work, compete & cooperate, which makes it even more important to tie them in a harmonious relationship to maintain Industrial Peace. Therefore, after Industrial Revolution, which mark the emergence of factories and labour- management relations, industrial relations evolved to regulate and harmonise their relations and to safeguard the labour from all sorts of exploitation at the industries and also to ensure their complete welfare and wellbeing.

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We shall now understand the concept of Industrial Relations more comprehensively with the help of some definitions:

H. Henry Richardson asserts "Industrial Relations is an art, the art of living together for the purpose of production". To work together it becomes a necessity for them to learn this art by acquiring the skill of adjustment.

On the other hand, H.A. Clegg emphasised the regulation and institutionalization of industrial relations when he asserted that "The field of Industrial Relations includes the study of workers and their trade unions, management, employers' association, and the state institutions concerned with the regulation of employment"

National Commission on Labour (NCL) also emphasised that "Industrial relations affect not merely the interests of the two participants-labour and management, but also the economic and social goals to which the State addresses itself. To regulate these relations in socially desirable channels is a function, which the State is in the best position to perform".

The above definitions clarify that Industrial Relations emerges out of employee employer relations in industries which are regulated by the Government/State in various aspects.

7.2.1 Nature of industrial Relations:

1. **Industrial Relation is interdisciplinary in nature:** As the study of conditions like level of wages and security of employment is related to economics, if we study their origin and evolution, it comes under history, resultant social conflicts due to these issues comes under sociology, study of attitude of various parties to Industrial Relations comes under the purview of psychology, state policies bearing on the issues under political science, the legal aspect of the issue under law, the technological aspect under the study of technology and the quantitative assessment of losses incurred by the parties and the country's economy under mathematics.

2. **Industrial Relation is multidimensional in nature**: Having three major dimensions as determinants, namely:

    a. Institutional factors such as government policies, labour laws unions of workers and employers, power, structure, community etc.

    b. Economic factors such as type of economic ownership like capitalist, socialist, company ownership etc.

    c. Technological factors such as techniques of production, capital structure, rationalization etc.

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3. **Industrial Relations as "Web of Rules"**: Formed by the interaction of the government, the industry and the labour are influenced by the existing and emerging institutional, economic and technological factors.

ACTIVITY

Industrial Relations is a multifarious topic. Like the above points, think of some more points in nature, features, characteristics of Industrial Relations that you have observed or experienced through your exposure to any industry or organization.

7.2.2 ASPECTS OF INDUSTRIAL RELATIONS:

"Cooperation is as common in human nature as Conflict". Therefore, Douglas McGregor considers both to be the two most important aspects of Industrial Relations.

Cooperation: Cooperation between union & management, the two actors in the industrial relations drama, differing in economic power, wealth and education, depends primarily on their ability and willingness to make contacts at points of mutual concern. In a nutshell "Union-Management cooperation will be a function of two forces- the behavioural pattern of union and management, and the balancing of union rights with management rights. This will require a tough exercise in the demarcation of joint and exclusive areas of the two parties"

Conflict: In Labour-Management relationship, conflict is inevitable. To some extent it also forms the base for their survival and is not always destructive. But the same conflict when becomes recurring in nature can be hazardous. Hence, a timely realization and redressal is necessary to maintain industrial harmony.

7.2.3 OBJECTIVES OF INDUSTRIAL RELATIONS:

According to the Labour management Committee of the Asian Regional Conference of the International Labour Organization (ILO) along with the primary objective of improving the economic conditions of the workers, increasing productivity and achieving industrial democracy in industrial enterprise, have also identified following as the fundamental objectives of Industrial relations:

i) To enable employers and trade unions to deal with their mutual problems freely, independently and responsibly.

ii) Facilitating the maximum use of collective bargaining for mutual accommodation.

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iii) Enabling workers' and employers' organization to associate with government agencies in consideration of general, public, social and economic measures affecting employers' and workers' relations.

iv) Timely redressal of Industrial conflicts and policing the occurrence of strikes and lockouts.

v) To provide higher job satisfaction to the workers to minimise labour turnover and absenteeism.

vi) To promote workers participation in management.

vii) To encourage government control in regulating production and industrial relations.

IN-TEXT QUESTIONS

1. Industrial Relations is an _____ of living together.
2. Industrial Relations came into being in 20th Century. True / False
3. Following is not one of the Aspects of Industrial Relations:
   a) Cooperation b) Confidence
   c) Conflict d) None of the above
4. Facilitating maximum use of _____ is the objective of IR.
5. Concern towards Employees _____ are major objectives of

7.2.4 SYSTEMS APPROACH TO INDUSTRIAL RELATIONS:

John Dunlop proposed System's Approach to Industrial Relations. This approach focuses on participants in the process, environmental forces and the output. It also studies inter-relations among different facets of Industrial Relations system.

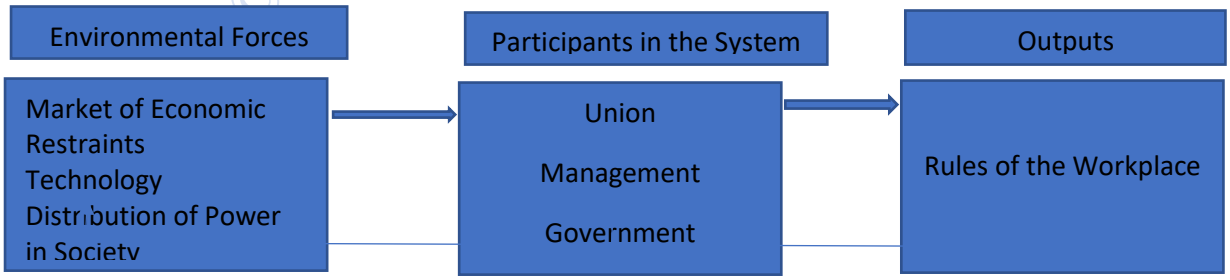

Fig 1.1 Systems Approach to Industrial Relations

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The basic elements of the system:

1. **Participants in the System**: Workers & their organization, management and their representatives, and government. These sub-systems interact with each other within the economic, social and politico-legal framework of the country.

2. **Environment**: Dunlop referred to these components as: "technological subsystem", "economic subsystem" and "political subsystem".

   a) **Technological characteristics**: Industrial relations would be very different in a labour-intensive industry than a capital-intensive one. Changes in technology enhances the employers' expectations about the skills of workers. The work processes and methods with modern techniques reduce the manual work and workers acquire greater control over their work, thus, higher production can be achieved.

   b) **Market or economic constraints**: These factors influence industrial relations because the need for labour is closely related to the demand of products. As the competition rises up the market share of an enterprise becomes uncertain which influences the industrial relations both in long and short terms.

   c) **The locus and balance of power**: The locus and balance of power in a society also influences the relationship between labour and management. The regulatory role of Government is an important factor in shaping the pattern of Industrial Relations.

3. **Output**: The output is the result of interaction of the parties/actors of the system which is manifested in the network of rules, policies and agreements etc. This facilitates the workers.

7.2.5 ENVIRONMENTAL FRAMEWORK OF INDUSTRIAL RELATIONS:

Relations at the workplace are influenced by various environmental factors. These factors shape these relationships, they even reinforce them in the course of developing Industrial Relations:

1. **Economic Forces**: There are numerous economic factors as difference in wages, unemployment, relative status, which has a direct relationship with the industrial relations. If the demands for higher wages and improvement in standard of living will not be met, conflict is inevitable.

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2. **Social Factors**: In the initial stage of industrialization various social factors such as social groups, social values and norms, social status influence industrial relations, which gives rise to the existence of class in industries. But with the progress in industrialization, such factors lose their importance.

3. **Psychological Forces**: Lack of motivation, lower morale, loss of personal identity, lack of interest and dissatisfaction due to dissatisfaction at work give vent to the worker's protest and to fight the same, employers form their organizations. Thus, an environment of 'power relationship' is created which might culminate in collective bargaining.

4. **Politico-Legal Forces**: The system of Government, political institutions, judiciary etc. influence the industrial relations in the country to a great extent. For ex. The philosophy of the political party in power influences the state of industrial relations by enacting and enforcing various statutes for the protection of the interest of the workers.

IN-TEXT QUESTIONS

6. Society is the participant in system. True / False
7. Systems Approach to Industrial Relations was proposed by _____.
8. Which is not one of the factors in the Environmental framework of IR:
   a) Economic b) Biological
   c) Social d) Legal
9. Motivation, Morale, Personal Identity are _____.
10. _____ are considered to be outputs in Systems Approach.

7.2.6 EVOLUTION OF INDUSTRIAL RELATIONS:

History of India marks the evolution of Industrial Relations in three distinct phases. First phase begun from the middle of the 19th Century and ended by the end of the First World War. Thereafter commenced the Second Phase and lasted by the attainment of Independence in 1947 and the post-independence era represents the Third phase.

First Phase: It commenced with the British Government attempt to minimise the competitive advantage of indigenous employers against the British employers by regulating the condition of work in their ways, a series of legislative measures were adopted, which worked as the beginning of industrial relations in India. The establishment of International Labour Organization (ILO) in 1919 had a great effect on industrial relations in India. With budding

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trade unions in India, foundation of All India Trade Union Congress (AITUC) in 1920 also was an important event in the history of Industrial Relations in our country.

Second Phase: As an extension to the First Phase, after the First World War, a number of laws were enacted. For Ex. Trade Dispute Act, 1929, provided a conciliation machinery for settlement of disputes. Also, a survey was conducted by The Royal Commission on Labour (1929-31) to assess labour problems in India related to their working conditions with respect to health, safety and welfare of the workers and made recommendations to make further modifications in policies, acts and laws.

Third Phase: The Industrial Truce Resolution adopted in 1947 was the major development in this phase. This encouraged "the labour and management to assist the Government to secure, promote & guarantee such agreements between the parties as will usher in a period of contended and orderly advancement towards a cooperative commonwealth". Under this phase more importance is given to the need for respecting the mutuality of interests between labour and capital in industrial development and recommended to the parties the method of mutual discussion of all problems, common to both and the determination to settle all disputes without recourse to interruption in or slowing down of production".

In the end it can be stated that as far as evolution of Industrial relations in India has been gradual. It went through phases from traditional to modern times of its existence. The evolution took place also to bring about change for the betterment of working conditions of the workers in terms of their health, safety and welfare at the workplace. Finally, it took a turn towards importance to mutuality of interest and role of Government in practicing law for dealing with industry related issues.

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IN-TEXT QUESTIONS

11. There are _____ phases in the Evolution of Industrial Relations.
12. A major development in Third phase is _____.
13. ILO conducted a survey to access labour problems in India. True / False
14. Trade Dispute Act, 1929 was enacted in the _____ Phase of IR Evolution.
15. When was All India Trade Union Congress formed:
    a) 1920 b) 1820
    c) 1944 d) 1947

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7.2.7 ANSWERS TO IN-TEXT QUESTIONS

1. Art	9. Psychological factors
2. False	10. Rules of the workplace
3. Confidence	11. Three
4. Collective Bargaining	12. Industrial Truce Resolution
5. Participation	13. False
6. False	14. Second
7. Dunlop	15. 1920
8. Biological	

7.3 DYNAMICS OF EMPLOYEES, EMPLOYER & THE STATE

Industrial Relations is made of two terms, out of which more important is relations. When it comes to relationship, their existence is possible only when there are two or more parties to it. In Industrial Relations this relation is "employment relationships" in industry i.e., between employers and labour which is secured under the great influence of government of the nation or state.

Therefore, there are three major parties to industrial relations: Workers and their organization, Employers & their organization and Government/State.

They have their own unique role to play in regulating industrial relations in the interest of industry and largely of the nation.

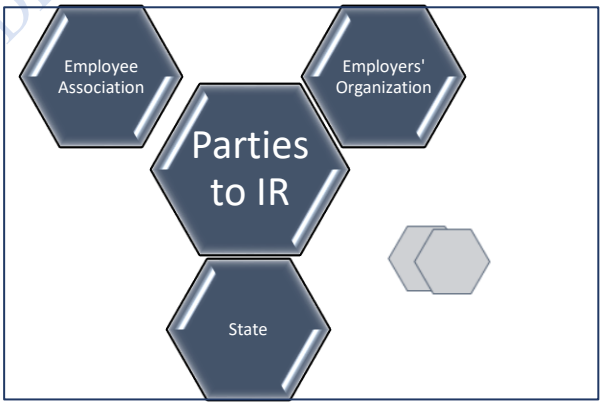

Fig 1.1: Parties to Industrial Relations

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7.3.1 PARTIES TO INDUSTRIAL RELATIONS:

The three major variables in Industrial Relations are:

a. **Workers & their organizations**: The diverse workforce with various differences in their characteristics, culture, attainment, qualifications, skills and attitude, forms a very important element of this industrial relations network. Workers organization, to be more specific, the Trade Unions are political institutions and are formed for safeguarding the political and social interest of the workers. They are the worker's representatives and moreover works as mediator between workers and the employers. Its major objective is to strengthen the workers position to support the fulfilment of their organizational objectives, and to secure management cooperation for the same.

b. **Employers & their organizations**: The other important thread in the network of Industrial Relations is the Employer. In fact, the industries exist because of employers, as they are the creators. They create industries and employment for the workers. They are the one who regulates the employment related factors such as worker behaviour, attitude, satisfaction/dissatisfaction for securing higher productivity from them. Similar to workers organizations, employers also sometimes have their association in order to increase their bargaining power to be utilised in the times of disputes with the workers. Employers' association can create pressure on workers as well as Government as and when required to regulate industrial relations.

c. **Government/State**: An Influential partner in the industrial relation system which bears powers over and above workers association and employers' organization, is the Government/State, whose role is to intervene in the working relationships and regulating working conditions through various laws relating to labour in the interest of employers, workers as well as the nation.

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ACTIVITY

Above we have talked about the Three major parties to Industrial Relations. You are supposed to draw three columns and enumerate the 5-5 functions each of Employee Association, Employer's Organization & the State/Government.

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IN-TEXT QUESTIONS

16. There are _____ parties to IR.
17. Trade Unions are formed to safeguard the recreational interest of the workers. True / False
18. Which is NOT a party to IR:
    a) Trade Unions b) Courts/Tribunals
    c)Employer's Organization d) ILO
19. _____ bears power over & above Employees Association & Employer's Organization.
20. _____ regulates employment related factors.

7.3.2 THE WORKERS ASSOCIATION: TRADE UNION

Unlike traditional, less complicated, less technological relation between workers and employers, the modern industrial organizations, using modern technology and large number of workers led to the development and growth of Trade Unions not only in advanced economies but also in developing economies like India.

'The emergence of trade unionism is spontaneous and inherent in the growth of capitalism. The origin of trade unionism lies in the Industrial Revolution which disrupted the older way of life and created a new society forged by the shop, the mine and the industry'.

According to Flippo "A Labour Union or Trade Union is an organization of workers formed to promote, protect and improve, through collective action, the social, economic and political interests of its members".

Following are some important features of Trade Unions:

a. It is an organization formed by employees or workers.

b. It is formed on a continuous basis. It is a permanent body and not a casual or temporary one.

c. It is formed to promote and protect all kinds of interest, most importantly economic.

d. It achieves its objectives through collective action and group efforts.

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OBJECTIVES OF TRADE UNIONS:

1. **Steady Employment**: Steady i.e., stable, stability in employment can be achieved only with the equity between word and pay (economic benefit). An important objective of Trade Unions is to achieve this equity between the two, which should also be competitive in market and beneficial and satisfactory for workers.

2. **Regulating personnel policy**: The organization runs with various policies related to selection of employees for lay off, retirement, transfer & promotion, assigning employees to job and disciplining them. These decisions shouldn't be subjective rather it should be transparent and fair to all. Driving management towards maintaining this transparency in the whole organizational process is also one of the objectives of Trade Unions.

3. **Making their voice heard in decision making:** Managing an organization is all about crucial decisions taken at the right point of time in the most appropriate manner. Hence, in this vital process, workers voice will be heard, their inputs will be taken only when they will have strength and strong views. Trade Unions are for the purpose of providing that required strength to workers so that they can also put forward their suggestions in important decision which will affect them in industries.

4. **Recognition & Participation**: When alone recognition is difficult, but as an association recognition and participation can be sought easily. Same lies with Trade Unions, workers join trade unions so as to gain position of equal partners with management in the task of production.

5. **Securing Legal sanctions**: In order to secure a permanent position in the contract between employers and workers, the worker's demands need to avail a legal sanction. For the same to happen unions may take recourse of political backing or forming their own political party.

Also, modern trade unions engage in achieving many more objectives like providing educational, medical recreational and other facilities for the welfare and wellbeing of families of members of trade unions, is the have sufficient funds.

FUNCTIONS OF TRADE UNIONS:

There are broadly THREE categories of functions performed by Trade Unions, viz., (i) Militant Functions, Fraternal Functions, and Political Functions.

a) **Militant Functions**: Although Collective Bargaining and Negotiations are the major weapons in the hands of Trade Unions, in certain situation when they, along with their

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other rights, also try to secure share in productivity gains, greater contribution in management decision making or even control of industry, they can adopt certain agitational methods like, strike, lockouts, gherao etc. increasing unrest in the industry, for fulfilment of their demands.

b) **Fraternal Function**: Fraternal responsibility is about standing in support in unfavourable times. This is what this function of union addresses. In the period of work stoppages due to strikes gheraos, or in times of illness, employment injury or when they are temporarily unemployed, unions are always willing to provide financial assistance and support.

c) **Political Functions**: Unions also sometimes attempts to improve the political status of its leader, members and union itself through associating them with political parties and sometimes contesting as political parties themselves in order to have influence over government and the labour policies.

7.3.3 EMPLOYERS' ORGANIZATION:

Employer's Organizations in India have a three-tier structure viz. local associations, regional industrial associations and All India Federation. Of the three, the local associations which operate mainly through the chambers of commerce covers all industries in an area. Their activities in the labour field are comparatively less extensive. The industrial associations are the general patterns of organization of employers in India. They are formed at the area or regional level as also at the all-India level and are generally affiliated to the central industrial organizations. At the national level, there are federations namely All India Organization of Employers (AIOE) formed in 1932, Employers' Federation of India (EFI) formed in 1933 and All India manufacturers' Organization (AIMO) formed in 1941, which have been given representation on different tripartite labour consultative bodies.

ROLES OF EMPLOYERS' ORGANIZATION:

Employers' Federation of India (EFI): The main objectives of the establishment of EFI are:

a) To protect and promote the legitimate interests of employers engaged in industry, trade and commerce.

b) To maintain harmonious relations between management and labour and to initiate and support schemes that would increase productivity and give labour a fair share of the increased return.

c) To collect and disseminate information affecting employers and to advice members on their labour/employer relations and other related problems.

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All India Organization of Employers (AIOE): The main objectives are:

a) To take all steps which may be necessary for promoting, supporting or opposing legislative and other measures affecting or likely to affect directly or indirectly, industries in general or particular

b) To nominate delegates and advisers etc. to represent the employers of India at International platform

c) To promote and support all schemes for the general uplift of labour and to take all possible steps to establish harmonious relations between capital and labour.

All India Manufacturers' Organization (AIMO): Addresses the following objectives which is not much different from that of EFI and AIOE:

a) To help bring about the rapid industrialization of the country through sound and progressive economic policies

b) To help increasing the aggregate wealth of India

c) To utilise to the fullest possible extent all the available national resources and talent in the country to uplift the standard of living of the people.

FUNCTIONS OF EMPLOYERS' ORGANIZATION:

A major function of an employers' organization is to protect & promote the interest of its members. Economic, commercial and fiscal matters and policies are crucial for them. They seek for legislative support for the realization of their objectives. Other than the above there are some more functions of employers' organization towards labour are as follows:

a) **Communication**: Communication regarding developed or developing labour legislations, regarding changes in labour policy, significant court decisions on labour matters as well as proceedings of important tripartite deliberations etc. has to be clearly and completely made by employers' organization to its members.

b) **Advisory Functions**: Employers' organizations build up an expert advisory service on labour matters to advise their affiliates.

c) **Educational Efforts**: Employers' Federation of India conducts various seminars, conferences, and training programmes to discuss important issues in the labour management relations.

d) **Social Responsiveness**: Participating in National Plans for Economic Development, eliciting responsive cooperation from the unions, improving levels of production and

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productivity, pursuing policies, adopting neighbourhood villages etc. are various social responsibilities shouldered by Employer's organizations.

e) **Representational Roles**: They also represent employers on various significant platforms as wage boards and various committees formed by the Government to place their point of views before them.

7.3.4 STATE/UNION GOVERNMENT:

Among the THREE parties to Industrial Relations, the apex governing body is the STATE, which has the responsibility of correcting correct any kind of imbalance or disrupted social and economic order so that the complex socio-economic system of industries. In various instances of disputes and indiscipline which goes out of the hands of the management, and they fail to resolve it through mutual agreement, bargaining and negotiation.

THE ROLES OF STATE IN INDUSTRIAL RELATIONS:

a) The major role played by the State is to lay down the Labour Policy, as guiding principles for the labour related issues such as wage payments, regulation of health and safety, welfare and social security, union management relations etc.

b) Labour policy is directed towards the achievement of various goals like industrial peace and harmony, reducing inequalities, increasing standard of living of workers, increasing productivity, providing social security, providing a fair wage, etc.

c) To achieve the above State also has the responsibility of keeping in place the industrial relation policy, welfare policy, social security policy etc.

d) Concern for planned development and rapid economic growth.

e) Fulfil requirements of a welfare stare as included in Directive Principles of State Policy

f) Addressing to the socio-economic imbalances in the society, depressed conditions in the working class as observed by the Royal Commission on Labour and the Labour Investigation Committee

g) Addressing to the imbalances in between unions and employers and the weaknesses of both the social partners, leading to preference for adjudication despite known appreciation of the merits of free and fair collective bargaining.

h) To achieve the commanding heights of the economy as per the Industrial policy resolution, 1956.

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IN-TEXT QUESTIONS

21. Trade Unions are formed on continuous basis and are permanent in nature. True / False
22. Among the three parties to IR, the Apex body is _____.
23. Which is not one of the functions of Trade Unions:
    a) Fraternal b) Maternal
    c) Militant d) Political
24. Full form of AIOE is _____.
25. Labour Policy is directed to achieve _____.

7.3.5 ANSWERS TO IN-TEXT QUESTIONS

16. Three	24. All India Organization of Employers
17. False	25. Industrial Peace & Harmony
18. ILO	
19. State	
20. Employer's Organization	
21. True	
22. State	
23. Fraternal	

7.4 TRADE UNIONS

With the emergence of Industries after Industrial Revolution between 1750 and 1825 AD, that resulted into modern factory system. It was characterised by large scale production and employment and separation of management from ownership, because of which personal touch has been lost and the relations between workers and management became very formal and complex.

The desire for higher profits by employers and weak bargaining power in the hands of workers led to the exploitation of working class. After a long time, they realised that if the workers will

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not strengthen their position before employers, they will be in great danger of serious exploitation by the employers. Hence Trade Unions came into existence. After emergence, with the passage of time and changes in situation, the face and form of Trade Unions also changed leaps and bounds.

"Trade Unions owe their origin to class struggle between the capitalist employers and their workers. To get more and more profits employers exploit the workers, who because of their common interest to get more wages unite in trade unions and then resist the employers".

To be more specific, "the origin and growth of trade unionism is the result of the increased complexities of economic structure. Industrial Revolution made it all the more essential to organise workers to protect their economic rights and secure better working environment".

Thus, trade unionism is the child of industrialization born out of the stresses and strains of Industrial Revolution.

7.4.1 TRADE UNIONS: PAST

Initially, it was some social workers, philanthropist and other religious leaders who started their efforts towards retaining worker welfare in industries. Social reformers under the leadership of Sorabjee Shapurjee Bangali started an agitation to draw the attention of the Government towards deteriorating conditions of workers in industries specially those of women and children and to appeal to the authorities to introduce legislation for bettering their conditions in industries.

Such pressure from social reformers and the traders compelled the Government to move ahead on this path and on the basis of the reports of Factories Commission, the first Indian Factories Act was enacted in 1881. The Act was a cause of great disappointment due to its inappropriateness in terms of its insufficient provisions for women and child labour raised demands for its amendment which led to an atmosphere of agitation.

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ACTIVITY

Talking about trade unions here, write your own definition to Trade Unions and list down the names of Trade Unions you have ever heard of.

7.4.1.1 Emergence of a labour leader:

Shri Narayan Meghaji Lokhandey who was influenced by Mahatma Phooley of Maharashtra emerged as a first labour leader in India. He devoted his whole life to the cause of labour

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movement. Shri Lokhandey organized a conference of workers in Bombay and drew up a memorandum sighed by about 5300 workers which was presented to the Factory Commission. It contained the following demands:

a) Complete day of rest after a week.

b) Work should begin at 6:30am and end at sunset.

c) ½ hour rest at noon.

d) Payment of wages not later than 15th day after the due date.

e) Payment of wages for the period of employment injury.

7.4.1.2 Formation of First Labour Organization:

The first workers' organization in India was the Bombay Mill Hands Association organized in the year 8190 by Shri N.M. Lokhandey, a factory worker himself. He was its first president also. However, The Bombay Mill Hands Association had no roll of membership, no funds and no rules. Hence, it is more correctly called as a philanthropic promoter of workers welfare rather than a labour organization. Shri Lokhandey, President of Bombay Mill-Hands Association present the petition again for resuming with the previous demands, which was followed by a bigger petition signed by 17000 workers and based on this recommendation to Factory Commission the Indian Factory Act of 1981 was passed.

The important provision of the Act was:

a) Regulation of hours of work for women labour to 11 hours a day with rest intervals for one and a half hours.

b) Raising of minimum and maximum ages of children to 9 and 14 respectively.

After the inception of Factory Act, 1891 a large number of labour associations were started. Some more important of them were:

1. The Amalgamated Society of Railway Servants of India, 1897
2. The Printers Union, Calcutta, 1905
3. The Bombay Postal Union, 1907
4. The Kamgar Hitvardhak Sabha, Bombay, 1910.

7.4.1.3 Post-independence scenario:

Trade Union movements in Punjab & Bengal was adversely affected by the partition of country. The THREE Central Trade Union Organization of that time were AITUC, IFL & INTUC. Among the three IFL was adversely affected. The IFL lost one of its big constituent unions in Calcutta, the Bengal Chamber of Labour with membership of over one lakh, as most of the workers were Muslims who migrated to Pakistan.

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When the socialist started Hind Mazdoor Sabha in December 1948, the Indian Federation of Labour existed then, and they both merged together. Still there were disagreements towards principles and objectives of Hind Mazdoor Sabha. Therefore, United Trade Union Committee was formed. The Committee called a conference of various leaders at Calcutta on 30th April 1949 where the United Trade Union Congress was formed.

By 1949, four Central Trade Union Organizations were functioning in the country:

1. The All-India Trade Union Congress
2. The Indian National Trade Union Congress
3. The Hind Mazdoor Sabha
4. The United Trade Union Congress

With increasing Industrialization, a number of industries emerged, and organized sector started growing rapidly. With the increasing number of workers, number of trade unions also increased. The industries were in a better capacity to pay, and unions could negotiate and extract better wages and facilities through collective bargaining. That era witnessed a continuous increase in the number of registered trade unions.

Another important reason responsible for this increase in the Political Influence. Various parties with the intention of being in good books of workers tried to bring workers within the folds of unions, which also increased the extent of unionization and made workers aware of the usefulness of this instrument.

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IN-TEXT QUESTIONS

26. Trade Unions owe their origins to _____.
27. Mahatma Gandhi was first labour leader in India. True / False
28. First Worker's Organization in India was:
    a) Calcutta Mill b) Andhra Mill
    c) Bombay Mill d) All of the above
29. Pre-Independence three Central Trade Union Organizations are _____.
30. _____ was an important reason for the increase in number of unions post-Independence.

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7.4.2 TRADE UNION: PRESENT

About the present state of the Trade Unions, we can only say that it is in its twilight state. The emergence and dominance of private sector governed by mostly information technology and artificial intelligence bring us to the "decreasing bites" of trade unions in the industrial system.

Unionization of employees are now considered to be traditional methods of regulating employee's working condition. With the increase in modern industries the employees have developed a distastefulness towards unionization. Issues like wage fixations for today's generation are not done through agitational methods, as it's an old school method. Now fixing salary is much related to the market conditions, the competition in the market, and goodwill of the company and so on.

If we talk about providing adequate facilities and working conditions. Today belief that "employees are the first consumers" has worked wonders as everyone believe in keeping customers happy. So, they try to provide the best facilities, the most conducive environment to work in order to maintain their edge over the other competitors and to retain the best talent with them in the competitive market. So, for all these they really don't need to depend on trade unions for bargaining and negotiating on their behalf leading to fewer grievances on the employee front.

On the positive side, businesses became more proficient in dealing with employees. In large Indian corporates supervisors have become far more understanding and respectful of their teams. In any case, for the bulk of the workforce, instead of supervisors and IR officers are finding ways to motivate employees rather than ways to exploit them.

Still in various industries in the country we may witness work stoppages and industrial unrests, but those are symbolic. The back breaking stoppages that used to happen traditionally is out of scene now.

7.4.3 TRADE UNION: FUTURE

Uncertain! Is the future of Trade Unions just as the future of work. The sea change brought into the labour markets due to globalization, demographic factors, environmental and technology are going to continue changing, and the COVID-19 crisis has increased the challenge to the next level by shutting down number of factories and making labours sit at home jobless. This also witnessed a dip in trade union membership leading to a downfall in trade unions.

In future also the organizations are believed to become even more human centric, widening the bridge between industries and need for unionization for the employees. The scenario in future

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will also showcase that how industries make efforts to keep employees highly motivated. The future only talks about, Talent acquisition, talent management, Intellectual capital management, human resource as business partners and the like, leaving no room for employees to bind themselves as unions, or feel the need to unite for better bargaining and negotiation with the management, and the agitational methods like work stoppages, strikes, gherao and so on has only found a place in books and have become only symbolic.

IN-TEXT QUESTIONS

31. At present Trade Unions are in _____ stage.
32. Due to modernization of industries employees have developed _____ towards unions.
33. In Future organization will try to keep employees more motivated. True / False
34. Employees are the first _____.
35. In future organizations are believed to become:
    a) production centric b) human centric
    c) Both d) None

7.4.4 ANSWERS TO IN-TEXT QUESTIONS

26. Class Struggle	34. Consumers
27. False	35. Human Centric
28. Bombay Mill	
29. AITUC, IFL, INTUC	
30. Political Influence	
31. Twilighting	
32. Distastefulness	
33. True	

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7.5 INDUSTRIAL HARMONY: WORKER'S PARTICIPATION

Harmony is where equality is. In the industry where all citizens are treated as equal and are allowed to participate freely in industrial affairs, they are treated as responsible partners of the

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enterprise and are allowed to participate in the decision making process, where they are also given the rights of self-expression and an opportunity to communicate their view on framing the policies of the company and in return what is needed is the service that they are expected to render in industry, in such kind of a setup Industrial Harmony can prevail for long. Worker's participation in management in a nutshell is prerequisite to industrial harmony. There are various objectives, modes and levels of workers participation in management.

7.5.1 INDUSTRIAL HARMONY

Industrial harmony synonymously used for the term Industrial Peace. There is certain requisite to Peace & Harmony in industries. When there is non-existence of situations of unrest in organizations, no-existence of strike by labour unions in organization resulting into competent and productive, harmony persists. The dimensions that contribute towards Industrial Harmony also involve nonexistence of industrial dissatisfaction, presence of consensus, trust and respect between work teams and unions, good connection between unions delegate and administration of the organization, employee positive attitude towards his or her impact to the organization, commitment and retention.

Today's modern philosophy of management, that strives to maintain harmony in industry, is based on considering workers not merely a wage earner, but also as equal partners in the productive process. They should be given the opportunity to participate in the management of the enterprise. Their views and suggestions should be given due consideration while taking decisions by the management. It is rightly suggested that management of industrial unit will be smooth and efficient if workers are associated with the management.

Merits of Industrial Harmony:

a) It brings effective communication between workers and management.

b) It leads to cordial labour-management relationships.

c) It gives higher status to workers and drive then towards higher participation

d) It develops spirit of cooperation among workers and management both.

e) Workers feel committed to the decisions taken by them jointly with the management.

For the above harmony to be maintained in industries there are various contributing factors, and an important one is "Worker's Participation in Management". Further in this chapter we will majorly focus on this aspect.

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ACTIVITY

In modern organizations various efforts are made to increase Worker's Participation in Management. Enlist any such FIVE trending activities along with the name of organizations practicing it.

IN-TEXT QUESTIONS

36. Harmony is where _____ is.
37. Industrial Harmony is unrelated to Worker's Participation in Management. True / False
38. Which is NOT one of the merits of Industrial Harmony:
    a) develops better communication b) develops cordial relationship
    c) drives them towards recreation d) develops commitment
39. Harmony persists with non-existence of _____.
40. Worker's Participation in Management is a _____ to Industrial Harmony.

7.5.2 WORKER" S PARTICIPATION IN MANAGEMENT

Worker is someone who work in a particular job or in a particular way. Worker participation in any organization is important because 80% of the organization's success depends on the worker's performance. According to the claims made in literature that modern management should and is 'empowering' the ordinary employees in new potential ways. Also, employee involvement and their techniques may enhance management communication and increase their motivation. According to Malcolm Leary, involvement of worker improves quality of thinking which is beneficial for decision making.

Keith Davis has defined the term "participation" as the mental and emotional involvement of a person in a group situation which encourages him to contribute to group goals and share responsibilities in them. This definition shows three important elements of participation. Firstly, it means mental and emotional involvement rather than only physical activity, secondly, participation must motivate a person to contribute to a specific situation to invest his own resources such as initiative, knowledge, creativity, ingenuity in the objectives of the organization and thirdly, it encourages people to share responsibility for a decision or activity.

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7.5.3 IMPORTANCE OF WORKER" S PARTICIPATION IN MANAGEMENT

From the above discussion we can conclude that for a smooth functioning of any organization. Industrial Harmony & Peace are the basic requirements, and it can be achieved through Worker's Participation in Management. Now let us discuss that what is its importance in the organization:

Reduced Industrial Unrest: By cutting at the very root of industrial conflict, workers participation minimizes the conflicting interest between the parties, and substitute it with cooperation, homogenous objectives, and common interest by making the decision arrived at become "Ours" instead of "theirs",

Reduced Misunderstanding: A common reason for misunderstanding among workers and managers is their outlook towards each other. They both believe that the other is working only with the intention of maximising their own profits. This can be resolved through worker's participation in management, so that they are aware of the decisions and also have the feeling of belongingness.

Increased Organizational Balance: In an environment where employees are free to share their problems and work towards common solution to those problems. There will be high degree of balance because of decreased misunderstandings and conflicts.

Improved Communication: With decreased misunderstanding there will be a free flow of communication. Many a time because of certain barriers important information gets restricted from flowing freely. Participation tends to break this barrier and make the available to managers for better decision making.

Higher Productivity: Co-operation between Labour and Management is the key to higher productivity. This was empirically tested that poor "labour management relationship" never encourage the workers to perform any more than the minimum requirement to retain their job. Therefore, participation becomes important to increase productivity.

Increased Commitment: Higher commitment comes from higher involvement, and opportunity to express oneself, contributing to the decisions, putting forward constructive opinions, getting acknowledged, accepted and appreciated for the same contributes to increased commitment and higher participation.

Industrial Democracy: Democracy is about reducing class conflict between capital and labour. Democracy is about encouraging people to have their own individuality and confidence in themselves to take a stand, putting point of views forward and participate in decision making process.

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Developments of individuals: Opportunity to express enhances creativity and ability to face job related challenges. When they enjoy freedom to give suggestions rather just following instructions their self-confidence improves and there is higher room for further growth and development.

Less resistance to change: When the changes are just introduced without explanation, they moreover become compulsion leading to high amount of resistance. On the contrary if the changes are discussed and planned collectively there will be lower resistance and higher acceptance and cooperation for its execution.

7.5.4 MODES OF WORKER" S PARTICIPATION IN MANAGEMENT

There are various methods through which workers participate in management of industrial enterprise:

1. **Works Committee**: Matters associated with wage payments, bonus, training, discipline etc. are discussed in works committee. It consists of equal number of representatives of both employers and workers, who meets frequently for discussion on commonly identified problems of workers and management, joint decisions are taken on such issues and are binding on both the parties. Works Committees are very popular in France and England but are not proved to be effective in India.

2. **Joint Management Council**: It involves setting up of joint committees represented by the workers and the management to discuss and give suggestions for improvement on matters of mutual interest. The decisions taken by such committee are not binding on either party but are implemented if they reach consensus in decision. Matters relating to wages, bonus and incentives are generally kept out of the reach of joint management council. Issues relating employee welfare, safety measures, grievance redressal, training, working hours etc. are dealt under joint management council.

3. **Collective Bargaining**: It is a process where employees through their elected leaders participate intermittently with management with the purpose of negotiating on labour agreements for redressing the grievances of the workers.

4. **Co-partnership**: By purchasing shares of the company the employees become co-owners so that they can participate in the management of the company through their elected representatives on the Board of Directors. They can also attend general meetings of shareholders and exercise their voting rights.

5. **Suggestion Schemes**: Here the workers are encouraged to give their suggestions to the management on various administrative matters, which are accepted if found suitable.

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Those providing constructive suggestions are also rewarded. This method is executed with the help of suggestion boxes. These suggestions are collected every month and suitable decisions are taken jointly by the committee comprising representatives of workers and management.

6. **Grievance Procedure**: In Indian context, Sec 9C of Industrial Dispute Act provides that in every establishment in which 100 or more workers are employed or have been employed on any one day in the preceding twelve months, the employer shall setup a time bound grievance redressal procedure.

7. **Quality Circle**: First originated in Japan during 1962 and then spread to many other countries including India. They are autonomous units of about 10 workers led by a supervisor. The workers who have a shared area of responsibility, meet weekly to discuss, analyse and propose solution to an ongoing problem, such as, reducing defects, scrap, rework and downtime leading to higher productivity.

IN-TEXT QUESTIONS

41. Only 20% of Organization success depends on Worker's performance. True / False
42. _____ defines Participation as Mental and Emotional Involvement.
43. Which is NOT one of the Modes of Worker's Participation:
    a) brainstorming b) works committee
    c) suggestion schemes d) collective bargaining
44. Worker's Participation decreases resistance to change. True/False
45. Becoming co-owners of the company is termed as _____.

7.5.5 WORKER" S PARTICIPATION IN MANAGEMENT IN INDIA

Around 1910 it was introduced in Textile Industry. Soon after the First World War, Tata Iron & Steel Company at Jamshedpur set up a Works Committee with workers cooperation, but it wound up after few years as it was not effective.

The Royal Commission on Labour in India recommended Works Committee at the plant and industry levels for consultation and resolution of disputes, but they also could not make much difference. After 1940, with the emergence of Indian Labour Conference, trade unions and political leaders made demands for labour association with management. It took a legislative

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form only when the Government of India enacted Industrial Disputes Act in 1947, which made it obligatory for all units employing more than one hundred workers to constitute works committees.

The idea of associating labour with management is even found in the Directive Principles of the State Policy in the Indian Constitution. The Industrial Policy Resolution of April 1956 made it clear that "*in a socialist democracy, labour is a partner in the common task of development and should participate in it with enthusiasm……*"

7.5.6 SUCCESS FOR WORKER'S PARTICIPATION IN MANAGEMENT:

Following requirements should be fulfilled in order to make Worker's Participation in Management Successful:

i) Enterprise should have a progressive management which is conscious of obligation and responsibilities towards its stakeholders and the country as a whole.

ii) Presence of strong trade union, which is a true representative of the workers.

iii) Unanimity regarding organizational objectives between management and labour as well as mutual recognition of their rights and responsibilities.

iv) Atmosphere of trust should be there both on management and worker's side.

v) Both management and workers should be aware of the benefits of participation. Merely as an action participation cannot be effective, till the time workers, management and the Government will not feel committed and determined, participation will remain fruitless.

vi) Single union should work as representative of workers in the participation process so as to prevent inter-union rivalry, which can adversely affect the industrial growth.

7.5.7 INDUSTRIAL HARMONY & WORKER'S PARTICIPATION IN MANAGEMENT:

In simple terms it can be explained by saying that Worker's Participation in Management crystalizes the concept of Industrial Harmony. On the other this is also a fact that managers/employers are really fascinated with this concept, but in most of the cases they are clueless about what should be done to achieve harmony through worker's participation and how worker's participation can be achieved.

We can say that worker's participation is the basic requirement for Industrial Harmony & Peace. In order to achieve the same an effective system of communication and consultation between the employees and workers is required. Industrial Harmony that can be achieved

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through Industrial Democracy is an Attitude, which can be given a clear and concrete shape only through Worker's Participation in Management.

There is absolutely no conflict between the two concepts. In fact, they both complement each other and are supplementary in character.

IN-TEXT QUESTIONS

46. Worker's Participation in Management was introduced in India in _____.
47. Unanimity regarding _____ success of Worker's Participation in Management.
48. Worker's Participation in India started in India in a Coal Mine. True / False
49. _____ made it obligatory to constitute Works Committee for all units employing more than 100 employees.
50. Industrial Harmony is an:
    a) bias b) myth
    c) perception d) attitude

1.5.8 ANSWERS TO IN-TEXT QUESTIONS

36. Equality	44. False
37. False	45. Co-partnership
38. Direct them towards recreation	46. 1910
39. strike	47. Organizational Objectives
40. prerequisite	48. False
41. False	49. Industrial Dispute Act, 1947
42. Keith Davis	50. Attitude
43. Brainstorming	

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7.6 COLLECTIVE BARGAINING: INTRODUCTION

In the early stage of Industrialization, when workers and management attempt to negotiate with each other on frequent basis in order to increase their own gains, individual negotiation became difficult in such large-sized labour market. Employers found it much convenient to negotiate

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with a group of employees at a time rather than dealing with them individually. This gave birth to the phenomenon of 'collective bargaining'. It began from local bargaining at the plant level to the regional level and finally to the national level. There are various aspects related to this process which will be discussed further in this chapter.

Famous historians of British Labour Movement, Sidney and Beatrice Webb originated the term "Collective Bargaining" in the end of nineteenth century. The term denoted a procedure under which two parties, namely, workers and management, reach an agreement about wage rates and basic conditions of employment.

In the words of Flippo, "Collective Bargaining is a process in which the representatives of a labour organization and the representatives of business organization meet and attempt to negotiate a contract or agreement, which specifies the nature of employee-employer union relationship".

Another important definition of Collective Bargaining according to a manual issued by the International Labour Office in 1960 defines the term as "negotiations about working conditions and terms of employment between and employer, a group of employers or one or more employers' organization, on the one hand, and one or more representative workers' organization, with a view to reach an agreement".

John T. Dunlop is of the view that "the term collective bargaining connotes multiple meanings. "Collective Bargaining is (i) a system which establishes, revises and administers many of the rules which govern the workers' place of work; (ii) a procedure which determines the quantum of compensation which employees should receive and which influences the distribution of economic benefits; (iii) a method of settling disputes during the pendency of agreement and of determining, after its expiry, whether a dispute should be reopened or whether a strike or a lock-out should be resorted to or not".

From the above definitions, some essential features of Collective Bargaining can be extracted:

(i) It is a collective process.
(ii) It is a continuous process.
(iii) It is a flexible and a dynamic process.
(iv) It is a method of partnership of workers in management.
(v) It is based on give and take approach and not in take or leave approach.
(vi) It is an attempt in achieving and maintaining discipline in industry.
(vii) It is an effective step in promoting industrial jurisprudence.

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7.6.1 Significance of Collective Bargaining:

Collective bargaining has its importance and benefits to Employees, to Employers and Society at large. The description of the same is as follows:

Importance to Employees:

(i) Collective bargaining develops a sense of self-respect and responsibility among the employees.

(ii) Collective bargaining increases the strength of the workers. Their bargaining capacity as a group increases.

(iii) Collective bargaining increases the morale and productivity of employees.

(iv) It restricts management freedom for arbitrary action against the employees,

(v) Effective Collective Bargaining machinery strengthen the trade union management.

Importance to Employers:

(i) The workers feel motivated as they can talk to the employers on various matters and bargain for higher benefits, leading to higher productivity.

(ii) It is easier for the management to resolve issues at the bargaining table rather than taking up complaints of employees individually.

(iii) Collective bargaining promotes a sense of job security among the employees and thereby tends to reduce cost of labour turnover to management, employees as well as the society at large.

(iv) Collective Bargaining opens up the channel of communication between the top and the bottom levels of the organization which may be difficult otherwise.

Importance to Society:

(i) Collective Bargaining can facilitate industrial peace in the country.

(ii) Collective Bargaining results in the establishment of a harmonious industrial climate which supports nation's economic and social development.

(iii) It is the most significant aspect of labour-management relations and extends the democratic principle from the political to the industrial field.

(iv) The exploitation of workers by the management can be checked.

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(v) Collective Bargaining is a measure to distribute equitably the benefits derived from industry among all the participants including the employees, the union, the management, the customer, the suppliers and the public.

7.6.2 Functions of Collective Bargaining:

Arthur D. Butler identifies three important functions of Collective bargaining, which carries over the process of decision-making and balancing the power between the employers and the employees. The functions are as follows:

(i) **Technique of long-run social change**: As a process of social change collective bargaining in more than the direct clash between employers and unions. It refers to the rise in the political and social power achieved by workers and the organization. With gradual rise in social and political power, workers gain greater recognition and ability to assert against employers.

(ii) **Peace Treaty or Temporary Truce**: In various cases Collective Bargaining can be viewed as a struggle between the workers and the management which is smoothened by the compromises. This compromise can happen in two major ways, i.e., Compromise with combative aspects and Compromise without combative aspects.

(iii) **Industrial Jurisprudence**: It means introducing civil rights in industry i.e., management be conducted by rules rather than arbitrary decisions. It establishes rules which define and restrict the traditional authority exercised by management.

7.6.3 PROCESS OF COLLECTIVE BARGAINING:

Collective Bargaining is a process in which through negotiating workers & management attempts to arrive at an agreement on wages and other economic benefits and other terms and conditions of service. In this context The Indian Institute of Personnel Management has suggested the following steps that constitute the process of Collective Bargaining.

1. Composition of the Negotiating Team: The team should consist of the representatives of both the workers and the employers, with adequate qualities, job knowledge and skill

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for negotiation, they should have full knowledge of the issue and must have full authority to speak for them and take complete decision.

2. Make a good beginning: Well, begun is half done and is true for Collective Bargaining too. It will be better to have a perfect clarity of the issue and both the parties begin with a correct mindset so that mutual co-operation can be secured.

3. Maintain continuity of talks: It is very important for a collective bargaining process to have continuity in discussions. What needs to be taken care of is that the discussion should not end mid-way because of any roadblock or confusion or should side-track. As long as the talk continue, a solution will be possible ultimately.

4. Develop a problem-solving attitude: To solve a problem it is important to have correct attitude and will to solve it. Both the parties in Collective Bargaining must proceed with the expectation of solving the problem, only then agreement will be easy to reach.

5. Encourage Leadership: More practical and easier is to deal with a few representatives of a strong and organized body than with a heterogenous mass of disunited individuals. To participate in collective bargaining not only management but union also must have a strong leadership.

6. Bring in other managers: Issues being discussed in collective bargaining may require diverse knowledge and expertise. Not necessarily every manager is a master in all fields. Therefore, managers of different field can be consulted to reach at the best possible solution of problem under discussion.

7. Contract administration: The final phase in the process of Collective Bargaining is to administer the contract which has been agreed upon between management and union. There should be unanimity of agreement and harmonious relations between the two parties for an effective administration of the contract.

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IN-TEXT QUESTIONS

51. The term "Collective Bargaining" has been originated by _____.
52. Collective Bargaining is a Tripartite system. True / False
53. What does not stand true for features of Collective Bargaining:
    a) Collective process b) Not Flexible
    c) Continuous process d) Based on give and take
54. _____ is the first step in the process of CB.
55. CB is an ineffective step in promoting industrial jurisprudence. True / False

7.6.4 COLLECTIVE BARGAINING IN INDIA:

Collective Bargaining is not that popular in private sector, but it takes place in public sector as bipartite agreement in India.

Some frequently occurring trends of Collective Bargaining that are found in India are as follows:

(i) Trend of counter-demands. When trade unions submit their charter of demands for negotiation, management also push forward their charter of demands as counter – demands.

(ii) Use of coercive tactics by unions, especially when it is militant union. Even in management, some officials were found following coercive approach to collective bargaining.

(iii) Industry wise bipartite committees are there for agreement on issues like wages and other terms of employment.

(iv) The scope of Collective Bargaining has expanded to cover in itself issues such as dearness allowance, retirement benefits, retrenchment benefits, bonus, annual leave, production norms, performance evaluation, workers' participation in management etc.

(v) Collective bargaining agreements in India have been concluded to settle a variety of issues at various levels-plant level, industry level and national level. On the whole it has been appreciated and was successful in some industries in India.

7.6.5 OBSTACLES TO COLLECTIVE BARGAINING IN INDIA:

Collective Bargaining process is not much encouraged in industries of India and where it also faces certain obstacles. They are as follows:

Multiple Unions: No union enjoys the support of the majority of workers in the plant. Inter Union rivalry does not allow a conducive atmosphere for Collective Bargaining.

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Non-Recognition: In case of multiple unions there is problem in recognizing union to serve as a bargaining agent on behalf of the workers.

Political Orientation: Leaning towards political parties is found to be easier by unions, hence they are not much in favour of collective bargaining.

Defective Laws: When the provides an easy access to adjudication, the parties lose faith and patience to enter into the process of bargaining.

Mediation of Political Leaders: In most of the industrial disputes the settlement is driven through political leaders inhibiting the growth of collective bargaining.

7.6.6 SUGGESTIONS FOR EFFECTIVE COLLECTIVE BARGAINING:

(i) Presence of strong and stable representative union in every plant.

(ii) Recognition of representative union should be provided by law.

(iv) Political leadership should be replaced by internal worker leadership.

(v) Political leaders should not interfere in industrial relations.

(vi) Both trade unions and management must have faith in peaceful methods of issues between them like Negotiation & Collective Bargaining.

(vii) Adjudication should be resorted to only when all other remedies have failed.

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IN-TEXT QUESTIONS

56. Collective Bargaining is commonly used in Private sector in India. True / False
57. A common trend of collective bargaining in India is _____.
58. What is not one of the obstacles to collective bargaining in India:
    a) Multiple Union b) Complex adjudication procedure
    c) Political Orientation d) Non-recognition of Unions
59. _____ should not interfere in Collective Bargaining Process.
60. Inter Union rivalry is an obstacle to Collective Bargaining. True/False

7.6 ANSWERS TO IN-TEXT QUESTIONS

1. Sidney & Beatrice Webb	6. False
2. False	7. Counter Demands
3. Not Flexible	8. Complex adjudication procedure

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4. Composing a Negotiating Team 5. False	9. Political Parties 10. True

7.7 SUMMARY

Industrial Relations can better be termed as a "complex system" formed with the three major parties i.e., Employer, Employee and the Government. These parties interact with each other in the functioning of an industry with their specific and unique roles. In the absence of even one of them the survival of industry will come under question. Therefore, it becomes even more important to maintain harmonious relations among them so as to secure industrial peace, satisfaction and higher productivity. Hence, the presence of machineries to manage industrial relation is inevitable.

The vital part of Industrial Relations is the one who constitutes Industrial Relations i.e., the parties to Industrial Relations and their association with each other. They have their own representative groups, having their specific and unique roles to play. The analysis of the above content also shows that these parties co-exist and one without the other will have no significant role to play. The Employer's Organization is the representative group for employers and similarly Trade Unions are for employees.

Trade Unions can be considered as child of Industrial Revolution. It was when the employers started exploiting the workers, it orders to secure their rights and dignity and to get them the share due to them in industries, the social reformers came forward with the concept of uniting the workers to strengthen their position before the management and get their due share in in terms of monetary benefits as well as respect in return of their service. Along with that an objective of Industrial Relations is to maintain Industrial Harmony and Peace through Workers' Participation in Management. We can say that it is Worker's Participation because of which we achieve Industrial Harmony & Peace. Management also plays a very significant role in securing worker's participation in management, by providing them liberty to put forward their ideas and suggestion, rewarding the constructive ones, considering them to be equal partners and not mere workers, accepting their contribution in decision making and so on. Worker's Participation in the form of works committee, joint management council, suggestion schemes, co-partnership etc. always contributes to Industrial Democracy leading to harmony.

In an industry peace and harmony can also be maintained when problems can be resolved collectively and peacefully among the conflicting parties. Therefore, the concept of

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Collective Bargaining was originated. It has been given different definition and meaning by different theorist. Collective bargaining has its own benefits for Employees, Employers and Society. It is a process with well-defined steps, which needs to be followed to increase the effectiveness of the process. In India Collective bargaining is less popular as compared to some other countries because of the presence of certain obstacles, which can also be prevented easily with the help of some corrective measures.

7.8 GLOSSARY

System: A set of idea or rules for organizing something.

Locus: A particular position or place where something is situated.

Politico-Legal: Pertaining to policy or the administration of the government.

Truce: An agreement to stop fighting for a period of time.

Legal Sanctions: Legal approval

Human Centric: Higher concern towards humans in organizations.

Amalgamated: Process in which separate organizations unite.

Harmony: Peaceful existence together.

Collective Bargaining: Procedure under which two parties reaches an agreement.

Industrial Jurisprudence: Introducing Civil rights in Industries.

Combative: Ready to fight or argue.

7.9 SELF-ASSESSMENT QUESTIONS

25. What do you mean by Industrial Relations? Explain its nature & objectives.
26. Discuss the systems approach to industrial relations and state the actors in Industrial relation system.
27. Explain the phases of Evolution of Industrial Relations.
28. Explain the various parties to Industrial Relations along with their specific roles.
29. Write an Essay on Trade Unionism in India.
30. "State is an important participant in Industrial Relations in the country". Comment & discuss the role of State in Industrial Relations.

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31. What is an Employers' Organization? State the origin and growth of employers' organizations in India.
32. Explain the concept of Collective bargaining and discuss its salient features.
33. Explain the Process of Collective Bargaining.
34. Comment on "Collective Bargaining in Indian context".
35. What is Trade Union? Comment on the beginning of Trade Union Movement in India.
36. What is meant by Industrial Harmony? What are the prerequisites for its success?
37. What do you understand by Worker's Participation in Management? Is it necessary to improve the relationship between workers and employers? Explain.
38. Write a comprehensive note on the role of Worker's participation in Management in maintaining Industrial Harmony & Peace.

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LESSON 8

GRIEVANCE, CONFLICT MANAGEMENT & INTERNATIONAL DIMENSIONS OF HRM

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STRUCTURE

8.1 Learning Objectives

8.2 Introduction

8.3 Grievance

- 8.3.1 Understanding of Grievance and its features
- 8.3.2 Causes of Grievance
- 8.3.3 Consequences of Grievance
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8.4 Discipline

- 8.4.1 Understanding of Discipline
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8.5 Conflict Management and Dispute Resolution

- 8.5.1 Understanding and Nature of Conflict
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8.6 Employee Engagement

- 8.6.1 Introduction and Understanding of Employee Engagement

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8.1 LEARNING OBJECTIVES

The objective of this chapter is to understand

- The concept of grievance, causes and importance of handling grievance
- The importance of Discipline to maintain good work relations and attain organisational goals
- The term conflict whether intra-individual or inter-individual, its impact on the organisation and its members and the measures to resolve disputes
- Employee engagement, its importance and factors affecting employee engagement
- International dimensions of HRM, difference between traditional HRM and International HRM

8.2 INTRODUCTION

This chapter is designed to provide an understanding of the terms- grievance, discipline, conflict and employee engagement which assume importance due to new challenges thrown by globalisation, work force diversity and economic uncertainty.

With human relations approach to management, organisations need to constantly address the issues of grievance, identify grievance and devise methods of handling grievance. They need to engage the employees in the managerial processes like planning and decision making in

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order to keep them satisfied and involved in the job. Additionally, each organisation experiences some level of conflict, whether inter-individual or intra- individual. Newer methods of handling conflicts need to be adopted keeping in mind the dysfunctional impacts of conflict. The need for discipline cannot be undermined in the achievement of organisational goals and maintaining good work environment. Going global has also increased the necessity of understanding the aspects of International HRM.

Clearly the unaddressed issues of grievance or conflict can create frustration, stress and loss of interest in work. Understanding the need to address grievance and conflict can go a long way in building employee-employer relation. Engagement / involvement of employees and maintenance of disciplinary environment can also reduce the chances of grievance or even conflict. The new challenges and opportunities created by International HRM need an understanding so as to ensure greater and better mobility of work force.

8.3 GRIEVANCE

8.3.1 Understanding Grievance and its features- Grievance is the feeling of injustice or discrimination in treatment or an experience of unfair treatment or exposure to unfavourable situation or any dissatisfaction from the job or any aspect of the job. An employee can experience grievance in job related matters like performance evaluation, promotion, leave, transfers, training or even compensation.

> According to Michael J. Jucius, Grievance is "any Discontent or dissatisfaction, whether expressed or not and whether valid or not, arising out of anything connected with the company that an employee thinks, believes or even feels, is unfair, unjust or inequitable."
>
> Keith Davis defines grievance as "any real or imaginary feeling of personal injustice which an employee has concerning his employment relationship."

The following are the features of Grievance:

1. Discontentment with some aspect of the organisation- The dissatisfaction or the feeling of injustice must be related to the organisation in which a person is engaged. For example, it can relate to unclear authority responsibility relationships, reporting to

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multiple bosses, violation of rules or procedures of the organisation, treatment by the supervisor, etc.

2. Discontentment arises out of employment- Grievance is something that is related to the job and personal difficulties, or issues are not part of the term industrial grievance. Thus, discontentment due family or marriage or personal financial issues does not qualify to be grievance. It can include dissatisfaction from wages or salaries, denial of leave, lack of recognition for work, biased performance evaluation by supervisor.

3. Dissatisfaction may be expressed or implied- Grievance may be expressed in words either in gossip or arguments or by communicating with supervisor. It may be implied/ conveyed by the conduct of an employee through his behaviour, which can include absenteeism, tardiness, daydreaming. Organisation should promptly identify and handle the grievance as it can have unfavourable consequences for the organisation.

4. Dissatisfaction may be real, imaginary, justified or unjustified, valid or invalid- Grievances that are genuine, real or justified, should be removed by the management. Employees may also be faced with grievance which are emotional in nature or based on distorted perception, imaginary or lack of proper thinking. These grievances may be difficult to handle.

5. Feeling of injustice – In instances of grievance workers feels that there has been unjust or unfair treatment. For example, employee might feel that the supervisory style is biased, or a self- motivated employee might not perceive autocratic leadership favourable.

6. Grievance, if not handled in time, may lead to low morale and productivity- Grievances when identified in the employees should be handled appropriately. If not handled on time, grievance may hamper progress of work or motivation to work or morale or even efficiency to complete the task. Thus, grievance if not removed in time can negatively impact the organisational goals.

8.3.2. Causes of Grievance – Grievance can occur from two broad factors (1) Management policies or (2) Working conditions. The possible causes of grievance are discussed below.

Management Policies	**Working Conditions**
Discriminatory Wage rate or scale of pay Overtime Denial of Leaves	Non- availability of machines, tools or other equipment required for doing the job

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Unreasonable transfers or improper matching of employee with job Subjectivity in Seniority, promotion and discharge Lack of career planning and employee development plan Lack of role clarity Hostility with trade unions Autocratic style of leadership	Lack of proper facilities for work like rest rooms, drinking water, ventilation Tight production standards

8.3.3. Consequences of Grievance – Grievance, if not addressed on time may have adverse effect on the employees and the organisation. The consequences of unaddressed grievance are discussed below.

(1) The employee experiencing grievance may witness a sense of frustration, disloyalty and non-cooperation.

(2) They may lose interest in work and show signs of disengagement.

(3) There may be indiscipline in the form of absenteeism, work-to-rule, demonstration, strike or even mass casual leave.

(4) The quality and quantity of output may suffer in the organisation.

8.3.4. Importance of Handling Grievance – It is pertinent to handle and redress grievance on time so as to ensure that grievance does not have unfavourable impact on the organisation. The importance of handling grievance is discussed below.

1. Organisations must collect genuine feedback on company policy, practice and procedure. This feedback can ensure better employee-employer relation and instil a feeling of engagement among employees. The involvement of employees in framing or revising of policies or practices can reduce the chances of grievance from policies, procedures or practices.

2. Organisation can benefit from keeping grievance within tolerable limits so timely detection and redressal of grievance is essential.

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3. Constant monitoring of cases of grievance assists management to understand the behaviour of superiors towards subordinates.
4. If grievance handling mechanism is in place, then employees know that their issues would be resolved to their satisfaction, and this would boast their morale.
5. Timely handling of grievance can help create a favourable work culture.
6. The reputation of the organisation improves when management gives due attention to human aspect and respects the dignity of employees. The organisation would be sought for employment when prospective candidates know that management treats employees with dignity and respect.

IN-TEXT QUESTIONS

1. Grievance can be (1) real or imaginary (2) justified or unjustified (3) valid or invalid (4) all of the above
2. Which of the following is not the cause of industrial grievance (1) denial of leave (2) discriminatory compensation (3) family issues (4) lack of proper working conditions
3. Grievance can be ____ from the conduct of an employee through his behaviour
4. Every employee expresses his grievance (True or False)

.

8.4. DISCIPLINE

8.4.1. Understanding of Discipline- Any organisation needs to cultivate the environment where there is orderly behaviour of employees for the achievement of goals of the organisation. In the absence of discipline there will be chaos, irregularity, disorder or even confusion in the organisation. Existence of discipline encourages the employees to follow the rules, procedure and practice and behave responsibly. Indiscipline was associated with punishment for long. But today organisations have realised that discipline should be followed voluntarily and not because of threat of punitive action. Thus, concept of self-discipline by education and training should be encouraged. If an individual is in conflict with the disciplinary process, then it might be difficult to maintain good human relations. Thus, discipline needs to be developed from within.

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According to Ordway Tead, "Discipline is the orderly conduct of affairs by the members of an organisation who adhere harmoniously in forwarding towards the end which the group has in view, and willingly recognise that."

8.4.2. Principles of Discipline - Discipline is the essence of our life. The prerequisites of any disciplinary policy in an organisation are discussed below.

1. The objective of industrial discipline should be clearly understood by workmen. They must clearly specify the standards expected from the workmen.
2. Clear and unambiguous rules and regulation must be set in consultation with workmen which serve as a code of conduct. Participation of workmen in designing rules and regulations would ensure their prompt acceptance.
3. The code of conduct must be made know to all those who need to follow them and all those who need to monitor the observance of this code in the same sense. The newly recruited employees should also be given orientation regarding the same.
4. These rules should also contain the provision for investigation and settlement of grievance and conflict arising during the course of work.
5. The policy should emphasise on observance of the code and prevention of breach of disciplinary rules rather than penalties for indiscipline.
6. Code of conduct should specify the authorities to be approached for grievance related to discipline and also appellant authorities. The code should also state the quantum of punishment for violation of disciplinary conduct.
7. Disciplinary committee may be established for looking into the causes of indiscipline and devising measures for removal of indiscipline.
8. Implementation of disciplinary code of conduct should be objective and consistent.

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IN-TEXT QUESTIONS

5. Discipline can be voluntarily followed or may be observed due to punishment. (True or False)
6. Observance of discipline can avoid
   (a) chaos or disorder (b) regularity (c) clarity of goals
7. Every organisation should devise a code of conduct so as to ensure uniformity and consistency in observance of disciplinary rules. (True/ False)
8. Disciplinary code of conduct is devised to ensure
   (a) prevention of indiscipline (b) victimises the employees (c) unfair treatment to employees.

8.5 CONFLICT MANAGEMENT AND DISPUTE RESOLUTION

8.5.1 Understanding and Nature of Conflict - Conflicts are indispensable in our everyday life. It is present in our personal life and professional life. Especially in case of organisations the manager needs to understand the consequences of conflict and learn to deal with it. Conflict can have adverse impact on the organisation like inefficiency, loss of interest in work, absenteeism, low productivity, stress, tension, depression and demotions. The conflict at work may have a spill over effect in personal life of the employees.

Conflict is a situation of imbalance or difference. It can be inter-individual (among individual) or intra individual (within individuals). In case of intra individual conflict the individual is in state of conflict in his mind as he is not in a situation to make decision in a particular situation. He is in dilemma over a particular issue. For example, an employee may not be able to decide whether to opt for lump-sum pension or NPS. Taking another example, there might be conflict of interest in the mind of employee as organisational and individual interests are different.

But an individual is in inter-individual conflict when there is a conflict with some other individual or group of individuals either because of difference of opinion or breakdown of decision making. For instance, in teamwork the delegation of responsibility may be difficult due to differences in opinion of team members on fixation of task responsibility.

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In the light of above discussion Pondy (1967) defines conflict as 'a breakdown in the standard mechanism of decision making.'

Follett defines conflict as "the appearance of difference, difference of opinion, of interest".

Conflict is indispensable as individuals are unique in their way of thinking, perceiving and interpreting situations. It is present at all levels with varying degrees between different persons. The nature of conflict is discussed below.

1. Conflict exists when there are alternative courses of action available and there is difficulty in selection of the best alternative in a given circumstance.
2. Conflict among individuals implies that there is conflicting perception, beliefs or goals.
3. Conflict is a dynamic process as it involves various stages or events. A conflicting situation does not occur overnight, its presence is due to a series of events occurring over a period of time.
4. It should be perceived by the parties standing in conflicting situation against each other. If there is no such perception, then there can be no conflict between the parties.

8.5.2 Adverse impact of conflict

Conflict may be bad as it has the possibility of affecting the efficiency, productivity and willingness to work. Every employee or member of group is required to deal with the conflict with strength and courage. It may demand a change in perception and even attitude. The dysfunctional aspects of conflict are discussed below.

1. Resignation of personnel- an individual may be encouraged to leave the job to avoid the situation of conflict. An individual may witness inter-individual conflict because of difference in philosophy between the management and himself or difficulty in getting along with group members due to difference of orientation or interest or because of biased attitude of the supervisor. Whatever may be the reason for inter-individual conflict, the individual employee may resign if he feels dissatisfied or strongly feels that he might not be able to continue with the organisation. This might lead to loss of key personnel of the organisation.
2. Tensions- conflict may lead to a situation of stress and even tension. In extreme cases the management may find it difficult to deal it. Timely action should be taken to avoid anxiety, frustration, depression and sense of insecurity.

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3. Discontentment- conflict presents circumstances of dissatisfaction/ discontentment among the two opposing parties. This difference can accelerate if the management fails to take corrective measures. In this win-lose situation the parties at dispute may seek opportunity to settle scores which can adversely affect the productivity of the organisation and attainment of goals.

4. Creation of distrust- the opposing parties might lose trust upon each other which has tendency to cause work delays. Also, in such a situation there may be loss of cooperation and coordination among the members of the team. It gives rise to negative feelings and the parties may avoid interaction with each other.

5. Goal displacement- conflicting parties may concentrate on winning the conflict, thereby causing wastage of time and effort in looking for tactics. This may distract the members from focusing on organisational goals and rather encourage the conflicting parties to concentrate on personal goals.

6. Weakening of organisation- the organisation may become weak because of the conflicting situation. The management trying to supress the conflict may have to deal with gigantic proportions later on and non-interference with the conflict may also increase unnecessary trouble for the organisation. Frequent conflicts may cause tensions and distrust among the members of the organisation which can cause resignation of key / skilled personnel.

8.5.3 Modes of handling conflict

In order to avoid dysfunctional aspect of conflict, every organisation should devise strategies to effectively deal with it. The following are some suggestions to deal with conflicts.

1. Avoidance and repression- avoidance means ignoring the conflict and repression calls for putting down of this conflict by the manager. This strategy includes

    a. Avoidance or ignoring the conflict- it requires a manager to avoid the conflict and pretend as if there was no existence of a conflict. This method is advisable for insignificant matters and matters relating to anything other than work like religion, caste, politics, etc. this method is useful when differences are not related to organisation's task.

    b. Reorganisation of groups- management can also look at reorganisation of the groups so as to place people together on some common ground. Grouping people with some similarity can help build their relations and assist in building cooperative work relations.

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c. Reduction of inter-dependence between groups- the existence of interdepartmental dependency among various groups in any organisation can be a cause of conflict. This interdependency can be because of resource limitations or sharing resources. The reduction of dependence may reduce inter groups differences.

d. Dominance or repression of difference- it means the conflicting parties gets a chance to redress the conflict by solution given by higher level. This method of resolving conflict is appropriate when delay in handling conflict can be costly, for instance, in cases when alternative project proposals are discussed and selected by top management and delay would result in resources remaining idle. This method may be viewed as an autocratic response to conflicting situation.

e. Regulation of inter-personal contacts through transfers- transfers of employees participating in conflicting situations to different departments or branches or locations can help keep the conflict at bay.

2. Containment of conflict- the managers surface the conflict, regulate the issues to be discussed in a conflicting situation and manner of resolution. The strategies include

a. Compromise or bargaining- it is a form of set off in which two conflicting parties exchange concessions until compromise is arrived. In this arrangement both parties stay consistent with their stand but slowly reach an agreement when both parties are willing to alter their stand and compromise to terminate the situation of conflict. Bargaining continues until mutually satisfactory arrangement is reached.

b. Restructuring interactions between the groups- encouraging formal communication of those groups which are dependent on each other for resources can reduce conflicting situations. Involvement of third parties can also be utilised for resolving the conflict as open discussion of conflict could further increases the conflict.

3. Confrontation- in this method manager permits both parties to face each other and sort out the differences. This method involves dangers of spreading ill will against each other and should be used with caution. In this method the parties get a chance to understand their differences, the procedure to resolve the conflict and their roles in resolving conflict. For example, the removal of Cyrus Mistry from the post of chairman of Tata group lead to a confrontation between Tata and Cyrus in the media. It helped

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understand their perception of conflict and deliberate on the friction. This helps identify the real reason for the conflict.

4. Problem solving- in this method the focus is on transforming the negative feelings of discontent and frustration by diverting energy towards creativity. The manager plays the role of communicator who recognises the conflict among the parties, their relationship and feelings. The management may engage an insider consultant to assist the two conflicting parties to identify the conflict and mutually decide a solution to remedy the situation.

5. Conflict stimulation- this strategy is based on the assumption that moderate level of conflict is essential for existence of creativity and innovation. The tactics involved in this strategy are

   a. Communication- manager can send threatening messages to the groups involved in conflict with each other to stimulate the conflict. Messages may include threats to downsize. However, planting such messages in the communication network should be done diligently to stimulate conflict.

   b. Encouraging competition- Conflict can be utilised to encourage healthy competition among the groups and individuals in the organisation. Additionally incentive schemes, bonus or awards can act as motivators for outstanding performance in this competition.

   c. Bringing in new employees- addition of new employees to the existing groups at workplace having different attitude, beliefs, background and values can enhance disequilibrium or conflict. This disturbance because of disequilibrium will cause members to struggle for new equilibrium.

   d. Restructuring the organisation- the management can restructure the organisation- its rules or practices to increase the inter-dependence among the groups. This will help in stimulating conflict, disturb the status quo and demand adjustments.

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IN-TEXT QUESTIONS

9. Which of the following is not the adverse impact of conflict

   (a) stress and tension (b) enhance creativity (c) resignation (d) weakness for organisation

10. Avoidance of conflict is suitable for

    (a) insignificant matters (b) significant and important matters

11. An individual experiencing conflict due to discriminatory treatment given by his colleagues, experiences (a) inter-individual conflict (b) intra-individual conflict

12. Conflict is a (a) dynamic process (b) static process

8.6 EMPLOYEE ENGAGEMENT

8.6.1 Introduction and understanding of employee engagement

With growing competition, globalisation, uncertain economic conditions, demand for talented workforce, the need for employee engagement is gaining significance. Engaged employees are committed, passionate and attached to their jobs. They help increase productivity, attain organisational goals and provide competitive advantage to the organisation. It is an important aspect of employer-employee relationship where leadership plays an important role. Employees, in general experience three levels of engagement- engaged, not engaged or disengaged. Engaged employees are those who work with passion towards organisational goals, not engaged employees are those who participate in work but without passion and energy while disengaged employees are those who are unhappy with work and display incomplete role performance. Clearly maintaining engaged employees is essential to avoid situations of job hopping, absenteeism, labour turnover or even low productivity. Engagement helps increase morale, loyalty, motivation of workforce, greater retention, high level of creativity and better customer service.

Different views were presented by different authors to give an understanding to employee engagement. According to one school a need satisfying approach in the understanding of

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employee engagement is essential. The employees are disengaged when three needs are not satisfied namely- meaningfulness (feeling of achievement), safety (work conditions related to the job) and availability (presence in the job). While the other school suggests a satisfaction-engagement approach. When employee feels exhausted or fatigued or burn out at his job, he may have a negative influence on the team members and may experience individual conflict. Burnout is associated with exhaustion while employee engagement is associated with satisfaction, emotional involvement, participation, enthusiasm and vigour. This approach links the employee engagement with business outcomes (such as productivity, profit and turnover).

According to Durand Crosby, "Employee engagement is described as the degree to which an individual is attentive and absorbed in the performance of his/ her job which in turn leads to fulfilling, positive experience and state of mind. These positive work-related experiences are likely to result in desired work outcome, such as increased commitment to the organisation."

Robinson defined employee engagement as "a positive attitude held by the employee towards the organisation and its value."

Gallup "The term employee engagement refers to an individual's involvement and satisfaction with as well as enthusiasm for work."

8.6.2 Factors affecting employee engagement

Several factors have been identified by researchers which affect the engagement of employees at work. Some such factors are discussed below:

1. Career development – Employee engagement is high in organisations providing opportunities for career advancement. Thus, organisation providing opportunities to learn more skills enhance ability or even knowledge assist the employee to reach their potential. Such organisations are sought by employees seeking career advancement and employers can retain them through training and development.

2. Leadership – Engaged workers seek leaders who recognise their effort and work and encourage them to reach their potential. A leader should be a visionary, influencer, good communicator and future oriented. He should involve the employees in the process of decision making, articulation of vision and maintain good leader member exchange to ensure engagement. Effective leader should positively consider feedback from employees to ensure participation and engagement.

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3. Effective management of talent – There is diversity in talent of the employees engaged in the organisation due to job requirement, task demand or individual factors. Engaged organisation recognise the diversity in talent and skill and encourage each individual employee to reach a higher vision of themselves. They provide training or skill development workshops to ensure continuous development of talent required to fulfil task in turbulent situations. For example, with initiation of AI, banks are training staff to understand the use and advantages associated with AI enabled banking solutions.

4. Clarity of company values, policies and practices – In order to engage employees, there needs to be clarity of values, policies and practice to ensure the trust of employees in the system. If values or policies are ambiguous, employees may feel a biased treatment towards them. Thus, clarity of values and practices is essential to gain trust of the employee and engage him.

5. Equal opportunity and fair treatment- There is high employee engagement when they are treated equally, fairly and justly. Thus, employer must ensure equal opportunity for career advancement, training, promotion and fairness in pay, performance evaluation and entitlement to leave. In cases on inequity or discriminatory treatment, employees would show withdrawal symptoms and hence disengagement.

6. Communication- Effective upward and downward communication ensures good relations between employer and employee as instructions pass easily and feedback is accepted well. Open door policy in context of communication plays a significant role in employee engagement. When the employee understands the policies, instructions and rules, he performs better in comparison to a situation when he is lacks the understanding.

7. Quality of work relationships with peers, supervisors and subordinates – The relation shared with colleagues whether supervisors, subordinates or peers determines engagement level in the organisation. An employee sharing friendly, transparent, cooperative relation with peers, supervisor or subordinate will encounter higher level of engagement. On the other hand, employees experiencing exhaustion or strained relations may experience low level of engagement. Thus, it becomes essential for management to maintain good quality of human relations with personnel.

8. Performance appraisal- A just, objective and unbiased evaluation of performance of employees can retain high level of engagement in the employees. A clearly defined and transparent performance evaluation mechanism can increase commitment and participation of employees. While a biased system of performance appraisal may give

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rise to dissatisfaction and grievance leading to withdrawal from participation and involvement.

9. Pay and benefits- An appropriate mix of monetary and non-monetary benefit would ensure engagement of employees in the life of the organisation. Employer should strike a balance between work done and compensation rewarded. When pay is directly related to work, the worker would stay motivated to work. Any ambiguity or inequity in pay and benefits may be a cause of disengagement among the employees.

10. Health and Safety – Ensuring health and safety of employees at work can increase the levels of engagement. Thus, working conditions, compensation for accidents during the course of work, reasonable work hours, installation of precautionary measures, insurance policy ensure engagement of employees. Employees exhibiting low level of engagement might be exposed to higher level of risk of health and safety.

11. Job satisfaction- Satisfied employees are more inclined to express high level of engagement and involvement. Dissatisfied employees slowly disengage from the organisation life. Thus, organisations must ensure proper work-life balance and integration of individual goals with the organisation goals.

IN-TEXT QUESTIONS

13. Which of the following is not a need in the understanding of employee engagement (a) meaningfulness (2) burnout (3) availability (4) safety

14. Employee engagement can be linked to _____

15. A disengaged worker is one who is (a) attached to the job (b) unhappy with the work (c) not passionate about his work.

16. Not Engaged worker lacks (a) energy and passion for work (b) will work (c) skills for work.

8.7 INTERNATIONAL DIMENSIONS OF HRM

8.7.1 Understanding the International HRM- with the mobility of human resources and globalisation, business expands beyond their domestic boundaries to provide goods and services to people spread in different geographic locations belonging to different culture with

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demand. Organisations going global manage human resource not only in their domestic boundary (parent country) but also in host country and other countries (who may be the suppliers of human resources). HRM involves the functions of recruitment, selection, training, development, compensation, when organisations are operating only in parent country. These functions in case of international HRM would be performed in three countries- parent, host and other countries. Thus, international HRM is the interplay among the three dimensions namely, human resource activities, types of employees and countries of operation.

International HRM involves broader functions than domestic HRM. International HRM can be distinguished from domestic HRM on the following points:

1. Broader HR activities – International HRM involves an understanding of international taxation, international relocation, orientation, relations with host government, dealing with expatriates.
2. Different tax laws – Expatriates working in a country other than home country is faced with different tax structures. The HR department is required to design the compensation such that there is no tax incentive or disincentive. The tax liability usually arises when the task/ project is complete. Thus, designing suitable compensation plan is essential.
3. International relocation and orientation – challenges such as pre-travel training, immigration, housing, medical, travel details, relocation allowance, international allowance, etc. need to be worked out.
4. Host-Government relations – Its essential to maintain relations with host country as parent country would need work permits, clearance to set up business, etc. The compliance with legal framework of host country is essential for operation of business in countries other than parent country.
5. Extensive involvement of HR personnel in personal life of employee – The HR personnel may need family details to arrange family visa for relocation or may be required to constantly explain the housing/ medical facilities extended by employer or may need to arrange schooling if employee is posted in remote areas. Thus, the scope of functions of HR department may expand.
6. Risk – There is a risk that the employee may not be able to settle in the foreign country and may want to return back to its parent country. In such cases the cost of relocation may be huge, and the employer may have to bear the loss of such failed experiment. Additionally, the risk due to terrorism, virus or economic uncertainty can also be

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immense. It is the responsibility of HR department to place the right candidate on a foreign project/ assignment.

7. Cultural Environment – when people are posted in a foreign country, they might experience a cultural shock. It happens when an individual stays away from his culture and slowly appreciates a different culture where he witnesses different beliefs, attitude and value system.

IN-TEXT QUESTIONS

17. International HRM involves operation in (a) parent country (b) host country (c) other countries supplying human resources (d) all of the above

18. International HRM involves interplay of ____

19. Which of the following is an argument for International HRM being distinct from domestic HRM (a) relations with host country's government (b) selection (c) planning the quantity of HRM required

8.8 SUMMARY

This chapter is an eye opener for both employees and employers as generally employers focus on organisational goals and ignore employee centric issues of grievance, conflict and engagement. Any employee can be suitably motivated if his employer can satisfactorily redress his grievance, maintain the discipline, resolve conflict and engage employee at different stages of management process. This understanding can create harmonious relations between employer and employee and benefit the organisation by enhancing the quality of work. The understanding of different aspects of International HRM can help the reader to appreciate the importance of this arena.

8.9 GLOSSARY

Grievance: any real or imaginary feeling of personal injustice which an employee has concerning his employment relationship.

Discipline: orderly behaviour of employees for the achievement of goals of the organisation.

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Conflict: the appearance of difference.

Employee engagement: an individual's involvement and satisfaction from work.

International HRM: the interplay among the three dimensions namely, human resource activities, types of employees and countries of operation

8.10 ANSWERS TO IN-TEXT QUESTIONS

1. All of the above	11. Inter- individual conflict
2. Family issues	12. Dynamic process
3. Implied	13. Burnout
4. False	14. Business Outcome
5. True	15. Unhappy with the work
6. Chaos or disorder	16. Energy and passion for work
7. True	17. All of the above
8. Prevention of indiscipline	18. Human resource activities, types of employees and countries of operation
9. Enhance creativity	19. Relations with host country's government
10. Insignificant matters	

8.11 SELF-ASSESSMENT QUESTIONS

1. Harsha, manager of ABC perceives that only inter individual conflict can occur in an organisation. Comment on the above statement and discuss the modes of handling conflict.
2. Engagement of employees is receiving attention today. Explain the concept of employee engagement and the factors affecting employee engagement.
3. Discuss the causes of Grievance and the importance of handling grievance.
4. Explain the concept of International HRM, its need and the difference between domestic HRM and International HRM.

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5. Molie, is a HR manager proposed to be transferred to a newly opened company branch located in Singapore. Molie feels that her Indian experience of handling HR is sufficient to meet the new challenges in Singapore. Explain on your understanding of International HRM, the preparation that might be required in comparison to traditional HRM.

6. Samie an engineer and Anshu a sales representative is working on a launch of new product. But they seem to have differences in ideas on promotion, highlighting product USP, launch event, etc. Because of this difference there is a delay in submission of draft launch proposal to the CEO. The project head is faced with the issue of resolution of conflict between the two. Suggest ways in which conflict can be resolved.

7. Manu is an HR executive who is appointed to revise and review the disciplinary policy in Timmy Ltd. This is his first just assignment, and he seeks your advice on the principles for drafting a disciplinary policy.

8. Priya and Shashi are colleagues and are discussing their dissatisfaction associated with workplace which includes non-recognition, discriminatory leave policy, no maternity benefits, etc. They perceive that there is no platform to voice their feelings and have started to look for better jobs. Explain to both of them, the concept of grievance, causes and importance.

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LESSON 1

COMMUNICATION IN ORGANISATIONS

STRUCTURE

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1.1 LEARNING OBJECTIVES

After a thorough reading of the lesson, you will be able to:

- ✓ Understand the importance of communication in business environment.
- ✓ Define communication and describe the process of communication.
- ✓ Understand the seven key characteristics of effective communication, also known as the 7Cs of communication.
- ✓ Appreciate the importance of listening.
- ✓ Identify and appreciate verbal, non-verbal and presentation skills.
- ✓ Identify and appreciate the key legal issues involved in communication.

1.2 INTRODUCTION

Communication is the most frequent activity that we engage in throughout our lives. Even the most challenging tasks can be accomplished with effective communication and therefore, it is an indispensable asset to have irrespective of the domain that one operates in. In this lesson, we will learn about communication and how it is used in the context of a business organisation.

We will start with an understanding of communication in the business environment, the basics of communication and the 7Cs of effective communication. This will be followed by a discussion on the basics of corporate communication and communication skills, including listening, verbal, non-verbal and presentation skills. We will conclude the lesson with a discussion on the legal issues involved in communication.

As you go through the lesson, you will be able to relate to how exactly the communication process takes place in your institution or workplace. You will learn to better comprehend the messages that you receive from business organisations and also critically examine the quality of the content and delivery.

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1.3 INTRODUCTION TO BUSINESS ENVIRONMENT AND COMMUNICATION

Business environment refers to the internal and external factors that affect the functioning of an organisation. These internal and external things play-out in an organisation on a continuous basis and need to be addressed to maintain smooth operations. Communication is the mechanism which ensures that an organisation keeps functioning smoothly within the business environment. Therefore, communication permeates an organisation.

A business organisation is driven by communication to such an extent that its very success and failure would hinge upon the effectiveness and seamlessness of communication. It is true of both internal communications happening within the organisation, as well as external communication with its clients, customers, suppliers, competitors, regulatory agencies, business associates, the government, etc.

1.3.1 What is communication?

The word is derived from *communicare* in Latin, which means 'to share' or 'make common'. Communication can be defined in many ways. Some define it as the process of sharing and understanding meaning (Pearson & Nelson, 2000) and others use a more mathematical definition that views communication as a process of coding and decoding messages. Using a blend of the various definitions of communication, the process of communication can be depicted as below.

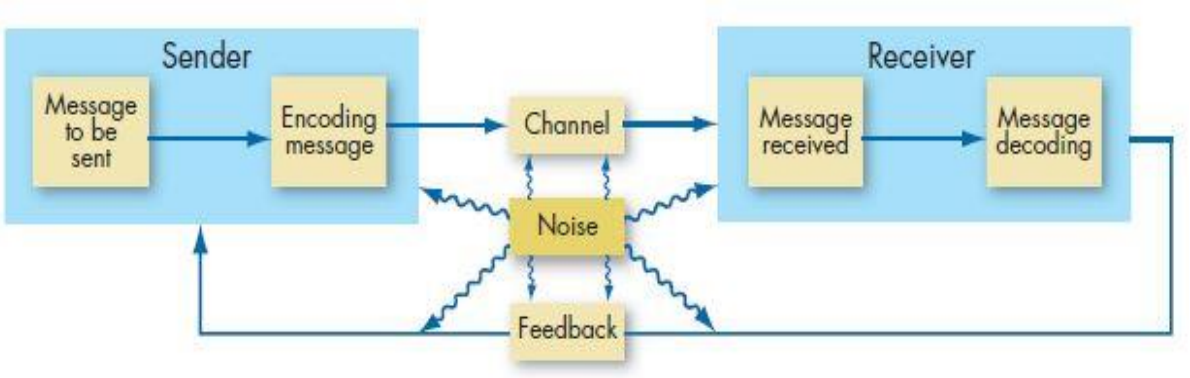

Fig 1.1: The Communication Process *(Source: https://www.papertyari.com/)*

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The definition given by Pearson & Nelson is a practical one and intuitive. Let us try to break it down to have more clarity on the keywords appearing in the definition.

✓ **Process**

Communication is a "process" which means that some activities are involved in it, including arranging your thoughts, coding your thoughts into signs, symbols, and words, sending out the coded message through a channel and receiving feedback from the receiver. At the other end, the received message is decoded by the receiver who, in turn, encodes the feedback and sends it out. The process of communication is influenced by many factors, including the context, language, audience, age group, etc.

✓ **Sharing**

You would agree that it is difficult to share your thoughts and ideas exactly as they originate in your mind. A process of coding and decoding is required for sharing the same. Language, signs, symbols, sounds, etc. help us in sharing our thoughts, feelings and ideas. You can see that sharing of thoughts, ideas, feelings, etc. is the primary purpose of communication.

✓ **Understanding**

Understanding refers to the process of interpreting or decoding the message by relating it to the knowledge possessed by the receiver. If the communication does not lead to understanding for the receiver, it is not communication at all.

Two hunters are out in the woods when one of them collapses. He's not breathing and his eyes are glazed. The other guy whips out his cell phone and calls 911.
"I think my friend is dead!" he yells. "What can I do?" The operator says, "Calm down. First, let's make sure he's dead."
There's a silence, then a shot. Back on the phone, the guy says, "OK, now what?"

Source: Reader's Digest

✓ **Meaning**

Meaning refers to what is being shared through communication. As you will see later, context has a lot to do with meaning. The same words may mean different things in different

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cultures. For instance, bike is a term used for bicycles in the US whereas a bike taken to mean a motorbike in India.

1.3.2 Basics of Communication

From the discussion so far, it is clear that the purpose of communication is to exchange ideas, thoughts and information, express feelings and to influence. Now let us list out the components of communication that will help you develop a deeper understanding of the process. The components can be identified using the mathematical model of communication referred to above and are listed below.

- ✓ **Source or Sender**

Source is where the idea / through / feeling / etc. originates and is coded into a message. So, the sender decides on what to share, how much to share and how to share. How well the message is articulated will depend on many factors, such as the knowledge / level of intellect, language skills, psychological state, level of preparation, etc. of the sender.

- ✓ **Message**

Message is an embodiment of the idea or thought and the meaning intended to be conveyed to the receiver. The message is codified by using language, signs and symbols, etc. whether spoken, non-verbal or written. The manner in which the message is delivered is also of great importance as it may turn the literal meaning of the message on its head.

For instance, if you tell your boss that you are very enthusiastic about additional work with your head down and avoiding eye contact it would most certainly be taken the other way by him.

- ✓ **Channel / Medium**

The channel or medium of communication refers to the delivery method which is used by the sender. The sender can select the spoken channel or the written channel or the non-verbal channel based on the importance of the message, sensitivity, context, etc.

Some common spoken channels are – face-to-face conversations, telephonic conversations, radio and television broadcasts, conference calls over the Internet, etc.

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Whereas the popular written channels are – letters, emails, memorandums, newspapers, mobile application-based chats, messages sent on social networking sites, press releases, etc.

✓ **Receiver**

The receiver is the other party in the communication process who receives and decodes the message. One of the major challenges in communication occurs because the sender has little control on whether the message will be interpreted in the manner intended by him. However, the sender must analyse her audience or the receiver before deciding on the choice of words, language, tone, etc. to increase the probability of the message being received and interpreted in the intended manner.

✓ **Feedback**

The response, whether intentional or unintentional, to the sender's message constitutes feedback. The feedback is a message in itself composed by the receiver and sent back to the source. Feedback can be verbal or non-verbal. The feedback tells you how well the meaning of your message was understood by your audience. Therefore, with an increase in feedback, the effectiveness of communication increases. Due to this, feedback is considered to be one of the most critical aspects of communication.

✓ **Environment**

Environment refers to the ambience in which the communication takes place which can be both physical as well as psychological. For instance, if you are in a modern-day café that plays loud music there is no way you can have a serious business negotiation. Therefore, it is important for you as a communicator to decide the place of communication to ensure that it is effective and successful.

✓ **Context**

The setting, situation, occasion, culture, timing, nature of relationship between the parties, etc. constitutes the context, which is the turf, so to speak, on which the communication takes place. You must remember that communication does not take place in vacuum, there is always a background and variables involved that complicate things in terms of expectations. For instance, if you meet a business associate at a funeral you will refrain from discussing business in front of the gathering, as the social context is inappropriate for it.

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We can see that context dominates what people would come to expect from each other and what would be considered appropriate and acceptable behaviour.

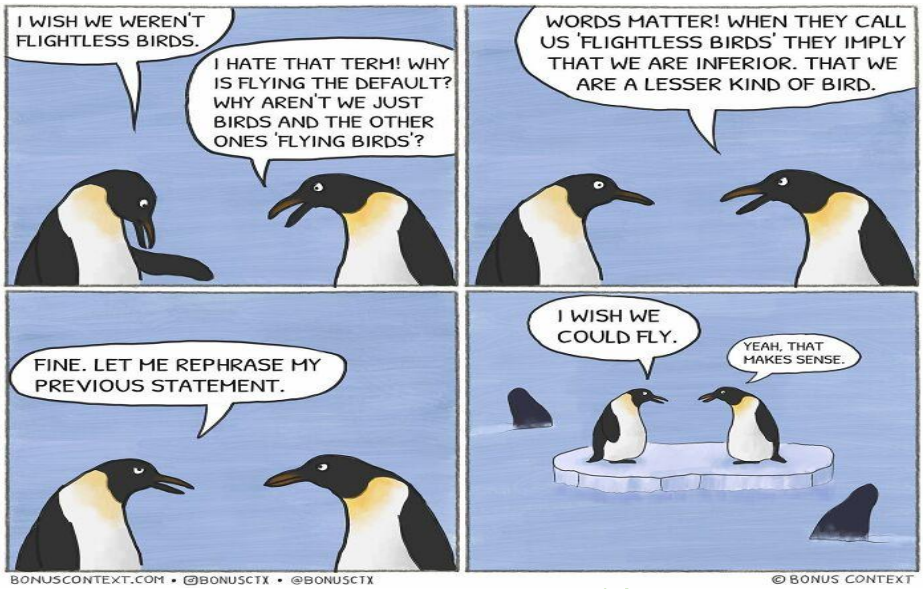

Fig 1.2: Importance of Context in Communication *(Source: https://www.boredpanda.com/)*

✓ **Noise**

Anything that acts as an obstacle to communication, thereby leading to distortion in the understanding of meaning as intended by the sender is called noise. Noise can come from various sources, including the sender's psychological state, the ambient environment and the receiver's perceptive biases, etc.

IN-TEXT QUESTIONS

1. Which of the following is not a key component of the process of communication?
   a) Encoding messages b) Decoding messages
   c) Interrupting d) Feedback
2. The _____ of communication refers to the delivery method which is used by the sender.
   a) Sender b) Receiver
   c) Channel / Medium d) Message
3. Feedback can be both intentional as well as unintentional. True / False

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1.4 SEVEN Cs OF COMMUNICATION

We communicate with people all the time whether it is with family, friends, colleagues, clients, and so on. It can hardly be taken for granted. The seven Cs of communication are a set of seven principles that your communication must follow in order to be effective. You can think of the 7Cs as a checklist of seven characteristics that your communication or message must possess to communicate successfully. Let us get down to each of these 7Cs and study what they mean.

i. Clear

Your message should be clear without any room for subjective interpretation by the receiver. It means that it should not leave room for your audience to read between the lines and misunderstand. No beating about the bush, get straight to the point. The best thing to do is to introduce only the bare minimum number of ideas in a sentence.

Clarity is all the more important in business communication as the same message may be relayed across media. For instance, say, a bank is initiating a drive to update the Know Your Customer (KYC) details of the account holders whose accounts have been lying dormant for more than a year. The following notification is sent out through text messaging:

Dear Account Holder, Please update your Know Your Customer (KYC) details to avoid temporary suspension of your accounts. XYZ Bank Ltd.

If the message does not indicate that it is meant only for the account holders whose accounts are dormant, the bank will be flooded with calls and branch visits. Even if the message is sent only to those with dormant accounts, still it may reach the other account holders through word-of-mouth and panic may still set it as the message itself is not clear. It will not only cause great inconvenience to the millions of account holders of the bank but also to the officials of the bank. Therefore, we can see that a lack of clarity in business

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communication can potentially lead to misunderstanding, unhappy clients, resentment among employees and heavy costs for reversing the damage.

ii. Concise

The message has to be brief and to the point, however it should not be at the cost of leaving out important information. You can do it by following the strategies given below.

- Avoid repetition of information. If you have already mentioned something, there is no need to repeat the same as it will not add any value to the message. It will only end up making the message long-winded.
- Weed-out any unnecessary sentences and "fillers" from the message, the removal of which will not cause any loss of meaning.

iii. Concrete

The message should be concrete which means that it should have all necessary details presented in a focussed manner readily consumable and easily understood. In other words, the message should be solid in content without compromising on details. There is no room for embellished, flowery language in a concrete message.

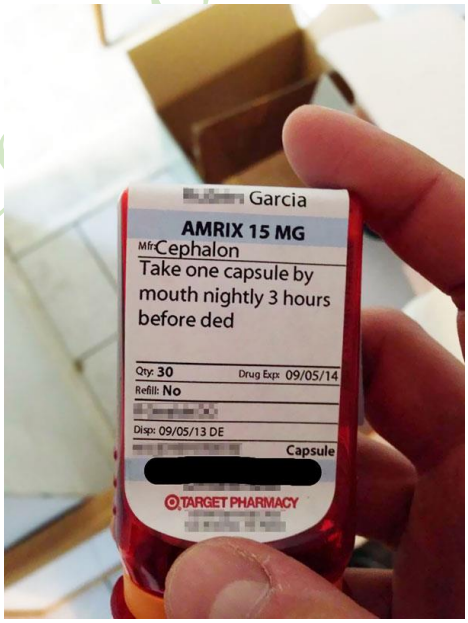

Fig. 1.3: Why Correctness Matters in Communication *(Source: From the Internet)*

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iv. Correct

The message should be factually correct and free from errors in order to be effective. Correctness implies correct in terms of facts and language. This principle of effective communication is most obvious and self-explanatory and therefore, does not require further elaboration.

v. Coherent

The message should be composed in a logical fashion to make it easily comprehensible to the receiver. It is important as the receiver may not have any interest whatsoever in putting together the pieces of information in a poorly composed message. In "The Adventure of Wisteria Lodge" by Sir Arthur Conan Doyle, Sherlock Holmes gives a very interesting advice to John Scott Eccles, his client in the story, which goes like this:

> "Come, come, sir," said Holmes, laughing. "You are like my friend, Dr. Watson, who has a bad habit of telling his stories wrong end foremost. Please arrange your thoughts and let me know, in their due sequence, exactly what those events are which have sent you out unbrushed and unkempt, with dress boots and waistcoat buttoned awry, in search of advice and assistance."
>
> *Extracted from the short story "The Adventure of Wisteria Lodge" by Sir Arthur Conan Doyle*

The above advice is a perfect one as it beautifully addresses the concept of coherence of messages in communication.

vi. Complete

The message has to be complete in all respects to convey the intended meaning. This characteristic will ensure minimum follow-up questions. It will also help the receiver to immediately swing into required action, if any. For instance, a recruitment notification to be published in newspapers needs to be complete in all respects to enable interested candidates to prepare their applications without the need for any clarifications.

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vii. Courteous

Your message should be polite and positive, giving due consideration to the receiver. It is important, for it impacts the receptivity of your target audience. A courteous message will always be embraced by the receiver as it is open and candid. Therefore, a conscious effort has to be made to avoid a confrontationist tone and adopt an empathetic tone to be effective while communicating.

IN-TEXT QUESTIONS

4. In order to make your message concise, which strategy will you use?

   a) Avoid repetition of information b) Weed-out fillers
   c) Both (a) and (b) d) None

5. Which of the following is not a part of 7Cs of communication?

   a) Coordination b) Courtesy
   c) Correctness d) Coherence

1.5 CORPORATE COMMUNICATION

Corporate communication refers to the activity of an organisation communicating with its internal and external stakeholders. A business organisation functions in a highly dynamic and competitive environment. It has to kindle the interest of its target customers in its products and services and carve-out a space for itself in the market to remain profitable and grow overtime. It should have the ability to outwit your competitors.

On the other hand, an organisation has the rather difficult task of keeping its workforce motivated enough to keep productivity high and attrition low. All this requires continuous engagement with internal and external stakeholders through effective communication. The major internal and external stakeholders are depicted in the image below.

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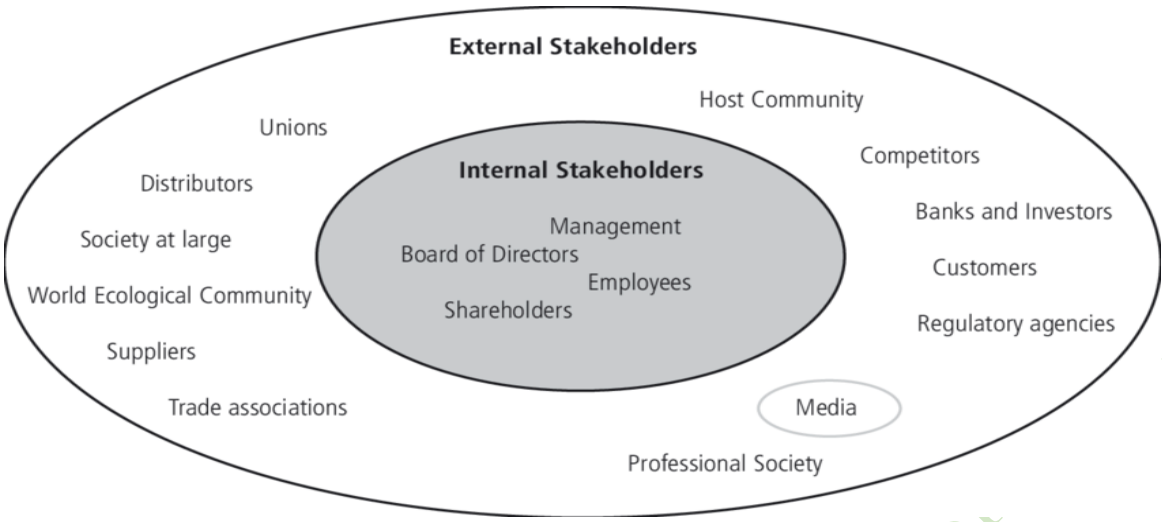

Source: Mark-Herbert, Cecilia & Carolina, Herbert &Schantz, Von. (2007)

Fig. 1.4 A Model of the Internal and External Stakeholders in Corporate Communication

The medium and instrument of corporate communication would vary depending upon the target and the objective which is to be achieved through the communication effort.

1.5.1 Functions of a Corporate Communications Department

There is a wide variety of communication activities for which the corporate communications department is responsible. These activities can be better understood if we group them based on the purpose. Accordingly, the major functions have been classified below.

✓ **Public Relations (PR)**

PR is a broad term that refers to how a business communicates with the public in general, including the media. As a part of the PR function, the communications professionals will be responsible for investor relations, media relations and so on. The activities undertaken by PR professionals include organising press conferences, planning and executing product launch events, drafting and circulating press releases, liaising with the media and other agencies, etc. The PR communication exercise involves regular communication of the major and minor events pertaining to the company through proper channels so as to help generate a favourable public opinion about the brand.

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✓ **Communication during Crisis**

The strategic communication steps that a company takes at the time of a crisis which can potentially damage the reputation and the brand value of the company. Any unanticipated event with the potential to cause damage to the organisation requires swift response to minimize the damage or to prevent the damage from occurring. Such unanticipated events include factory / workplace accidents, product defects, oil / chemical spills, frauds involving a company, etc.

CASE STUDY

A Case of Duplicate Venue Booking

A leading exhibition venue provider in India was startled to discover that the halls inside the venue had been leased out to two different event organisers, namely A Ltd. and B Ltd., for the same dates. At the time of discovery of this mistake, the event dates were less than four months away. This was a case of duplicate booking and there was no way two events could be held in the same exhibition halls on the same dates.

Both event organisers were given allotment letters around two years earlier for the same dates and they had started with their respective publicity campaigns. They had even finalised the participation and allotment of booths to individual exhibitors.

When this error was discovered by a junior officer of the venue provider, he immediately informed the matter to his reporting manager and quickly the matter was escalated to the senior management. The management of the venue immediately constituted a crisis management team of four seasoned officers to deal with the crisis.

The team convened an internal meeting to deliberate upon the matter and develop a strategy for dealing with the crisis. The very first decision by the team was that the issue had to be communicated to both event organisers without losing any time. This would be followed by negotiations with the organisers to persuade one of them to consider changing the dates of the event. Breaking this development to the organisers was a challenge and the medium of communication for the same had to be chosen carefully. Written communication in the form of email or letter or even communication through telephone was ruled out, as it would have been perceived by the event organisers as an indifferent

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approach to the crisis by the venue provider. The crisis management team agreed that it would be best to invite the two event organisers separately for in-person meetings to communicate the same.

During the meeting, event organisers were very upset as their events were in serious jeopardy. The venue team acknowledged the error and assured of all support and cooperation to deal with the issue. Both organisers were requested to consider changing the dates of the exhibition. However, none of them agreed and A Ltd. even threatened to take the matter to court.

After the initial meetings, the crisis team realised that since one of the two would get to keep the originally booked dates, it would be best to pursue the matter with B Ltd. as A Ltd. was already thinking of filing a lawsuit. Meanwhile, to prevent the latter from filing a lawsuit, a formal communication was immediately sent by the venue team giving assurance of a swift resolution of the matter. The same day, the crisis team invited B Ltd. for another meeting to understand if there were any circumstances under which they would consider rescheduling the event.

The crisis team had a series of meetings with B Ltd. at various levels and it got inkling that the event being organised by B Ltd. did not have enough participation as expected. The crisis team immediately formulated a strategy and went back to the management to consider offering a 25 percent discount on the venue rentals to B Ltd. and becoming a sponsor of the event in return for rescheduling the event. The sponsorship from the venue provider was much valued in the industry. The management empowered the team to negotiate with B Ltd. on similar lines and to issue a joint statement for rescheduling of the event.

With this leverage, the crisis team again communicated in-person with the management of B Ltd. and made the offer. The crisis team also advised that the change of dates of the event can be jointly announced in a press conference by the Venue provider and the event organiser. With this kind of support from the venue provider and the offer of joint communication, B Ltd. realised that it would be much easier to persuade its stakeholders for change of dates. B Ltd. was reassured with the gesture of the venue provider to take the onus and ownership of the mistake and support it in a crisis situation.

In order to complete the deal and prevent a change of mind by B Ltd., the crisis team

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immediately engaged the Legal team of the venue and formalised the legal contract. As soon as the contract was signed, A Ltd. was informed that their allotment was unchanged and that their cooperation was appreciated. A press conference was soon arranged and the venue provider and event organiser jointly addressed the media and assured the industry that the event will be strengthened with the on-boarding of the venue as a sponsor and that the event will turn out to be a resounding success.

The venue provider constituted another team from the operations and IT departments to fix the loopholes in the booking system to prevent such instance of duplicate bookings in the future.

Discuss the key learning from the above case.

✓ **Marketing / Customer / Client Communications**

Though marketing communication is considered to be in the realm of marketing department in most companies, corporate communication function does involve engagement with the customers by means of strategic marketing content developed in collaboration with the marketing departments. Such content includes brochures, flyers, newsletters, posting content on social media platforms, and blogs, etc. So, it involves directly communicating with your customers and clients to create a favourable image of your brand and instigate desired behaviour.

✓ **Internal Communication**

The role of the corporate communication department in internal communication is to sensitise the employees with the latest developments and decisions taken in the company, create literature for use by the employees, conduct training sessions and manage the internal publications of a company. Internal communication is a small part of the overall corporate communication function as a majority of the work is focussed on communication with the external stakeholders.

1.5.2 Tools of Corporate Communication

✓ **The Written Mode**

It is the most commonly used corporate communication strategy and can take the form of reports (both internal and external), press releases, emails, advertisements,

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advertorials, memorandums, notices, website, blogs and promotional materials. The written mode tends to be more formal and requires careful planning and strategizing before it is released to the intended audience.

✓ **Spoken Mode**

It consists of press conferences, conference calls, meetings, seminars, symposiums, interviews, panel discussions, televised messages, and television commercials (TVCs), etc. The spoken mode requires a lot more preparation and trained people for execution.

✓ **Non-Verbal Communication**

In the context of corporate communication, non-verbal or non-spoken communication refers to the posting of infographics, photographs and other such illustrations. Such communication is typically delivered through the digital medium. For instance, an automobile manufacturer posting pictures of its newly launched SUV from an off-roading event is an example of non-spoken communication.

IN-TEXT QUESTIONS

6. In the context of corporate communication, which of the following is not an external stakeholder?
   a) Shareholder b) Customer
   c) Supplier d) Regulator
7. Which of the following is not a function of the corporate communications department?
   a) Public Relations b) Accounting
   c) Marketing Communications d) Internal Communication

1.6 LISTENING SKILLS

In the communication process, listening refers to the act of receiving and interpreting messages sent by the source or sender. You must distinguish between listening and hearing before we proceed further. Hearing is just the ability to perceive sound by means of receiving vibrations through the ears and is confined to your sense of receiving the stimulus of sound. Whereas, listening involves being attentive to what is being communicated and to hear with a

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conscious mind to interpret the message for a complete understanding of the same. You may note that your mind is constantly active when you are listening to something.

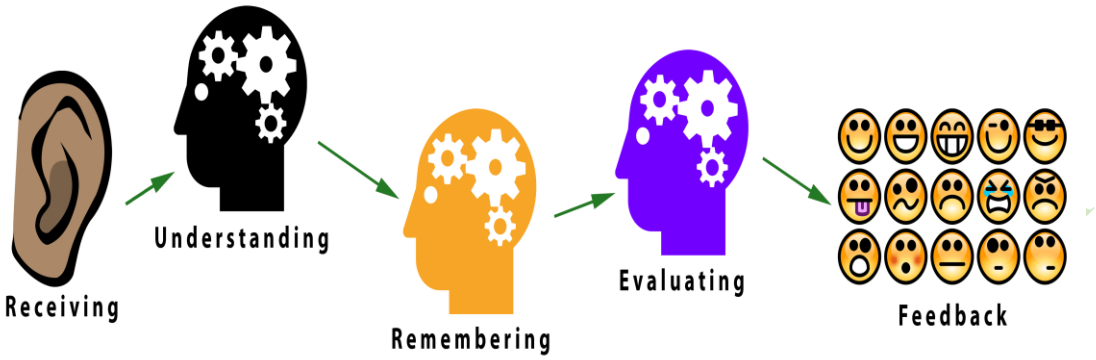

Fig 1.5: Stages of Listening *(Source: http://kell.indstate.edu)*

1.6.1 Stages of Listening

a. Receiving

The first stage involves merely hearing the message of the speaker by focusing on the sounds coming from the source and filtering out the other noises. At this stage, as depicted in the figure above, only your ears are involved.

b. Understanding

This is the most critical stage of the listening process as there are so many factors involved which can potentially distort understanding of the message. It may be due to language issues, differences in knowledge level, use of jargons, etc.

c. Remembering

At this stage, you will try to memorise some of the key details mentioned in the message to enable you to engage in the communication process.

d. Evaluating

The evaluation stage involves making your value judgement as to the message. Different people will evaluate the same message differently due to differences in perception,

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biases, knowledge levels and so on. In the second, third and fourth stages of listening, the mind is actively involved.

e. Feedback

Feedback is the final stage of the listening process and involves codifying your response into a message and sending it to the source. Please note that feedback "completes" the listening process and without feedback, listening does not mean much.

1.6.2 Listening Skills / Techniques

The ability of paying attention to what the speaker is saying to effectively interpret and understand the message is known as listening skill. Effective listening skills can be cultivated and learnt over time. Some of the techniques used for effective listening are mentioned below.

a. Prepare

In case the communication is a planned one with clarity on the agenda, you must prepare yourself for it by reading from various relevant sources to develop a basic understanding of the subject matter. It will equip you to handle the communication better as you will be in a position to quickly grasp the speaker's messages.

b. Pay attention

Give your full attention to the speaker without being distracted by environmental factors and use non-verbal signals to acknowledge that the message is being received. You can do this by maintaining eye-contact, nodding occasionally and adopting an alert posture.

c. Do not interrupt

You must not interrupt the speaker as it would be perceived as being rude and can send out the signal that you do not value what the speaker is saying. The best thing to do is to wait for the speaker to complete and then seek whatever clarification is required.

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d. Empathize

An effective listener has the quality of being empathetic and considerate towards the speaker. It simply means that you encourage the speaker to share her perspective and then understand the emotions involved. Empathizing with the speaker would invariably have the effect of turning the situation in the positive direction.

e. Ask Questions

Asking questions will help the listener to clarify any doubts or gaps in understanding. It will also let the speaker know that you are actually interested in the conversation and act as an encouragement for him.

f. Refrain from making premature judgement

A good listener would wait and listen patiently before he has enough evidence to make a judgement call. However, jumping to conclusions too early is a characteristic of poor listeners. The issue with jumping to conclusions too early is that the judgement may be completely incorrect. Besides, it can be potentially risky to jump to conclusions and also unfair to the speaker.

g. Feedback

Feedback does two very important things – (a) It shows the speaker that you were indeed listening genuinely, and (b) It helps improve your understanding of the message in the manner that the speaker intends.

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SOME COMMONLY USED PHRASES / STATEMENTS ASSOCIATED WITH ACTIVE LISTENING

"I see what you mean…" OR simply *"I see"*.

"I agree with your assessment…" OR simply *"I agree"*.

"You mentioned that…"

"It is encouraging to hear from you about…"

Citing Similar Experiences: *"I had a similar experience while visiting one of the distributors."*

Paraphrasing: *"So, you think that the increase in interest rates may cause a decline in the credit offtake for the next two quarters"?*

1.6.3 Types of Listening

a. Active Listening

Active listening is the process of listening to the verbal and non-verbal messages and cues of a speaker, asking questions for seeking clarification and providing feedback with the objective of understanding the message by the receiver as intended by the sender. It is the most ideal form of listening.

b. Pseudo-Listening

Pseudo-listening refers to the act of portraying as if one is being attentive in a conversation, whereas in reality he may be completely ignoring what the speaker is saying. It may be because of plain disregard for the topic under discussion or it may be an attempt to deceive the speaker for some vested interest. The mechanism followed in pseudo-listening is to send out non-verbal signals, such as nodding, smiling, etc. to signal that you are attentive.

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c. Selective Listening

Selective listening refers to the filtering of the incoming messages to let in only the part that interests the listener. The listener selects only as much information as he considers relevant for his interests.

d. Insulated Listening

It is the act of avoiding certain information from the communication is known as insulated listening and hence, it the opposite of selective listening.

e. Stage Hogging

Some people seem to be interested only in conveying their own feelings, ideas, etc. in order to be the centre of attraction. This is done by planning interruptions every now and then to hog the limelight.

1.7 VERBAL, NON-VERBAL AND PRESENTATION SKILLS

You must have noticed in your day-to-day life that before you start a conversation with any person, the subconscious mind makes an assessment as to that person's ability or expertise in the matter that you wish to talk about and other aspects, such as cultural background, profession, etc. Accordingly, you will customize and calibrate the message to suit the receiver's capacity to understand the same. Your skill lies in how well you can strategize and customize the message to suit the requirement and ability of the receiver. These skills can be classified into the following three sets: -

1.7.1 Verbal Skills

The use of words, whether spoken or written, for the purpose of sharing information, ideas, thoughts, etc. is known as verbal communication. Some of the key verbal communication skills are listed below.

✓ **Knowledge about your Audience**

Before you start preparing your message you must think about who your target is. Some of the relevant questions that you need to answer for this purpose are – What is the

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cultural background of the target? What language does the target speak? What is the level of education of the target?

The answers to these questions will help you design and plan your communication in a much better way. For instance, if you have been assigned to design a sensitization programme on the vision and mission of your organisation, you will have to develop different modules for, say the executives and the factory workers. It is simply because the two target groups have different level of education and hence require customisation of the content to cater to each group.

✓ **Clarity of Thought**

In order to be an effective communicator, clarity of thought is an attribute that one cannot do without. Before you start speaking or drafting your message, you should be able to clearly recognize the relevant thoughts, understand the importance of each one based on the context and organise them in a logical and interesting fashion to compel the audience to listen or read through the message.

✓ **Articulation**

Closely related to clarity of thought is articulation, which means how clearly the thoughts are expressed in words. Articulate communicators build coherent and concise messages which stand out for their sharpness and focus.

✓ **Intonation and Modulation of Voice**

This particular skill is a great asset for any kind of public speaking, whether it is delivering a speech, speaking in a conference or seminar, delivering a presentation to a potential investor, negotiation meetings, and so on. It lends a sort of musical touch to speech and is a treat for the ears. Intonation is a part of pronunciation and includes attributes, such as accent, stress and cadence. Modulation of voice means to control your voice to make it sound louder, emotional, thrilling, dramatic, and so on.

✓ **Receptivity**

Receptiveness is a skill that is essential for the communicator to understand the point-of-view of the other party and reorient the messages to improve understanding. It means that you have to listen actively to communicate better with your audience. However, receptivity

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should not be confined to the verbal responses or feedback. In fact, the non-verbal signals are equally important, if not more. The non-verbal signals help you recalibrate your communication to prevent the audience from losing interest.

✓ **Engaging the Audience**

Very few communicators have the ability to establish a rapport with their audiences. It is actually a difficult skill to master as every time it will be a different audience and a new setting. Nevertheless, there are many techniques that will help you in connecting with others. Firstly, you have to be genuine and authentic in your communication. Nothing works better than an honest message. Secondly, you must us your body language and gestures to convey that you are open and receptive. You must also read the non-verbal cues of the other party as it is the best feedback you can receive. Thirdly, sharing experiences with your audience helps you connect with them as some of them may have had similar experience and will be able to relate to it.

1.7.2 Non-Verbal Skills

People are quite comfortable when it comes to verbal communication, however, non-verbal communication often takes place at the subconscious level. It is a source of information that tells the observer many important things that even spoken words may not. In this part of the section, we will learn about non-verbal communication skills and how we can interpret them. Let us first look at the types of non-verbal communication.

1.7.2.1 Types and Techniques of Non-Verbal Communication

✓ **Proxemics**

It refers to the study of how people think the physical space around them influences their behaviour and communication. It should be noted here that people from different cultures perceive and use the space around them differently. Further, there is also marked difference in the way people from different cultures use the space between the persons they communicate with. Other factors that influence personal space include setting, gender and individual preferences. The space is classified into the following categories.

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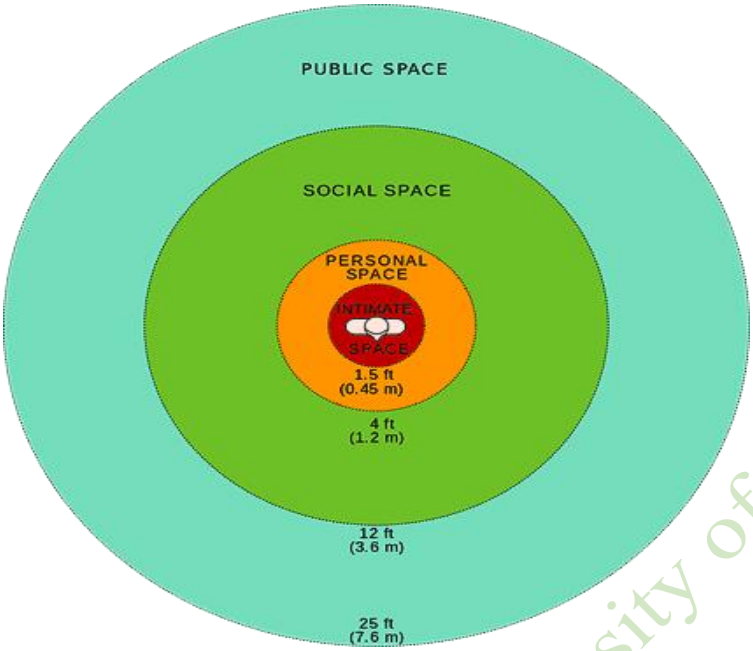

Fig. 1.6: Edward T. Hall's Depiction of Interpersonal Distances of Man*(Source: https://www.researchgate.net)*

- Intimate – For embracing, touching, etc.
- Personal – For communicating with friends and family
- Social – For socialising and communicating with acquaintances
- Public – For public meetings, speeches, etc.

✓ **Body Language**

Body language is one of the most important type of non-verbal communication that includes the following:

Kinesics

It refers to the use of body or facial expressions to convey messages. The different types of kinesics are given below.

- Facial expressions – There are numerous facial expressions that convey some messages or the other. These include smiling, raising eyebrows, winking, etc.
- Gestures – The movements made with hands and other body parts, including head, fingers, arms and legs, etc. are referred to as gestures. Common gestures include the thumbs-up, beckoning gesture, the OK gesture, and so on. You must remember that

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the same gesture can mean very different things in different cultures. For instance, the OK gesture which is used in the Western cultures to indicate that something is very good, whereas in the Arab culture it is a very vulgar gesture.

- Posture – It refers to the way the body is positioned by a person while communicating with his counterpart or his audience. Postures also convey some meaning, for example, the arms akimbo posture is considered as a dominant posture.

Oculesics or Eye Contact

In the field of communication, oculesics refers to the study of eye-contact, duration of eye-contact, intensity, and eye movement. Again, eye contact has different connotations in different cultures. For instance, in the western culture, maintaining eye contact is a sign of honesty and showing interest in communication. Whereas, in eastern and oriental cultures, direct eye contact especially with elders is considered a sign of disrespect or rudeness.

Haptics

In some cultures, touching is also a means of expressing one's feelings. For instance, you pat somebody's back to appreciate his / her achievement. However, as is the case with most types of body language, touching can be taken very differently in different cultures. For instance, the American culture is a "no touch" culture, whereas, in Arab culture, touching your friends is common.

Paralanguage

The non-verbal characteristics of spoken messages is known as paralanguage. In other words, the acoustic features of speech that include tone, modulation of voice, pitch, accent, loudness, etc. are part of paralanguage. It is also known as prosody.

1.7.2.2 How to Interpret Non-Verbal Signals

People use body language all the time consciously or subconsciously. Since these non-verbal signals are very useful for understanding the verbal message, knowledge of how non-verbal signals can be interpreted becomes essential. Given below are some of the strategies for interpreting body language.

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✓ **Observe**

It is quite obvious that observation is key to interpretation of non-verbal signals. It is being reiterated to emphasise that as a communicator, you must develop a habit of keenly observing the postures, gestures, pitch of voice and so on that will help you get a great deal of insight into the other person's state of mind.

✓ **Track the Eye-Movement**

Eye-movement and eye contact convey a great deal of information. During a meeting, if your counterpart keeps looking away, it possibly means that the latter may not be interested. Please remember that paying attention to the eye movement should be in a manner that the other person does not feel uncomfortable. Because the other person may perceive your constant tracking of his / her eye movement as intrusive or even threatening.

✓ **Observe the Posture**

The position in which a person is sitting or standing can tell you something about his interest in what is being said. For instance, if a person is standing in a straight posture it indicates that he is listening and engaged in the conversation.

✓ **Pay Attention to Hand Gestures**

Gestures can be both voluntary and involuntary. For instance, the open palms gesture suggests that the speaker has nothing to hide. Another example is that of clenched hands which may indicate that the person is under stress or angry. As a skilled reader of body language, you will learn to observe these seemingly unimportant things and utilise them to have a successful engagement.

✓ **Pay Attention to Facial Expressions**

Facial expressions are the most commonly used and read non-verbal signals simply because faces are in focus during any conversation. You will notice facial expressions changing often during a conversation. For example, when people are focused and listening intently, their eyebrows are lowered and centred.

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✓ **Observe the Legs and Feet**

You will notice that when people are feeling bored or restless, they tap heir feet on the ground. If you see a person sitting with his legs and arms crossed, it indicates that the person may be creating a barrier with the speaker and may not be very receptive.

1.7.3 Presentation Skills

Making effective presentations is a skill that is essential for survival in the corporate world. Generating great ideas is simply not good enough unless you are able to present it in a manner that is compelling and persuasive to those who matter.

There are two aspects of making great presentations, namely:

a. Planning and putting together great presentations

b. Delivering the presentation

1.7.3.1 Features of an Effective Presentation

✓ **Customised content based on the audience**

The content should be designed based on the understanding level of the audience. In case the content is too difficult, the audience may not understand anything and if it is too simple the audience would not gain anything out of it.

✓ **Brevity**

The content has to be crisp and to the point. The length and detail of the presentation would depend largely on the purpose for which the presentation is taking place. You must also avoid cluttering the slides with text and instead use keywords and images that you can elaborate upon.

✓ **Language to Match the Audience**

The selection of language of the presentation has to be in consonance with what the audience would easily understand. The objective is not to make a superfluous masterpiece out of the presentation but to deliver the point across in an impactful manner.

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✓ **Sequencing of Information**

In order to keep alive the interest of the audience, you must design the slides in a sequential manner, revealing little by little. This will help the audience digressing to the next idea or though in the presentation before completing the present one.

✓ **Sprinkle it with Appropriate Humour**

If used in the right manner, humour can help you establish an instant rapport with the audience. Once a rapport is established, it can be a pretty smooth journey afterwards.

✓ **Delivery**

The delivery has to be in a clear and audible voice with the presenter's body language conveying confidence. The presenter must use voice modulation and intonation to make it appealing to the audience.

1.7.3.2 How to Put Together an Effective Presentation

In order to prepare a good presentation, you need to find answers to five questions. If you can answer these five questions precisely, you can be sure of making an effective presentation.

These questions have been discussed below.

Who?

The question we start with is - who is the target group for whom the presentation is being planned. There are a few more question that logically follow from this, which are listed below:

- ✓ How many people will be attending?
- ✓ What is their age group?
- ✓ What is their education?
- ✓ How aware is the target group about the topic of presentation?
- ✓ What is the nature of relationship between the speaker and the audience?
- ✓ What language is the audience accustomed to?

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The answer to each of the questions above will impact content planning and delivery.

For example, if the audience is a group of school children who are being given a presentation on inflation, the content will be different and if the audience is a group of economists, the content will be entirely different, though the topic of the presentation is the same.

Why?

The reason for making the presentation is the next key question that needs to be answered before planning the content. Is the presentation merely informational or is to introduce a change in an established system that the audience is accustomed to? Or is it a presentation to raise funds from potential investors? The responses to these questions will shape the content further.

Where?

This question looks at issues, such as – Where is the presentation being planned? Is it going to take place at a client's premises? How large is the venue? What are the facilities and visual aids available at the venue? What is the level of ambient noise? How comfortable is the seating? Is there power back-up available? - and so on. The responses to these questions will help you not only plan the content but also arrange the necessary logistics and support for the presentation.

When?

The question here is when or at what time of the day is the presentation scheduled. Is it a single presentation or one of a series of presentations during the course of the day? Is it immediately preceding or post lunch? Is it the first or the last presentation of the day? You will have to be very tactful in planning the content and delivery based on the responses to such questions.

For instance, it has been seen that if your presentation is in the last slot just before the day is going to be over, the audience will already be drained with all the activity during the day and hence you will have to plan the content carefully to not include too many heavy concepts. You may also use appropriate humour to keep the audience's interest alive.

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What?

With this we come to the all-important question of WHAT. It directly addresses the issue of what should the content of the presentation look like. The series of questions that need to be answered to decide the content are –

- ✓ How much detail is required?
- ✓ What will the audience be interested in?
- ✓ Is there something sensitive about the topic that needs to be avoided?
- ✓ What examples will the audience relate to?
- ✓ Will the audience like more visual content?

Once the above questions are answered, you will know what to include and how much to include. The length of the presentation is a critical aspect which calls for a general strategy of developing and keeping multiple presentations on the same topic at readiness, just in case you have to, say cut-short the presentation. In such scenarios, using the same presentation may not be a good strategy.

Therefore, it is advisable to have at least three separate presentations on the same topic of varying lengths. The shortest will have the core ideas that you cannot do without. The middle length will have a little more detail and the longer version will be a comprehensive one with as much detail as possible.

1.7.3.3: - Effective Delivery of a Presentation

- ✓ **Keep Notes**

If it is a lengthy presentation, you will do better with short notes that mention the key ideas that you will be speaking about. Keeping notes handy will help you deliver the presentation in an orderly fashion without having to take long pauses to remember what would come next. You should not feel embarrassed to refer to the notes as generally it is acceptable to use the same. However, it would depend on the situation and the context, on whether your audience would accept you reading from notes. Therefore, if you are expected not to use notes, you should prepare accordingly and speak from memory.

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✓ **Eye Contact**

The best way to connect with your audience is to strike eye-contact with the audience. However, the eye-contact should be with the entire audience and not concentrated towards a particular zone or spot or an individual. It demonstrates your confidence and sincerity with which you are delivering the presentation.

✓ **Dressing for the Occasion**

Your attire will play an important role in how seriously you will be taken by your audience. The best thing to do is to avoid clothes that can potentially distract the attention of the audience. You should also avoid wearing dresses that you do not feel comfortable in, as it may interfere with your focus.

✓ **Voice**

The most important aspect of delivering a presentation is your voice and how you control it. In case there is no public address system or microphones and speakers available, you will have to put in a lot more effort to be loud enough to the entire audience. You must use voice modulation and intonation to your advantage. Intonation and modulation lend a sort of music to your speech which makes it sound much more impressive. You should think of the presentation as a usual conversation that you have with your colleagues. The presenter's job is to convince people and therefore, he must be convinced of himself. Unless you have conviction in what you are saying, you cannot expect the others to get convinced. Another important aspect is the rate of speech. Do not go too fast as your audience may have difficulty in understanding your messages.

✓ **Posture**

Your posture during a presentation should be relaxed and composed. There should not be any stiffness in the body as it would impair your movement and you may not be able to utilise the stage. You should not remain tucked away from the view of your audience behind the lectern. Rather, you should use the space on the stage to your advantage. Moving around the stage, while you deliver the presentation, will make you appear confident and comfortable. It will also help you overcome any nervousness that you may experience.

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✓ **Gestures**

Hand gestures, when used properly and naturally, convey confidence and conviction in what you are communicating. However, overdoing it can often distract the audience and impair understanding. Some things to avoid include keeping your hands inside your trouser pockets, locking them at the back or folding hands as these are closed / defensives gestures and are not considered professionally appropriate.

1.8 LEGAL ISSUES IN COMMUNICATION

Organisations communicate with stakeholders on a routine basis. These stakeholders can be internal as well as external as explained earlier in the lesson. The communication that goes out has to be carefully drafted as the image and goodwill of the organisation are at stake. In fact, the actions and statements of the employees of an organisation may have legal implications. Insensitive and incorrect communication can potentially lead to lawsuits against the company. Litigations can mean huge costs in the terms of money and human resources for businesses. Therefore, an organisation must be serious and diligent about the communication that it has with the stakeholders and the public in general. The employees of an organisation must be trained to act in an informed and responsible manner.

Many aspects of business communication are regulated by law. The enactment of the Right to Information (RTI) Act and several initiatives in the area of corporate governance have ushered in an era of greater transparency and accessibility. This means that internal documents and records can be produced in the court of law and other such forums. Therefore, a sound understanding of the legal framework is essential for business communication to ensure that all communication passes the check on the parameter of legal appropriateness.

Let us get down to the various issues involved in different types of communication and how an organisation can prevent or minimize legal trouble.

a. Marketing Communication

There exist several provisions in the law that cover some aspects of marketing communications. In case of advertising, which is a major medium of marketing communication, there is self-regulation in the form of guidelines for ethical and professional

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conduct. These guidelines have been codified by self-regulatory organisations, such as the Advertising Standards Council of India (ASCI). The guidelines of ASCI are aimed at maintaining legality, decency and truthfulness of advertisements. It ensures that the adverts are in the spirit of fair competitions and not hazardous or malicious in content. Therefore, the crux of the matter is that there should not be any misrepresentation, deception or manipulation of facts in the marketing communications rolled out by a company.

b. Disclaimers

Companies must develop suitable product / service disclosures warning about the risks and dangers of misuse in order to get sufficient protection in the event of misuse or misunderstanding by clients / customers. These disclaimers need to be prominently displayed in advertisements, product packaging and should ideally be a part of the sales pitch. For instance, all toys for children have indication for the age group that it is intended for. The package clearly displays if it is not safe for children below a certain age. You must have noticed the warning at the end of every advertisement of mutual fund which goes like this:

> *"Mutual fund investments are subject to market risks, please read the offer document before investing".*

It is an example of a disclaimer used by the mutual fund companies from the Banking and Financial Services Industry (BFSI).

You will also notice that even in the emails that you receive from companies, at the bottom of the email, there is a disclaimer, which goes something like this:

> *"This Communication is for the exclusive use of the intended recipient(s) and shall not attach any liability on the originator. If you are the addressee, the contents of this email are intended for your use only and it shall not be forwarded to any third party, without first obtaining written authorization from the originator. It may contain information which is confidential and legally privileged and the same shall not be used or dealt with by any third party in any manner whatsoever without the specific consent of the originator".*

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c. Disclosures

Disclosures are made in order to release all relevant information about a particular aspect of business often as a part of regulatory requirement. Several disclosure requirements are a part of financial reporting standards. You must be aware of the mandatory conflict-of-interest disclosure requirement for stock market analysts. There are non-disclosure agreements which are often a part of the contracts between two organisations entering into some sort of business relationship in which one or both of them agrees not to share information outside of the contractual relationship.

d. Financial Reporting

Financial reports are one of the most strictly regulated areas of business communication as it involves presenting of key information about the company to investors, shareholders, regulators and the public in general. Misrepresentation or manipulation of financial information will lead to penalties, criminal proceedings and irreparable damage to the reputation of the company.

e. Intellectual Property Rights (IPR)

There are many types of intellectual properties, including patents, writings, trademarks, etc. Unauthorised infringement of the intellectual property of others will invite litigation. Organisations have to be very careful in the drafting of their communication material so as not to infringe the intellectual property right of others, whether wilful or innocent.

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IN-TEXT QUESTIONS

8. Which of the following refers to the study of eye contact and movement of eyes?
   a) Proxemics b) Haptics
   c) Facial Expression d) Oculesics
9. _____ refers to the study of how people think the physical space around them influences their behaviour and communication.
10. Humour should never be included in presentations as it is unprofessional. True / False
11. Which of the following is not a feature of effective presentations?
    a) Very comprehensive and detailed b) Sequenced flow
    c) Crisp and to the point d) Language to match audience
12. Which of the following will help in effectively delivering a presentation?
    a) Use of gestures b) Maintaining eye contact
    c) Intonation and modulation of voice d) All of these
13. You can interpret non-verbal signals by:
    a) Tracking eye movements b) Observing hand gestures
    c) Observing position of legs and feet d) All of these
14. _____ gives a musical touch to your speech?
    a) Clarity of Thought b) Articulation
    c) Intonation and modulation of voice d) Receptivity
15. Which of the following helps in avoiding particular liability on account of misuse of a product / service?
    a) Disclosure b) Disclaimer
    c) Financial Reporting d) None of these

1.9 SUMMARY

- ✓ Communication is the process of sharing and understanding meaning. The purpose of communication in general is to exchange ideas, thoughts and information, express feelings and to influence.
- ✓ The seven Cs of communication are the characteristics that a message should possess in order to be effective. It says that the message should be clear, concise, coherent, concrete, correct, complete and courteous.

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- ✓ Corporate communication refers to the activity of an organisation communicating with its internal and external stakeholders. The internal stakeholders include the employees, the management and the Board of Directors. The external stakeholders include customers, suppliers, vendors, governments, regulators, professional bodies, trade associations, etc.
- ✓ The functions of corporate communication include – marketing communication, internal communication, public relations and communication during crisis.
- ✓ Listening is the act of receiving and interpreting messages sent by the sender. Listening is different from hearing. Hearing is the ability to perceive sound and is confined to your sense of receiving the stimulus of sound. On the other hand, listening refers to hearing with a conscious mind to interpret the message for a complete understanding.
- ✓ Many aspects of business communication are regulated by law. The marketing communications and the routine communication that an organisation and its employees have with various stakeholders need to be carefully drafted to avoid legal trouble.

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. c	9. Proxemics
2. c	10. False
3. True	11. a
4. c	12. d
5. a	13. d
6. a	14. c
7. b	15. a
8. d	

1.11 SELF-ASSESSMENT QUESTIONS

1. Explain the process of communication.

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2. What are the What are the 7Cs of effective communication?
3. What is corporate communication? Discuss its functions?
4. How important is communication during a crisis? Discuss with an example from the corporate world.
5. What is the difference between hearing and listening? What are the different types of listening?
6. What are the key questions to answer in order to plan and draft an effective presentation?
7. Discuss some of the legal issues involved in communication.

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Unit-2

Written Skills

2.1 Learning Objectives

2.2 Introduction (Writing)

2.3 Writing communication

- 2.3.1 Advantages of writing communication
- 2.3.2 Disadvantages of writing communication
- 2.3.3 Planning Message
- 2.3.4 Executive Different types of messages
- 2.3.5 Different types of messages

2.4 Writing reports

- 2.4.1 Objectives of reports
- 2.4.2 Types of reports
- 2.4.3 format of report writing
- 2.4.4 steps to write a report

2.5 Improving personal writing skills

- 2.5.1 Sentence structure
- 2.5.2 Paragraph construction

2.6 Report Writing

2.7 Summary

2.8 Answers to In-text Questions

2.9 Self-Assessment Questions

2.10 Suggested Readings

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2.1 LEARNING OBJECTIVES

In this chapter we will:

- Engage in writing skills after being introduced with the definition and importance of written communication in detail
- Learn how to Plan and execute messages even before drafting a written message
- Learn about different types of messages
- Know the significance of different types of reports in business world
- Improve our writing skills

2.2 INTRODUCTION

Enhancing one's communication skills is of utmost importance. They can go a long way in helping to prevent many mistakes that one may end up making in a business world. The clear knowledge and understanding of various concepts such as verbal and nonverbal communication, writing formal documents, and even correcting the basics such as sentence structures and grammatical errors, can help build strong business relationships. Lack of theoretical and practical knowledge of written communication can lead to awkward situations. Therefore, proficiency in these aspects is highly required which is the goal of this chapter to be brought forward to the students.

Communication is an activity which cannot be escaped. It is expected that after going through the contents of this unit and the objectives laid down for the students, the students will feel at ease and highly motivated to write clearly and enjoy the learning process throughout. Not only will the various aspects of written communication make the students confident, but they will also be comfortable with writing different styles of writing by the time they reach the end of this unit.

This unit will make the students highly efficient in terms of producing writings which would be complete in all aspects after gaining full knowledge and understanding of the same. The various elements contained in this chapter will aid the student in learning about written communication in depth.

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2.3 Writing Communication

Written communication is a type of verbal communication. It refers to the transfer of messages through the written or printed word. It can be used both formally and informally. Some of the examples of formal written communication are letters, reports, circulars, business proposals, and notices. Whereas informal letters, text messages with a friend, and handwritten notes are some of the widely used informal forms of written communication.

2.3.1 Advantages of Written Communication

- A written document is precise.
- It is helpful in maintaining records.
- It is useful for future reference.
- It holds legal validity.
- It can be read as many times as the reader wants to gain clarity of thought.
- Charts and tables can be used in this form of communication.
- Written documents are used widely by organizations to convey their vision, policies, rules and regulations to the employees.
- It offers scope for editing and proofreading a message.

2.3.2 Disadvantages of Written Communication

- It is time consuming. It requires careful planning and execution in order to make the receiver comprehend the message entirely.
- Immediate feedback is not available.
- It amounts to a lot owing to the large use of stationery.
- It involves a lot of paperwork. It becomes challenging to maintain a record of the same.
- Non-verbal cues of communication are absent.

2.3.3 Planning Message

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The transmission of messages from one person to another should be carefully planned in order for the process of communication to be effective. There are some essentials which heighten this effectiveness while creating a message and result in intended feedback from the receiver. Following are the prerequisites for a strong and impactful message to be observed by the sender of a message:

1. **Complete:** The sender must ensure that the message does not lack any relevant information which is required to be sent to its audience. It should be complete in all respects. In case a detail is missing from the message, it can lead to misinterpretations. The feedback may not as be intended by the sender. The facts and figures demanded by the subject of the message must be present entirely in the message.
2. **Clear:** If the writer does not think clearly and plan in advance regarding what s/he wants to convey to the receiver, the message runs the risk of losing its meaning. It will result in bad impression. In other words, the writer must be clear about the purpose of drafting a particular message. The language of the message should also not be ambiguous. It may lead to doubt and confusion in the mind of the receiver.
3. **Correct:** The details provided in a message should be accurate. The statements should not be misleading. The message should be grammatically and syntactically correct. No room should be left for any sort of mistake as they cause inconvenience. Messages such as reports, notices, or letters should be edited and proofread before they are finally sent to the receiver.
4. **Concise:** Brevity is the key to effective communication. A writer with clear thought knows exactly what to write without exaggerating any detail. A message that is short and to-the-point leads to clear transmission of message. Each statement is meaningful and relevant to the topic in a concise message.
5. **Concrete:** Facts and figures should be used to support the message and make it impactful. These details should also be organized in a systematic manner so that its meaning is clearly communicated to the receiver.
6. **Coherent:** A message must flow logically. In many of the written forms of communication, a proper structure is followed which contains the introduction, the

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body, and the conclusion. Within this structure, all the details must be organized in an order depending upon the subject matter and the needs of the readers.

7. **Courteous:** The tone of the message should be polite keeping the audience in mind. The message should be considerate about the feelings, issues, and sensibilities of the audience before choosing the appropriate words. The message must convey respectful attitude towards the receiver. Offensive words and rude tone should be avoided to have a positive response from the receiver.

2.3.4 Executive Different Types of Messages

After careful and successful planning, it is even more challenging to successfully execute a message. There are different types of messages which a sender has to keep in mind that can garner either a positive, neutral or a negative response from the audience. But even before coming to this understanding, the sender must first understand the audience. The sender's knowledge of the audience with reference to their age groups, the culture that they belong to, their economic level, their needs and expectations will help in getting a closer look at their point of view in any given scenario. It is imperative that a "you" or the "reader-centred" approach must be essentially followed in business communication. It is this approach that will provide the sender the experience of dealing with them regularly. Here, a writer-centric or the self-centred approach while preparing messages will not lead to positive feedback from the audience as it will only be focusing on its own needs. However, the reader-oriented approach builds trust and confidence in the creator of the message. It builds a healthy business atmosphere between a seller and a buyer, for instance. The use of courteous tone in the message promotes encouragement and results in desired feedback from the recipient. Simultaneously, a positive impression of the organization gets created. It is therefore highly recommended that the readers' interests should begiven the utmost priority.

While planning effective business messages, writers are faced with innumerable questions that they need to first ask themselves before executing them completely:

- What will be my reaction if I were in the receiver's place?

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- How would I have expected the tone of the letter to be while being explained the issue?
- Should I have expected more clarity on the matter?
- Will I be expecting more accuracy in the content?

2.3.5 Different Types of Messages

After having undergone this reflective process, writers execute the messages keeping the expected feedback in mind. Based on the different types of messages, writers' draft statements carefully so that the readers don't get disappointed and maintain a healthy business relationship.

1. **Request Messages:** They are claim letters which state direct requests in the opening of the letter. They are followed by supporting arguments for the request so that necessary action can be taken at the earliest. These arguments are followed by a brief explanation which further heightens the need for quick action to be undertaken by the company. For instance, an electronics company's response to a claim letter seeking replacement of a defective air conditioner recently bought from the company could be "We understand your concern. Since the product is still within warranty, the issue will be resolved. Thank you for giving us the opportunity to serve you better." Statements like these build trust of the buyer in the company and encourages them to stay connected with them every step of the way.
2. **Positive Messages:** They are the messages that deliver good news, and the receiver is expected to react in a neutral to pleased manner. Congratulatory messages, messages of appreciation, appraisal messages, or apology messages are some of the examples. Statements like, "We would like to congratulate you for your hard work and your efforts that you showed towards the project which translated into the company achieving a higher ranking", or "We apologize for the inconvenience caused. The matter will be looked into with immediate effect" result in a positive response.
3. **Negative Messages:** These are the messages where the reader is expected to be annoyed and vexed. Some of the examples giving rise to such a situation can be a company's refusal to issue a refund or its inability to resolve a matter. It is here that drafting a neutral response from the company proves to be useful. They have to ensure that their conclusion is backed by strong arguments that facilitate acceptance

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by the receiver without hampering their business relationship. Instead of saying direct "No", the company can offer some positive suggestions in order to direct the receiver to feasible alternatives. For instance, "Thank you for placing an order with us. We appreciate your interest in our products. This is to let you know that due to an unexpected demand of the same product, we would be able to serve you with a slight delay of 5-6 days. Please find a gift utility coupon of Rs. 250/- in the "Coupons" section. The coupon is valid for the next 21 days. We are thankful to you for choosing us to serve you."

4. **Persuasive Messages:** These messages are required to persuade an unwilling and disinterested receiver. The language has to be convincing and confident to move the receiver. At the same time, it has to be supported by evidence leading the receiver towards the desired action. For instance, "The new bank portal must be downloaded by the customer because it is more secure than the previous one. It may appear incomprehensible at first, but it has various user-friendly features. The bank assures you that once you start to explore, you'll be immediately familiarised with it."

After an understanding of the reader-oriented approach while planning and executing different types of messages, it becomes clear how these stages play a crucial role in the business realm. Communication thus is not a mere transfer of messages from the sender to the receiver. It incorporates various other factors that go into making the whole process of communication effective.

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IN-TEXT QUESTIONS

17. Examples of Oral communication ……

A). Letter B). E-mail

C). Telephone D). Fax

2. Reports from the subordinates to the superiors take the form of……

A). Upward communication B). Downward Communication

C). Face to face Communication D). Person to person Communication

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2.4 WRITING REPORTS

The term "Report" originates from the Latin word "report are". It means to bring back or carry back. A report, therefore, is a document which aims to bring back details of an event in an organized manner for a definite receiver. As a form of formal communication, reports play a vital role in communicating crucial information across both intra and inter organizational levels. It is an important document which is required by managers time and again. For instance, within an organisation, a manager relies heavily on his employees for the collection of data, figures, or other specific information with reference to an event which is further organized by them in the format of the report and sent to the manager. The details contained within a report, in turn, can be used for effective decision-making and problem solving. Similarly, sometimes governments form separate departments which oversee a set of events specific to each department. In such cases, the reports get communicated from each department to the government carrying deciding particulars. Through such instances, it thus becomes clear that reports are highly informative and help an organization strengthen professional relationships both within and outside its domain.

2.4.1 Objectives of Reports

While identifying the various objectives of report writing, it is important to keep in mind that the scope of reports is extensive. A report can be prepared for the following purposes:

- To present information of an event, be it facts or figures, in an organized manner
- To disseminate details to a specific audience
- To inform the receiver about the progress and the underlying problems of an organization
- To provide recommendations or proposed plan or solutions, wherever required, solely based on the data provided in the report
- To record the event objectively for future reference
- To promote efficacious decision-making

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2.4.2 Types of Reports

Reports serve as efficient business tools. Business reports usually cover the issues related to a company's business. They cover a wide range of topics such as the review of an issue or an event, the assessment of the business acquired over a period of time, or the evaluation of the progress of some work assigned to a team of employees of the company. They are extremely formal in nature. Such reports require inclusion of a lot of factual data. As mentioned, owing to their manner of objective presentation and communication of details, and their vertical and lateral movement in the business world, reports get classified in several forms:

- **Informational Report**: While drafting informational reports, it is made sure that each and every detail of an event is presented objectively. In other words, no personal opinions, interpretations or suggestions are offered to maintain the nature of these reports. Annual reports are a good example of informational report writing. These reports provide information regarding a company's growth in their respective sector from the previous financial year to the current. Financial reports too serve as a useful tool which inform a company about its business with the help of clearly tracking cash inflows and outflows of a company.
- **Analytical Report**: These reports provide the analysis of the observations made by the reporter along with the collection and presentation of data. This helps the receiver of this report to understand the actual scenario. The reporter drafts an analytical report with the aim of bringing to the receiver a description and an understanding of the events in depth. As opposed to the informational reports, analytical reports tend to provide interpretations and recommendations based as well in an attempt to solve problems. A report identifying fall in the sales of a company product and analysing its effects on the company and seeking recommendations simultaneously for countering the fall in sales can be classified as an analytical report.
- **Vertical Report**: This refers to the direction in which a report travel. The reports which follow the upward or downward flow of communication on the corporate ladder are called vertical reports.

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- **Lateral Report**: Lateral reports, on the other hand, move horizontally at the same hierarchical level. They help in coordination across different departments.
- **Internal Report**: The reports which move either horizontally or vertically within an organization are called internal reports. They are also useful in clearly stating the business objectives to its employees by keeping them updated on several factors such as sales data or company turnover of the company. A report providing performance details of a company's crucial project to its employees with an aim of keeping them informed is a good example of internal report.
- **External Report**: As opposed to the internal reports, the reports which move outside the organization are called external reports. The purpose of these reports is to keep all the stakeholders of an organization informed. For instance, annual report of a company which clearly states the financial statements move outside the company by being circulated to its various stakeholders.
- **Progress Report:** These reports are submitted by the employees to their superiors on a weekly or a monthly basis. In other words, progress reports must be submitted at regular intervals by the employees in order to keep a track of the work assigned to them. Descriptive details such as the amount of work completed during a specific period of time or the future course of action of the project at hand are mentioned. Simultaneously, these help to keep in check the performance of the employees as well.
- **Periodic Report:** These reports are required by the upper echelons of the organization periodically to know precisely the performance of the entire organization. It involves details of everyday affairs such as the problems that a company might be facing, the solutions that have already been utilised to resolve the issues and the proposed solutions which would be fruitful in countering similar problems in the future. These reports are precise.

2.4.3 Formats of report Writing

Reports have been further divided into two based on the different formats they follow.

1. **Letter Format:** If a report is to be sent outside the organization, that is, if it is an external report, the letter format is used for writing report. It is useful for drafting long reports.

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Elements of Letter Format of Report:

1. **Heading:** Name and address of the organization of the reporter
2. **Date:** The date of sending the report
3. **Receiver's Address:** along with receiver's designation
4. **Subject**
5. **Salutation**
6. **Body of the report:** It includes introduction, observations and findings, and conclusion based on the details given in the beginning. It may also include internal headings and tables for a precise and clear understanding of the subject. As far as the language is concerned, it can be written in first person.
7. **Complimentary close**
8. **Signature**
9. **Enclosures (if any)**

2. **Memo Format:**It is short for "memorandum". It is a brief note or a record for future reference that moves within the organization. Terms such as "Interoffice Memorandum" or "Office Memorandum" are used while drafting the memo format of the report.

Elements of Memo Format of Report:

1. **Heading:** Name and address of the organization of the reporter
2. **Title:** Interoffice Memorandum/ Office Memorandum
3. **Date**
4. **To:** Recipient's Designation
5. **From:** Sender's Designation
6. **Subject**
7. **Body:** The formal salutation which is an essential part of the letter format is not required here.However, like in the letter format of report, personal pronouns can be used in the Memo Format as well. It can also include recommendations and suggestions.

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8. **Signature:** Complimentary close as present in the letter format is not required here. Providing signature with name is sufficient here as the designation of the reporter is already mentioned in the beginning of this format.

2.4.4 Steps to write a report

Writing a report can be a challenging task. A reporter has to make sure that taking specific subject matters into consideration, the correct type of report should be chosen and drafted with careful planning. One has to always bear in mind the audience of the report so that it can be drafted accordingly for their understanding. There are some steps that should be followed while drafting a report:

1. **Introduction:** A report must begin with a clear statement of purpose. Here, the subject of the report can be introduced. At this step, the report should indicate the readers what they could expect in the following body of the report.
2. **Providing Information:** All the relevant details including the context of the subject matter being recorded in the form of a report must be provided to arrive at a logical conclusion. The observations and findings regarding what happened need to be included here.
3. **Development:** Based on the observations provided in the above step, the explanation and analysis of the issues related to the subject matter is done at this step.
4. **Conclusion or Recommendations:** A reporter arrives at conclusions or proposes some recommendations depending upon the details given in the report. If a problem persists, the recipient can expect the reporter to provide recommendations from his/her perspective. This will help the recipient to monitor the situation clearly.
5. **Editing and Proofreading:** After finishing the report, a reporter must ensure that the correct format of the report is used other than the type of report. Any unnecessary information has to be removed from the report. The statement of purpose should be clearly mentioned. The report must be devoid of grammatical and syntactical errors.

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Sample Reports

A: Assistant Vice President of ABC Company has asked for a progress report from the Manager. Draft a report clearly stating the status of the work assigned to you. Also, provide your plan for the same over the period of next two months.

ABC Company

New Delhi

Interoffice Memorandum

Date: 17 August 2022

To: Assistant Vice President

From: Manager

Subject: Progress Report for July 2022 and Plan for August and September 2022

As per your requirement, I am sharing the report on the amount of work completed in the month of July 2022 for the target assigned to me.

S. No.	Client Name	Date of Meeting	Amount of Business	Expected Closure Date
1.	Supreme Logistics	03 July 2022	Rs. 10 Cr	Closed on 20 July 2022
2	Rajesh Auto Parts	05 July 2022	Rs. 2 Cr	Closed on 15 July 2022
3	Kumar Auto Sales	15 July 2022	Rs. 7 Cr	Closed on 30 July 2022
4	Smart Ventures Pvt Ltd	03 Aug 2022	Rs. 20 Cr	Expected to be closed on 27 Aug 2022
5	Tarachand & Sons	Meeting to be held on 18 Aug 2022	Rs. 5 Cr	Expected to be closed on 03 Sep 2022

(signature)

XYZ

B: You are the CEO of ABC Firm. Write a report sharing first quarter's financial results for the year 2022 and CFO succession to be sent to a stakeholder.

ABC Firm

Gurugram

Date: 17 August 2022

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179, Nariman Point,

Mumbai-400004

Subject: Half year 2022 financial results and CFO succession

Dear Stakeholder

Today, we are releasing consolidated financial results for ABC Firm's first quarter of 2022 (April 1 – June 30), as well as for our business segments. All our businesses have delivered exceptional and record-breaking numbers, much ahead of the plans.

We reported revenue of approximately $8 billion, an increase of 5% as compared to the prior-year second quarter. Adjusting for the impact of foreign currency, revenue growth was 2%. On an organic basis, which excludes the impact of foreign currency and any acquisitions or divestures, revenue growth was 3.5%.

Our adjusted operating margin increased by 190 basis points and was 15% of revenue, compared to 12% of revenue for the prior-year second quarter. And our overall free cash flow results were $500 million.

Based on these strong results, it is clear that ABC Firm is well positioned to compete vigorously across our businesses around the world. We are winning new business, bringing the best to our clients and actively recruiting. And we are going to continue to innovate and adapt to address evolving client needs.

Lastly, we are delighted to announce that the ABC Firm's board of directors has unanimously selected Mr. Vijay Sharma as the company's new chief financial officer. Mr. Vijay Sharma currently leads our Banking segment and will immediately take on the role and succeed current Mr. Ankur Mehta in this role, upon his retirement on December 31, 2022.

Yours sincerely

(signature)

Mr. Umesh Singh

CEO

ABC Firm

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IN-TEXT QUESTIONS

3. …….. aims at making people work together for the common good of the organization.

A). Communication B). Conversation
C). Combination D). Connections

4. Communication is a nonstop……

A). Paper B). Process
C). Programmed D). Plan

2.5 Improving personal writing skills

It is often found that despite having an understanding of what to write, how to organize thoughts and execute them in the written format, written communication is full of grammatical and syntactical errors. It is because of these mistakes that a company ends up leaving a bad impression upon the receiver. This leads to a decline in an established business relationship. Therefore, writing skills are of paramount importance. Before moving on to composing long paragraphs and essays, it is essential to start from the basics.

2.5.1 **Sentence Structure**

The knowledge of sentence structure can prove to be the steppingstone for creating clear and correct messages. Broadly, a sentence has two parts: the Subject and the Predicate. The subject indicates the doer of the action, while the predicate tells something about the subject. For example,

<u>Subject Predicate</u>

- The police caught the thief.
- Anil kicked the football.
- The dog jumped over the wall.

Each of the sentences clearly state how a sentence can be broadly divided into two. Delving deep into this, it is to be understood that each of the words used in a sentence has its own role which in turn add meaning to the sentence. This brings us to the different parts of speech which collaborate to make a sentence.

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1. **Parts of Speech**

- **Noun:** names of people, places, animals, things, the state of a person: for example, Jia, crown, table, anger
- **Pronoun:** words that are used in place of a noun to avoid repetition: for example, I, you, he, she, it, we, they
- **Adjective:** words that describe nouns or pronouns: for example, beautiful, vast, enormous
- **Verb:** words that indicate action or state of being for example, dance, study, be
- **Adverb:** words that describe verbs, adjectives or other adverbs: for example, very, really, soon, sometimes
- **Prepositions:** words that are placed before a noun or a pronoun: for example, at, on, for, with
- **Conjunctions:** words that link words, phrases and clauses in a sentence: for example, because, but, and, either…or
- **Interjections:** words that express sudden emotion: for example, oh, alas, hey

After going through each of these details, one should be comfortable in identifying various parts of speeches while framing a sentence.

Some of the most common mistakes found in writing styles in terms of Sentence structure are:

1. **Run-on Sentence:**

   a) Incorrect sentence-*The manager asked for the report from Anil by yesterday he has not sent it yet*

   This is an example of a run-on sentence which does not separate two independent clauses with the help of any punctuation mark.

   Correction-*The manager asked for the report from Anil by yesterday. He has not sent it yet.*

   b) Incorrect sentence- She loves to write stories she would write more often if she had the time

   Correction- She loves to write stories. She would write more often if she had the time.

OR

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She loves to write stories, and she would write more often if she had the time.

2. **Sentence Fragment:**

   a) Incorrect sentence-*Because the manager fired Anil* is an example of a sentence fragment. Although it contains the main verb, it stands incomplete as it is dependent on another clause indicated by the presence of the word "Because".

   Correction-*Because the manager fired Anil, he had to advertise for the vacant position.*

   b) Incorrect sentence-Shows no sign of declaring a bonus. (Subject missing)

   Correction- The company shows no sign of declaring a bonus.

3. **Parallel Structure:**

   It means that the same pattern of words is used throughout the sentence.

   a) Incorrect sentence- Reena likes dancing, singing, and to hike.

   Correction- Reena likes dancing, singing, and hiking.

   OR

   Reena likes to dance, sing, and hike.

   b) Incorrect sentence- The company awards those employees who are diligent, efficient, and who submit their work on time.

   Correction- The company awards diligent, efficient, and punctual employees.

4. **Lengthy phrases and sentences:**

   It is essential to avoid lengthy phrases and sentences to highlight clarity of thought in the written content. Concise phrases and sentences should be preferred always.

   Phrases

   Due to the fact that- because

   In the end - ultimately

   Give consideration to - consider

   Sooner or later - eventually

   Sentences

   a) When I started my own company, it gave me skills to handle problems on my own and find their solutions.

   Concise version:

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Starting my own company made me adept at solving problems.

b) There are two employees who have been selected for this year's Best Employee Award.

Concise version:

Two employees have been selected for this year's Best Employee Award.

2.5.2 Paragraph Construction

Now that sentence structure and common mistakes with reference to the same have been discussed, the next step of paragraph construction demands equal attention. It is imperative for a paragraph to be dedicated to one central topic. All the sentences of the topic should be connected to that same topic being discussed in a paragraph. It must mention the topic sentence either in the beginning, the middle, or the end of the paragraph. The rest of the sentences in the paragraph provide support using vivid words, logical sentence order, and grammatically and syntactically correct sentences. An effective paragraph lacks run-on sentences. It also uses transition words such as 'then', 'in addition to', or 'finally' to connect separate paragraphs coherently. The concluding sentence of a paragraph summarizes the central idea discussed in the paragraph.

As far as paragraph breaks are concerned, they offer a pause to the reader before moving into a different set of ideas in the new paragraph. There is no fixed number of sentences to be dedicated to one paragraph. The main idea is to stick to one chain of thought while writing one paragraph. A good writer reflects these aspects in writing.

Look at the following group of sentences and try to compose them logically:

Since this is not the kind of experience, we want you to have, we've made a note of your feedback on the driver-partner's profile. Please note that we have adjusted the fare as per our thresholds and will not be able to make any further changes to the trip fare. We appreciate you bringing this to our attention. We are sorry to hear that you are not happy with the fare you have been charged for this trip.

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Solution:

We are sorry to hear that you are not happy with the fare you have been charged for this trip. Please note that we have adjusted the fare as per our thresholds and will not be able to make any further changes to the trip fare. Since this is not the kind of experience, we want you to have, we've made a note of your feedback on the driver-partner's profile. We appreciate you bringing this to our attention.

IN-TEXT QUESTIONS

5. Communication is a ……. skills.

A). Soft B). Hard

C). Rough D). Short

6. A business proposal from a branch manager of a company to the managing director of the company is an example of horizontal communication. (True/False)

2.6 Writing Composition

After understanding how to construct a paragraph, it is important to take the next big step wherein paragraph will be seen as a part of a larger essay. Many paragraphs combine to make one long essay. An essay composition requires three parts- the introduction, the body, and the conclusion. Skilful writers remind themselves of these three broad requirements as they continue to pursue writing essays. Other than one paragraph dedicated to both introduction and conclusion, there are more than one paragraphs which develop the key idea in the body of the essay. Just as creating a paragraph requires supporting statements developing the key idea, essay composition too demands the same through the inclusion of several paragraphs. The purpose is to develop the thesis statement in an elaborate manner. There are some steps that can be followed to compose an essay systematically:

1. **Prewriting:** it is the first step where a writer comes up with a topic. Various methods such as making notes, brainstorming, or free writing are used in order to finalize the main idea on which the body of the essay would be developed. The whole plan and structure to execute its various themes and sub-topics is charted at

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this stage. The purpose of writing is made clear. Questions such as why, for whom, and what are thought of and answered. After the topic has been decided, the thesis statement has to be decided. Clarity in this regard expresses the author's clarity of thought. Ideas can be developed logically later in the essay once the thesis statement is established in the beginning.

2. **Writing: a) Introduction-** The writer should capture the readers' attention through the introductory paragraph. The thesis statement should be carefully placed here so that the readers become interested in reading further. The plan to incorporate various themes, and sub-topics which were decided at the prewriting stage must be divulged here. The reader should be directed towards the organization of the writing.

   b) Body of the essay- Ideas are developed here. Facts, figures, and other details specific to the topic are provided. Body of an essay can have more than one paragraph. The writer has to ensure that each paragraph is related to the thesis statement and gets developed with the help of supporting ideas.

   c) Conclusion- After systematically organizing the ideas throughout the introduction and the body of the essay, the last paragraph that sums up the main points is called the concluding paragraph. It gives the coherent shape to the whole writing. Phrases such as, "After a thorough analysis of this, it is clear that…", "Therefore,", "It can be concluded that…" or "Thus," are used to conclude an essay.

3. **Editing:** At the end, editing and proof-reading eliminate any errors present in the writing. The writer can revise, replace, add or omit any phrase or sentence which seems incorrect. This will help the readers receive a well-organized and completely correct version of the essay.

It is therefore clear that writing is a challenging task. It requires dedication at every stage right from the beginning, be it the sentence structure, grammar, paragraph construction, or essay composition.

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2.7 SUMMARY

Each business relies heavily on the formal modes of communication. These include a lot of written communication. Therefore, as seen in this unit, written communication is put on a high pedestal. If a writer goes wrong even on the basic level, it will end up leaving a bad impression on the receiver of their message and may also result in hampering their established business relationship.

A thorough knowledge of the advantages and disadvantages of written communication, how to plan and execute different types of messages and their relevance in the business world, the role of different types of reports, and how to improve one's writing skills beginning absolutely from the start, can help one achieve efficiency.

As shown through various examples of planning, executing, organizing data in a systematic manner and correction to be made at the first level of phrases and sentences will help a writer create highly impactful written communication in every field. Any person who has to work in a vast business environment should attain fluency in communication. It will help one attain the ability to perform all tasks without any trouble.

2.8 ANSWERS TO IN-TEXT QUESTIONS

1. Telephone
2. Upward Communication
3. Communication
4. Process
5. Soft
6. False

2.9 SELF-ASSESSMENT QUESTIONS

Q1. Try to identify some parts of speeches in the following sentences:

1. I admitted my mistake politely.

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2. The boy swam across the river.
3. The company rejected my application.
4. There has been a huge rise in the sales of our product lately.
5. The table is right behind you.

Q2. As Administrative officer of ABC College, you, as a part of routine inspection, visited the college canteen. Write a report to the principal about the findings. Also include recommendations in the report.

Q3. You are a woman activist. You carried out a survey to find out the reasons of escalating crimes against woman in Delhi. Prepare a report on the outcome of the same. Also recommend some measures.

Q4. Draft a report on the increase in sales in the first quarter of the current financial year to be sent to the shareholders of your company.

Q5. Discuss the importance of written communication in the business world.

Q6. What should a writer keep in mind before drafting a formal document?

Q7. What are the different steps of writing a composition?

2.10 SUGGESTED READINGS

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LESSON 3

INTERNPERSONAL COMMUNICATION

STRUCTURE

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3.1 LEARNING OBJECTIVES

After completion of this lesson, you should be able to: -

- ✓ Define interpersonal communication, its principles and the major theories of interpersonal communication.
- ✓ Understand the dynamics of communicating in teams and apply strategies for improving your communication within the team.
- ✓ Understand the process of negotiation and apply communication strategies for successful negotiations.
- ✓ Use communication strategies for averting and resolution of conflicts.
- ✓ Formulate a plan for mentoring and communicating with mentees for improved transfer of knowledge and skills.
- ✓ Improve handling of appraisals through communication strategies.
- ✓ Understand the process of digital communication and social media communication.

3.2 INTRODUCTION

Lack of communication ruins everything because instead of knowing how the other person is feeling, we just assume.

- From the Internet

Humans are a gregarious species for whom communication is a tool of socialisation. We communicate with each other all the time at the level of individual-to-individual, individual-to-group and vice versa. In fact, communication is identified as a basic human need which implies that people engage in interpersonal communication throughout their lives starting from infancy till the very end of one's life.

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Interpersonal communication is a very important and highly valued skill not just in the professional context, but also in the personal and social context. It is through interpersonal communication that humans develop and maintain relationships.

On closer examination of the concept of interpersonal communication, you will realise that you simply cannot choose to opt out of it. There is no way you can choose not to have interpersonal communication. So much so that making a conscious decision not to communicate by ignoring somebody is also a type of communication. Your signal of ignoring someone will be decoded based on the other non-verbal signals accompanying your silence.

3.3 Understanding Interpersonal Communication

Interpersonal Communication refers to the exchange of thoughts, ideas and feelings between two or more people through the means of verbal and non-verbal communication. Interpersonal communication can be of the following types: -

a. **Listening** – The most important yet the most neglected communication type is that of listening or active listening which is the cornerstone of interpersonal communication as well as a relationship.

b. **Verbal** – It is the spoken word, including the language that you select, the manner in which you speak, and so on.

c. **Non-Verbal** – In a face-to-face interaction, everything that gets conveyed without the use of words is non-verbal communication. It includes gestures, postures, silence, eye contact (or absence of it), expressions, pitch of voice, intonation and modulation, etc.

d. **Written** - This type includes the use of writing and involves codifying the message in a particular language that the receiver understands.

3.3.1 Principles of Interpersonal Communication

There are certain principles of interpersonal communication that form the basis of our understanding of the phenomenon. These principles will help a discerning individual to be an effective communicator. The principles are mentioned below: -

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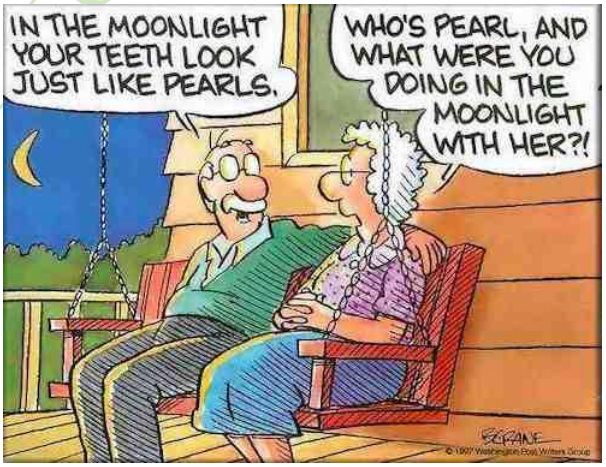
(i) You cannot do without interpersonal communication. In other words, interpersonal communication is **indispensable**. It is quite evident that a life devoid of any interpersonal communication is impossible. Any attempt to lead a life of complete isolation is bound to fail, as the interdependence of humans for emotional, physical and material needs is inescapable.

(ii) Interpersonal communication is **irreversible** by definition. It simply means that once you communicate something, it is out there and cannot be taken back. You may regret whatever you said or make a formal apology; however, the damage to the relationship may already have taken place. Mahatma Gandhi famously wrote in his autobiography: -

> ***"And I can now give myself the certificate that a thoughtless word hardly ever escapes my tongue or pen".***
>
> ***- Mahatma Gandhi***

(iii) Interpersonal communication is a **complex** process due to the sheer variety of the variables involved in it. There are the individuals themselves who choose a language, words, symbols, body language, expressions, etc. followed by perceptions of the individuals and then there is the all-important 'context', all of which have infinite permutations and combinations causing interpersonal communication to be highly complex.



(Source: https://redshoemovement.com/)

Fig. 3.1: Is communication really taking place

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(iv) Interpersonal communication occurs in a **context** that a communicator needs to be aware about. In other words, the context help you determine how your messages will be interpreted. The broad categories into which the context can be segregated are listed below: -

a. **Psychological**: - Interpersonal communication is influenced by the state of mind or the state of psychological well-being of the parties engaged in communication. For instance, an individual under considerable work-related pressure may get agitated on being asked completely harmless questions at home or yell at a child who insists on him / her playing with the child.

b. **Situational**: - The place / situation / circumstance / occasion / setting where the communication is taking place has a great impact on it. In simple words, people communicate differently in different situations.

c. **Relational**: - The nature of relationship that exists between the communicating parties greatly influences the communication process. For instance, two friends would communicate so differently when compared to how each of them would communicate with, his / her parents.

d. **Cultural**: - Every culture has certain set of unwritten rules that are manifest and understood only by those initiated into that culture. The difference in cultures of the people engaging in communication may cause them to interpret signals differently due to ethnocentric bias or ethnocentrism.

3.3.2 Theories of Interpersonal Communication

There are several theories of Interpersonal Communication that provide very useful framework for understanding the process. These theories are based on different perspectives and accordingly help in the study and practice of effective communication.

Uncertainty Reduction Theory

Human beings are inherently uncomfortable with uncertainty and prefer predictability. The uncertainty is classified into cognitive and behavioural uncertainties. The former refers to the lack of clarity on the other person's beliefs, thoughts, views and opinions, etc. whereas the latter refers to the lack of predictability of an individual's actions.

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The uncertainty reduction theory tries to explain the initial interaction among people as an attempt to reduce the uncertainty as to their behaviour towards each other. The higher the uncertainty the greater is the distance between people. The theory assumes that people would cognitively gauge uncertainty and act with the objective of reducing it. Though, there needs to be a trigger as per this theory that will prompt the individual to take steps to reduce the uncertainty. This trigger is usually in the form of a social situation and / or the cognitive process. The uncertainty reduction theory states that people tend to reduce uncertainty using the approaches mentioned below: -

Active Approach

It involves an individual trying to gain information about the target by asking those acquainted with the latter.

Passive Approach

As the name suggests, the passive approach entails gathering information about the other person by observation.

Interactive Approach

This approach is also an active approach where an individual uses direct interaction as a strategy to learn about the other person by probing and sharing.

Extractive Approach

The extractive information seeking approach was later added to the theory and is about using online media to get information about a person.

Application of the Uncertainty Reduction Theory

The major application of the uncertainty reduction theory is in the area of intercultural communication, recruitment, treatment of patients and computer-mediated communication (CMC).

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Computer-Mediated Communication (CMC)

The various forms of communication between people that happens through two or more electronic devices connected through network, which can be synchronous and asynchronous. The exchange can be one-to-one, one-to-many and many-to-many through the medium of text messaging, voice and video.

Social Exchange Theory

The social exchange theory states that individuals choose social interactions that they perceive to be beneficial for them. This theory postulates that human interaction is akin to economic trade which is founded on cost-benefit analysis, with each participant vying for maximization of benefits and minimization of costs. The process involves disclosure of information between individuals as long as the costs of doing so are more than offset by the benefits. As a consequence, the individuals progressively gain intimacy as long as they keep receiving rewards. Marriage is an example of a social exchange where each individual in the relationship feels content and comfortable as long as they feel that they are getting reciprocated with benefits equal to the efforts put in by him / her. The failure of a marriage is a result of decreasing level of rewards and reciprocity as perceived by one or both the partners. A similar situation can be imagined in a professional context where an employee will be discontent if he / she thinks that the remuneration is not commensurate with the efforts and performance. It must be amply clear by now that the cornerstones of this theory are the cost-benefit analysis and reciprocity.

3.4 COMMUNICATING IN TEAMS

A **team** is a group of individuals selected on the basis of possession of complementary skills who work together and generate synergy to achieve a common objective. Teamwork is based on sharing of responsibility and active communication.

How are Teams different from Groups?

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The simple difference between a group and a team lies in that, in the former, the members coordinate their efforts in the pursuit of individual goals and in the latter, the members coordinate their efforts towards achievement of a common goal.

3.4.1 Characteristics of a Team

Clarity of Goal

The fundamental aspect of teams is that before a team is put together, the goals / objective and the desired outcomes have to be decided. It would help the team to work with a clear direction. However, the team is often given sufficient flexibility to formulate strategies for achieving the goals.

Interdependence

The team members are dependent on each other and are unable to achieve the goals independently. There is considerable reliance of the team members on each other for the right information and support in terms of expertise in a particular domain.

Responsibility and Accountability

The team members are collectively responsible for completion of the assigned work and are collectively accountable for it. The risks and rewards are shared by the team members.

Authority

The team as a unit is given the authority to make decisions pertaining to the activities undertaken by it in the pursuit of the desired outcomes and goals.

Open Communication

Communication is the most important ingredient for an effective and successful team. The way of communication, the methods adopted for communication within the team and the frequency of communication, etc. determine how well the team is functioning. It is this characteristic of teams that we will be focusing on.

3.4.2 Team Communication

Team communication refers to the exchange of information among the members of a team working towards a common goal / objective. An overwhelming number of professionals

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would agree that the most common cause of failures in the workplace is ineffective communication. Organisations rely on teams for getting the work done and therefore, effective teams are valued very highly not just in the organisational context but also in myriad fields, such as sports, research, etc.

Benefits of Improving Team Communication

Organisations and leaders are constantly on the lookout for ways of improving communication within the organisation. These organisations have several teams that are working on crucial projects. It is imperative for leaders to ensure that there is a culture of open and effective communication for smooth functioning of the organisation and for the achievement of organisational objectives. Improving team communication has the following key benefits:

Rapport Building

During the initial phase of a team, improving communication within the team reduces the uncertainty as to each other's behaviour which helps break the ice. It leads to better coordination and helps build trust and confidence within the team. A well-coordinated team with no trust issues is better placed for achieving the goals and desired outcomes.

Fosters Innovation

Continuous exchange of information and feedback within a team can be the source of creativity and innovation. It helps discover more efficient ways of doing things and arriving at out-of-the-box solutions to work-related problems.

Conflict Management

Possibly the greatest advantage of better team communication is that it helps in early resolution of conflicts within the team. It can even help in avoiding and averting potential conflict situations. Active listening is a skill that is all important in team communication as it improves shared understanding of each other's perspectives, opinions, needs and emotions. By paying attention to other's perspectives and giving it a genuine thought, you will be able to better comprehend and appreciate them and respond in a constructive manner thereby minimizing the chances of conflicts. Active listening also includes "listening" to the body language which can supplement your comprehension of the spoken word. Some very simple

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yet useful techniques that will come handy in handling situations of conflict are mentioned below (Note how these are all closely connected with active listening):

Paraphrase: Restate what the other person has said in your own words. This will prompt the other person to recognize that you genuinely listened to him / her and that you understand the other person's view.

Restate: It is plain repetition of what the other person has just told you. This again demonstrates that you are actively engaging in the communication.

Reframe: It is a description of what you understand about the other person's needs or demands. If you use positive language to reframe, it will show your earnestness to overcome the impasse.

Summarize: It involves a giving a brief of the situation in your own words also putting into words the emotions that may have been manifest in the other person's communication. It will reassure them that you have the right understanding of the situation.

Improves Productivity

A team that communicates effectively gets to improve its productivity as there is a clear understanding of each other and very few chances of an information blockage. We have seen technology coming to the aid of teams in the form of applications that enable sharing of screens, virtual meetings, etc. It has lowered the timeframe required for team members to get in sync.

Work Culture

Communicating routinely as a trust and confidence building measure helps build a work culture that appreciates and values teamwork. It helps create a healthy and transparent work environment where employees put in their best with earnestness.

3.4.3 Strategies to Improve Team Communication

In an idyllic workplace, there is open communication with full professionalism and close collaboration among team members. Each team member is aware and conscious of his / her roles and responsibilities. There are no conflicts and all goals are achieved within the given timelines.

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However, the reality is nowhere close to the above picture. Most workplaces are characterised by mistrust, misunderstandings, conflicts, delays and cost overruns.

There are certain strategies that will help in improving team communication and overcoming issues, such as misunderstandings, conflicts, delays, etc. Some of these strategies have been discussed below:

Cultivate "Open-Door Policy"

Many organisations have been following the open-door policy which encourages employees to ask questions, raise concerns, share experiences and put forward novel ideas. Some have gone to the extent of removing actual doors and partitions as it is believed that it would facilitate free exchange of thoughts and ideas. The open-door policy also helps create an atmosphere of trust and confidence which is conducive for improvement in productivity. This policy would help in immediate resolution of issues rather than waiting for a formal meeting to be scheduled for it.

Exchange Feedback

The leaders must help develop a practice of exchanging feedback at various levels. Feedback is a two-way process and the person receiving the feedback needs to develop a receptive temperament. However, feedback has to be constructive rather than vindictive. Documentation of constructive feedback can also help create resources that can be used for future learning.

Team-Building Exercises

Team outings, excursions, games and other such fun activities go a very long way in improving the communication between team members. A two-day trip with your colleagues will help you learn about them more than years of working together in office. Such activities, if planned at regular intervals, can be a great de-stressing experience. It will help the team members rejuvenate themselves and the activities undertaken during the team-building exercise will help expose hidden talents in some of the team members.

Use Technology

Technology has provided tools for teams to better coordinate and simplify workflow. There are innumerable cloud-based applications available which aid in communicating

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better, especially when the team is not located at one place. Standardizing the use of some of these applications will make it convenient for everyone and it would be easier to initiate new members into the ecosystem. These applications enable collaboration, progress-review, referring to workflow, deadlines, etc. in a much easier way than a conventional email based communication.

Address Personnel Diversity

The industry is witnessing greater workforce diversity than ever before. Individuals of different nationalities, regions, cultures, professions, sexual orientation, ideologies and languages, etc. often come together to work in the same teams. Understanding each other's culture, language, accents, slangs, beliefs and humour will take time and concerted efforts at team building. The leaders have to take charge and devise methods to enable greater interaction and overcome difficulties due to a multicultural team.

Communication Training

Training the team members in communication-related modules / courses will equip them with skills to function as a coherent unit by application of effective communication strategies. The training programmes may be selected based on the nature of the work being handled by the team and the existing skill sets, strengths and weaknesses of the members.

3.4.4 Challenges in Team Communication

There are many challenges that teams have to deal with in order to operate efficiently. It is important for you to understand what these challenges are, so that you can detect issues before they get out of hand and cause injury to the team fabric. Let us discuss some major challenges that teams face.

Bias towards One's Own Position

It is observed that sometimes a group member takes a position and defends it unnecessarily in a bid to prove himself right. Such a situation arises when an individual keeps his ego above the interest of the group. The solution is to orient the team members, right from the time of induction into the team, to think for the common good of the team by putting the interest of the team first.

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Lack of Trust

Trust deficit among members of a team is one of the most common causes of lack of communication within the team. This lack of trust can manifest itself in the form of the following behaviours:

- Members avoiding each other
- Avoiding team meetings
- Refusal to seek and offer assistance
- Low morale
- Lack of warmth

Groupthink

When the group members become too comfortable with each other, they tend to desire group cohesion to such an extent that the group starts thinking of having a consensus all the time. This is known as groupthink and it has the effect of driving out critical analysis of ideas, opinions and alternatives. Groupthink retards proper communication within a team as there is no exchange of fresh ideas, alternative positions and perspectives. Everybody agrees to everything and eventually, nothing innovative comes out of the team.

Issues with Communication Tools

It is obvious that the members of a team may not be sitting in the same office. In fact, some or even all team members may be working from different locations. In such a scenario, the communication among team members is only as good as the tool(s) used for communication. If there are hi-tech cloud-based tools for communication, it makes things pretty seamless, however there may be members who may not be as comfortable with such tools as others.

Information Overload

It has been observed that when a team makes use of multiple platforms for communication, such as emails, phone calls, video conferencing, face-to-face meetings, instant messaging, etc., there is so much of information being exchanged on a daily, even hourly basis that keeping a track of things becomes a challenge. As you can see, issues in

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team communication can arise not just because of the lack of information exchange, but also due to excess of it.

Hybrid Teams

After the onset of the Covid-19 pandemic, companies started forming Hybrid Teams. A hybrid team one in which some members work remotely, and some may be working from the office premises. Mostly, the facility of working from a remote location is rotated between members so as to offer flexibility to all. Based on the workload and urgency, the arrangement is adapted to suit specific requirements. Before the Covid-19 pandemic, the concept of hybrid teams was restricted mostly to distributed teams. However, it is now used widely because of obvious benefits, some of which are mentioned below.

- ✓ Cost-effective both for the employee as well as the employer
- ✓ Provides flexibility
- ✓ Companies can hire talent which may not be available locally
- ✓ Helps in attaining work-life balance

The above benefits notwithstanding, there are several issues with hybrid teams as well. The most important thing is that in hybrid teams, physical connect is lost. Cohesion among team members usually develops by means of face-to-face interactions. Especially those informal conversations around the pantry area during coffee breaks. Further, whatever important decisions are taken in the office is required to be communicated to the remote workers to keep them abreast. These communication channels need to be worked-out and formalised to ensure that the people for whom it is intended actually consume it.

3.5 NEGOTIATION

Negotiation refers to the back-and-forth communication or dialogue between two or more parties to reach an agreement on issues that concern these parties where there may be some common interests and some conflicting interests. People negotiate routinely in their personal and professional lives. However, some negotiations are rather challenging that require certain skill sets for achieving a mutually agreeable outcome.

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You will observe that most people are not very adept at negotiation; in fact, many people fear negotiations. Though, one can pick up the required skills to be a good negotiator by training, doing your homework and with some practice.

3.5.1 Types of Negotiations

✓ **Distributive**

There are negotiations in which the involved parties negotiate for the distribution of a fixed value. In such negotiations, one's gain is a result of the share foregone by the other. These negotiations are like zero-sum games where the gain of one is the loss of the other. It is also known as a win-lose negotiation.

✓ **Integrative**

The negotiations where multiple factors and interests are under discussion and provide an opportunity to the negotiators to satisfy the needs of each party are called integrative negotiations. It can potentially turn out to be a win-win situation for the parties involved. Distributive negotiations also have the potential to be turned into integrative if the issues are rethought and the parameters are reworked.

✓ **Team Negotiation**

The negotiations which is conducted by a team of negotiators from each side is called as team negotiation. For instance, an automotive component manufacturer from India is interested in entering into a Joint Venture (JV) with a Japanese company. The Indian company sends a team of six negotiators with each of the negotiators having a specialised expertise. The Japanese counterpart will also have multiple members to proceed with the negotiations.

✓ **Multiparty Negotiation**

As the name suggests, multiparty negotiations involve multiple parties and the interests of each other these parties is at stake which makes multiparty negotiation much more difficult. For the same reason, multiparty negotiation requires more polished and wider skills. A very good **example** is that of trade negotiations at the World Trade Organisation (WTO), where the interest of all 164 member countries is involved and the representatives of each of the member countries are experts in the domain.

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✓ **One-Time or One-Shot Negotiation**

Negotiations where the parties involved negotiate only once and have no intention of any further dealings in the future. Since there is no intention of a long-term engagement, the parties can potentially resort to unethical means. **For example**, suppose you are standing outside a movie theatre and see the House Full sign and decide to purchase a ticket from a black marketer. The latter may resort to unethical means to sell the ticket. His / her only aim is to sell at a high price and yours is get it a cost as close to the window price.

3.5.2 Some Key Negotiation Skills

✓ **Planning**

Proper planning to work out the details of the short-term, medium-term and long-term ramifications of the terms of negotiation will ensure that you are not caught by surprise in the middle of the negotiation and will prevent you from exposing your position.

✓ **Communication**

Communication is an indispensable skill that becomes the medium through which negotiations take place. During a negotiation, communicating the right messages in the right manner so as to sound compelling and persuasive is a skill that is acquired over time. It involves careful selection of words, observation of non-verbal cues and developing a deep understanding of the context, especially in case of an intercultural setting.

✓ **Resourcefulness**

Resourcefulness and creativity are skills that come in handy during negotiations where spot thinking is required to overcome new constraints.

✓ **Problem-Solving**

Most negotiations occur when there is an impasse, and no progress can be made. Seasoned negotiators apply their problem-solving skills to overcome the situation and end the stalemate.

✓ **Active Listening**

This skill helps you to perfectly understand the other party's position and helps create an atmosphere of trust and confidence which is a great catalyst for a successful negotiation.

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✓ **Persuasiveness**

The ability to convince the other party that the terms you have set forth are justified and get them to agree to it is called persuasiveness. In other words, successful negotiators have the ability to influence the other party.

✓ **Identify Trade-offs**

You must study the entire situation deeply to identify issues that are dear to the other party but not very important for you. Such trade-offs can be exploited to your advantage by allowing to take a step closer on that point in return for something of value to you.

3.5.3 Key Strategies in Negotiation

The naive approach to negotiation is based on a reactive tactic rather than taking the proactive approach. The biggest downside of the reactive approach is that the outcomes or possible outcomes of the negotiation will be a function of the proposals / demand coming from your counterpart. The reactive approach may seem to work in simple situations, such as haggling for a discount from a street vendor. However, complex negotiations require a well-developed strategy that you can implement during the process. Some of the key strategies in negotiation are discussed below.

✓ **Engage with Stakeholders other than the Obvious Counterpart**

Before you begin the negotiation process, think about all the parties other than the counterpart that have an interest in the outcome of the negotiation. You may find some stakeholder who could be your counterpart in bringing about the desired outcome without even having to negotiate with the original counterpart. You will be required to think about ways to engage with the new counterpart to achieve the desired outcomes. This strategy is frequently used in legal cases where a hostile party is disciplined by using another related party in the value-chain by negotiating with the latter to halt supplies to the former.

✓ **Find out about potential allies at the planning stage**

During the negotiation process, you may require the support of others to help with your cause. You must complete the potential ally identification process at the planning stage so that you can fall back on your ally for crucial support in negotiation.

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✓ **Identify your potential Adversaries**

Just as you identify your allies, the process of identification of potential adversaries who can potentially derail the negotiation is equally important. If possible, address the concerns of your opponents to prevent them from forming a damaging alliance and trying to block the negotiations.

✓ **Use your Leverage Effectively**

Leverage is generally perceived as the negotiating power that one party has over the other. It may be thought of as the extent to which one party wants the deal relative to the other and the relative value of the best alternative available to each party.

✓ **Work on your Best Alternative to Negotiated Agreement (BATNA)**

BATNA is the next best deal available with you in case the negotiation with the party fails. You will feel much more confident walking into the negotiation room if you have prepared your BATNA. It will also give you the leverage to demand more from the other party. The first step is to list down all your options and check how feasible and actionable each one is. The second step is to make the same assessment for your counterpart's available and actionable options.

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Leverage and Negotiation

ABC Ltd. was in urgent need of appointment of a vendor to procure laptops for a new batch of Management Trainees. A tender was floated for procurement and only one bid was received for the same. This bidder had already worked with ABC Ltd. previously. The bid was too high and there was no time to retender. The procurement manager of ABC Ltd. was in a difficult situation. He decided to invite the bidder for negotiation of the prices received in the bid.

The procurement manager had already checked the work record of the bidder and he found that a substantial sum of the bidder was lying with ABC Ltd. as security deposit which was not being released due to some issue with a document submitted in connection with a previous work executed by the bidder. However, the work itself was completed satisfactorily.

The procurement manager had some leverage in hand to negotiate with. In the meeting, the bidder refused to reduce the prices as he was aware that he was the only bidder. However, the procurement manager told the bidder that he was considering retender as there was only one bid and too was very high. It was communicated in a matter-of-fact manner and gave the bidder an impression that he could lose the work despite being the only bidder. The procurement manager also stated that he was aware that security deposit of the bidder lying with ABC Ltd. and he could help in getting the matter resolved.

The offer seemed good to the bidder as there was some chance of getting the stuck payment released in exchange for a reasonable reduction in the bid. The vendor readily agreed to resubmit a lower bid.

3.6 COMMUNICATION SKILLS DURING A CONFLICT

Conflict can be defined as a disagreement or dispute between interdependent parties that often arises due to incompatible goals, scarcity of resources or opposing point-of-view. Interpersonal conflicts can be manifested by individuals over an interesting spectrum of verbal and non-verbal expressions, ranging from complete withdrawal into silence to an emotional and furious outburst. Interpersonal conflicts are bound to happen because whenever individuals go out of sync in terms of information exchange, potential misunderstanding can develop which can turn into a conflict, if not addressed in a timely manner.

The importance of communication for preventing and resolving conflicts can hardly be exaggerated. Poor communication, more often than not, causes misunderstandings that soon balloons into a conflict. Therefore, communication as a tool will help you build

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relationships and help you in managing conflicts that will inevitably occur even in the strongest of relationships.

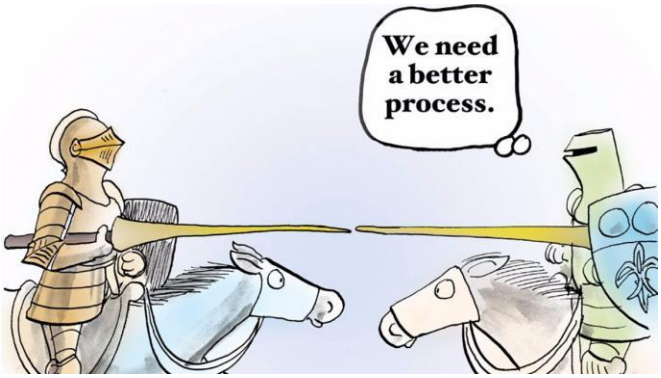

Fig. 3.2: Communication is the answer *(Source: https://www.readersdigest.in/)*

3.6.1 Communication Strategies for Conflict Situations

✓ **Active Listening**

Active listening is one communication skill that we will keep talking about in this course. Despite being one of the most potent skills in the entire process of communication, it remains the most underutilised and neglected one. When in a conflict situation, lend an ear to the other person and listen genuinely to what he / she has to say. This listening has to be without any animated expressions, interruptions and loss of attention. The person being heard will feel placated with your sincere effort. Use the pauses to restate or paraphrase what the other person has been saying to confirm your understanding.

✓ **Watch Your Tone and Pitch**

A very interesting fact that you will notice during arguments is that when one party begins speaking in a very loud pitch the natural reaction from the other party is to respond in an equally loud pitch which leads to worsening of the situation. It can be deduced that on the contrary, if you mellow down your pitch and volume during a heated argument the other party will be compelled to do the same thereby de-escalating the situation. Therefore, you can make use of this strategy in real life by controlling the pitch and tone of your speech in a conflict.

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✓ **Timing of Communication**

Bad timing to attempt resolving a conflict can potentially prolong the conflict despite the best of intentions. In interpersonal conflicts, sometimes it has been observed that one party is so eager to resolve the conflict that an attempt is made even if the other party is unwell or in an important office engagement or a social gathering. Such ill-timed interventions can further worsen the situation and make resolution even more challenging and painful. The best strategy is to ask the other person if he / she is comfortable and willing to have a dialogue and take cues from the response, both verbal and non-verbal.

✓ **Keep Your Non-Verbal Communication in Check**

Improper non-verbal communication can cause as much damage in a conflict situation as can poor verbal communication. The strategy to be followed here is to restrain from expressing extreme emotions, such as walking out in the middle of a conversation, withdrawing into silence, etc. This animated display will send the signal that you do not wish the situation to improve, further reducing any chances of de-escalation and resolution of the dispute.

✓ **No Absolute Statements**

In a conflict situation, one should avoid using absolute statements like "never", "ever", "always" as an expression of emphasis because it can further aggravate the situation and spark a fresh series of arguments on how the statement was unjustified.

✓ **Avoid "You" Statements, Use "I" Instead**

In a conflict situation, the communication has to sound like an attempt at reasoning with the other party and not like an interrogation. Rather than using sentences that contain "you", such as "Why did you give away all the credit of success to Mr. X." Instead, use "I" statements, like "I felt dejected when all the credit of success was given to Mr. X." You statements sound more like blaming or accusing someone for something.

✓ **Accept Responsibility**

Admitting your mistake graciously is not actually a strategy rather it is plain honesty, which would resonate well with the other party. Owning responsibility of one's mistakes is a trait found in leaders and is appreciated by all. It can be a profound experience for the one owning responsibility and equally as overwhelming for the other party to see such a gesture

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of honesty and sincerity. It would have an immediate effect of the de-escalation of the situation.

✓ **Avoid Passing Judgements and Verdicts**

Jumping to conclusions when you are extremely agitated and stressed is a bad idea as rational thought would be missing from such conclusions. In fact, one should make a conscious effort not to pass any judgements on the statement / behaviour / motive of the other person as it is certain to backfire and would lead to a rapid deterioration of the situation. The best strategy is to actively listen to the other person, process each thought with logic and facts before summarizing the chain of events in your words. This can be followed by presenting your account of the whole matter in an empathetic manner so as not to hurt the sentiment of the already upset counterpart.

3.7 MENTORING AND APPRAISALS

Mentoring is a learning relationship between an experienced person and a relatively junior person, where the former offers guidance, support and counsel for the long-term career development of the latter. It is a one-to-one interaction between the "mentor" (the senior person) and the "mentee" (the junior person). The mentee stands to gain a great deal of knowledge and wisdom from the mentor without having to go through the slow learning curve. The mentor, on the other hand, gets a fresh perspective on the business and possible new solutions to old work problems.

3.7.1 Objectives of Mentoring

- ✓ To train and groom employees
- ✓ To fast-track the professional development of an employee
- ✓ To foster creativity and innovation
- ✓ To provide an opportunity for skill-transfer to the mentor
- ✓ For succession planning

Effective communication between a mentor and mentee is the key to a successful mentoring programme. It is important to understand that the communication in a mentoring relationship is often about imparting problem-solving skills to enable the mentee to learn to

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solve such problems without actual handholding. The mentee may just be learning to communicate in a professional setting and would look up to the mentor for guidance.

3.7.2 How to ensure effective communication in a mentoring relationship?

Active Listening

A mentee may have a hundred questions for you simply because he is new to the professional world or to the industry. You must make it a point to listen to him so as to inspire and build trust in the relationship. Listening actively is also important for you to interpret the issue in the right context so that your response caters to it adequately.

Speak in First Person

Speaking in first person conveys ownership of whatever advice you are giving as a mentor and helps inspire confidence in the mentee. So, try to use more "I" statements like "I have observed while working on similar assignments that..."

Ask Questions

Probing to gauge the understanding of the mentee on the underlying concepts of an issue which is being discussed helps the mentor to calibrate the learning process appropriately. Asking questions as you go along during a session is also important to ascertain whether the mentee is grasping the nuances well.

Body Language

Make use of your knowledge of body language, including gestures, posture, expressions and eye contact to supplement your reading of the mentees understanding. Any divergence in the two will prompt you to interject and ask questions to clarify and improve understanding.

Mind the Generation Gap

More often than not, there is some age difference between the mentor and the mentee leading to potentially significant differences in the perceptions, metaphors and vocabulary. Seeking clarification wherever you think your mentee has used a certain term which you find to be out of place from your perspective is always a good thing to do to avoid divergence in understanding.

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Use Technology to Communicate

After the onset of the Covid-19 pandemic there has been a significant increase in work-from-home (WFH) option for employees. In such cases, the mentor and mentee may be sitting far apart and physical meetings may happen rarely. Communicating through the electronic media, i.e. email, instant messaging (IM), etc. may be a good idea for routine issues. However, the more important issues are best discussed in person, or with the use of video conferencing (VC) applications, such as MS Teams, WebEx, Zoom, etc. as per the policy of your organisation.

3.7.3 Appraisals

Appraisal is a tool in the hands of the reporting managers to systematically track, evaluate and document the performance of a team member based on which regular feedback is provided to the latter to enable improvement in performance and deliverables. The performance appraisal is also used as a document based on which pay hikes, job rotations, promotions, etc. are decided.

Appraisal and Communication

✓ ***Confidentiality***

The most important aspect of communication of performance appraisals is confidentiality. Appraisal contains sensitive information as to the employee's pay grade, designation, roles and responsibilities, key performance indicators, timelines, etc. which needs to be kept confidential. When appraisal forms are sent, they are kept in sealed envelopes and handed over to the addressee only. However, these days the performance appraisal systems are online application-based with each supervisor and employee getting login accounts to keep it private and confidential.

✓ ***One-To-One Communication***

Appraisal being such as a sensitive process needs to be conducted with due care and diligence. Never conduct appraisals for your team members in a group as it would entail ethical issues. Discussing one's performance in a group can be insulting and humiliating, besides you cannot expect a team member to be candid in front of others. Therefore, it has to

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be a one-to-one exercise and a focussed and detailed one at that, conducted in a dignified manner.

✓ ***Listen and Discuss Openly***

An appraisal is not complete without the employee agreeing to what the assessment says. Therefore, the supervisor and the employee have to be in agreement on the performance appraisal before it is formalised. In case the employee differs in opinion about your assessment, sit down and discuss the points where the employee feels that the assessment is not a true reflection of actual performance. Listen carefully without any preconceived notion or bias as the employee may really have a point which requires rethinking of certain items in the appraisal made by you. It will help clear any potential resentment which can even lead to the exit of the employee from the organisation. It is a fact that attrition in many organisations peak immediately after appraisals. This can be avoided if reporting managers are able to communicate well during appraisals and listen to what the employees have to say and valuing it on merits.

✓ ***Celebrating the Outcome***

As a supervisor, you must make it a point to congratulate your team members on the appraisals and promotions in a way that makes them feel appreciated. Many supervisors spend some time with the employees at their workstations discussing and commending the journey of the employees over the appraisal period. This recognition can be a great motivation for the employees to continue to put in their best.

3.8 COMMUNICATION IN SOCIAL MEDIA AND DIGITAL COMMUNICATION

Digital Communication

The process of communicating with people through various online channels, including social media, emails, web-banner adverts, online adverts and advertorials, blogs, podcasts, etc. is known as digital communication. The digital medium has gained huge traction over the past decade.

Social Media

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A platform of interaction for people that they use to create, share and consume information, ideas, thoughts, entertaining content, etc. is known as social media. The most popular social media platforms include YouTube, Facebook, Instagram, Twitter LinkedIn and blogs. Social media is used by a very large number of people on a daily basis for having conversations, sharing thought and ideas, images and videos, advertising and marketing and making new friends and relationships. Profiles are created on these platforms not just by people for their personal use, but also by organisations, institutions and brands.

The biggest advantage of communication using Social Media is that there is hardly any cost involved in it. Brands can reach a wide audience at negligible costs if they choose to utilise the social media. In fact, there are many brands, such as Rolls Royce, Ferrero Rocher and Zara that hardly spend any money on advertising through the conventional media of television commercials (TVCs) and print adverts. Such companies rely almost entirely on digital communication and social media for the purpose.

3.8.1 Social Media Communication as a Key External Communication Strategy

Social media has captured the imagination of marketing professionals and communicators across businesses and organisations. The entire paradigm of external communication has shifted in favour of social media. It has changed the way corporations communicate with its external stakeholders, including customers, investors, distributors, suppliers, etc. Managers use the social media platforms for story-telling, creating a buzz around an event or a product, spreading awareness and so on. Organisations have started realising that their priority is to continuously engage with their stakeholders and that social media is too important a tool to be ignored.

The importance of social media for communication with external stakeholders can be understood from the reasons mentioned below-

a. Social media facilitates direct and open communication with stakeholders. Brands can rely on information discovery by stakeholders provided that they keep posting engaging content.

b. Social media is a great tool for mobilising public opinion and.it is increasingly being used for market research, surveys, opinions polls, product development, customer service, etc.

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c. Social media enables organisations in reaching a wide audience at negligible costs, which would otherwise involve spending huge sums on advertising through conventional media.

d. Another great advantage of social media for communicating with external stakeholders is that it provides a channel for direct feedback on a continuous basis which enables communication professionals to adapt the company's offerings to the evolving needs and expectations of the stakeholders.

3.8.2 Communication Using Social Media Campaigns

Social media campaigns are presently the most preferred medium for businesses to connect with customers. The primary reason is that social media is much more engaging than the conventional media. Further, social media enables artificial intelligence (AI)-enabled delivery of customized content based on the interests of various target groups and individuals. Let us see how communication professionals build engaging social media campaigns on various platforms.

- ✓ **YouTube** is a platform that is used by communications professionals for brand building by partnering with influencers, creating how-to-videos for relevant brands, create behind-the-scenes or making-of-something videos that creates a story around the evolution of a product, etc.
- ✓ Brands utilize **Twitter** is many ways, including a direct marketing communication with customers, conduct market research and surveys and provide customer support by setting up full-fledged customer support handle. Many brands make use of trending handles to communicate with its target market.
- ✓ **Facebook** is a great medium to engage with groups and social communities. Professionals communicate with the communities through dedicated brand pages and groups. Facebook Store feature also allows small businesses to create an online store on their platform for free.
- ✓ **Instagram** is used by brands that rely on visual appeal to connect with its target market. For instance, all brands connected to the fashion industry, celebrity marketing and so on.
- ✓ **LinkedIn** is a professional networking platform where people share and discuss their thoughts, ideas, experiences, etc.

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- ✓ **Blogs** are internet sites that are written in the form of a journal where the author posts entries in a sequential manner. Brands often use blogs as a part of their web content to reach out to its target audience. Blogging is not just used for external communication, but also for internal communication regarding policy changes, new initiatives, etc.

3.8.3 Challenges in Social Media Communication

Social media communication has great advantages for corporations. However, it is also the most challenging medium of communication for the reasons discussed below.

Creating Content Frequently

People have very short memories when it comes to digital content. They need something new for consumption every time they are online. Thus, social media communicators have the gargantuan task of developing creative content too frequently. You would appreciate that it is indeed a challenge, for human creativity cannot be forced.

Customising Content for Various Target Groups

Creating content on a regular basis is not good enough, there is also the need to customise the content to suit the tastes of different target audiences. This task of customisation can be equally enormous and time-consuming. The issue with customising the content for too many audiences is that it becomes difficult to maintain the uniqueness of content.

Timing

Timing the release of content and the duration for which the content is to be run on various platforms is also one of the most challenging aspects of social media communication. Social media communicators have to keep a close watch on how well the content is being received in order to make the most out of it. If a popular campaign is withdrawn too early to make way for a fresh campaign, the potential benefits of the former may be lost.

Lack of Expertise and Resources

Social media content creation is a highly skilled job and the expertise may not be available in-house in most companies. Further, if you want to use multimedia content in your posts, finding the right multimedia which is high-quality, fitting the specifications etc. can be a challenge.

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Legal Aspects

Another key issue with social media communication is that of the legal implications pertaining intellectual property rights (IPR). Therefore, social media communicators have to be very conscientious when using multimedia content developed by third-parties.

3.9 SUMMARY

1. The exchange of thoughts, ideas and feelings between people through verbal and non-verbal communication is called Interpersonal Communication.
2. Team communication refers to the exchange of information among the members of a team working towards a common goal / objective.
3. Negotiation is the dialogue that two or more parties engage in for sorting out their differences. Effective communication strategies help in successful negotiation and finding a win-win solution.
4. A disagreement between interdependent parties that arises due to incompatible goals, scarcity of resources or opposing point-of-view is known as a conflict. Proper communication is the most potent solution for preventing conflicts from arising and also resolving them without much damage.
5. Mentoring is referred to as the process of guiding, advising and supporting a junior by a seasoned and experience senior within the organisation.
6. Appraisal refers to a continuous process evaluating and documenting the performance of an employee in the execution of the duties assigned to him / her for a specific period of assessment. The key performance indicators (KPIs), expected outcomes, etc. need to be documented well and communicated for a fair and just assessment.
7. Digital communication and its major component, i.e., social media are the most important communication channel for developing and nurturing relationships with your stakeholders. The right communication mix using various digital media channels help in reaching the right people and relaying the right message.
8.

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3.10 SELF-ASSESSMENT QUESTIONS

1. Discuss the benefits of improving communication within a team.
2. What is interpersonal communication? How would you use the uncertainty reduction theory to help you transition successfully into your new study or work environment?
3. Identify some negotiation skills that you think are the most useful in turning the tide in your favour?
4. Have you ever been embroiled in a conflict? Recall the strategies that you used to resolve it and compare it with the strategies given in the lesson.
5. Why is so much emphasis given on confidentiality during appraisal communication?
6. What are some of the strategies that you use on your personal social media handles to invite attention of people and engage with them?

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LESSON 4

CROSS-CULTURAL COMMUNICATION

STRUCTURE

4.1 Learning Objectives

4.2 Introduction

4.3 What is culture?

4.3.1 Where can you start?

4.4 Studying culture

4.4.1 Structural Approach

4.4.2 Transaction Approach

4.5 Cross-Cultural Communication

4.5.1 Understanding Cross-Cultural Communication through Structure-View

4.6 Communication across cultures through different mediums

4.6.1 Active Listening

4.6.2 Verbal Medium

4.6.3 Non-Verbal Medium: Speaking Sans Words

4.7 Business Etiquette across Cultures

4.8 Strategizing for Effective Cross-Cultural Communication

4.9 Summary

4.10 References and Suggested Reading

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4.1 LEARNING OBJECTIVES

After completing this lesson, you will be able to:

- ✓ Define culture and explain the evolution of culture.
- ✓ Enumerate the different approaches to study cultures.
- ✓ Define cross-cultural communication and appreciate its importance in the present context.
- ✓ Enumerate the different mediums through which communication occurs across cultures.
- ✓ Enunciate business etiquettes observed in different cultures
- ✓ Formulate strategies for successfully communicating across cultures using the theoretical framework provided in the lesson

4.2 INTRODUCTION

Have you noticed that the world around us is getting more diverse and our interactions with people from different cultures are growing at a rate faster than ever? The interaction among people from different cultures has been on the rise due to industrialisation, migration from rural to urban areas and improvement in technology, modes of transportation and communication. Foreign trade is taking place at unprecedented levels and more people are travelling to get their business done. Corporations are enthusiastic about having a culturally diverse workforce and flaunt it in their presentations and annual reports.

Communication with people from different cultures within the country or different nationalities can be a greater challenge than you imagine. Your chances of success in business will be determined by how well you are able to overcome this challenge.

Cultural differences can be tangible and intangible. Food, art, costumes, etc. constitute the tangible or visible aspect of cultural differences. However, it is only a minor aspect when compared to the intangible aspect which basically stems from differences in core values across cultures. Therefore, it is upon the intangible aspect of cultural differences that we will be dwelling upon in this lesson.

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4.3 WHAT IS CULTURE?

Culture refers to the collective way of thinking and going about life. It evolves as a consequence of the complex phenomenon of continuous communication between people. As they go along, the people adopt certain ideas, values, beliefs, principles, rituals and customs that are passed on from one generation to the next. This definition implies that culture is a collective asset and is shared by each individual who happens to be a part of it. Those from the same culture often feel an affinity for each other, especially when interacting in a heterogeneous environment. A culture often evolves within a geographical region.

Members make conscious efforts to preserve it which means that culture becomes a unifying factor for its members.

Every culture has certain unique attitudes which greatly influence the communication patterns of its members. Culture has a deep impact on the style of communication, however people frequently oversimplify it and create stereotypes which is a barrier to effective communication.

4.3.1 Where can you start?

Acknowledge…The first step towards learning to communicate better in a cross-cultural business environment is to acknowledge that there are differences in culture and that there is nothing good or bad about it. The next step is to shed all preconceived notions about a culture and start afresh.

Be curious…If you want to make a genuine attempt at communicating better with people of different cultures, get curious like a child and start reading.

4.4 STUDYING CULTURES

The two key approaches to studying cultures are detailed below.

4.4.1 Structural Approach

Examining culture using the structural method entails studying its constitution and forms. The structural approach is based on identifying the differences in cultures of various

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nation states, geographical regions not confined by national boundaries, faiths, ethnicities, etc. based on differences in values, beliefs, customs, attitudes, expectations and goals.

For example, there are stark differences in the western and oriental cultures. The culture of British people is distinct from that of the other mainland European nations which in turn, have distinct cultures of their own.

The structural approach is the traditional way of studying cultures and offers great insights in developing an understanding of how to communicate to be successful in our day-to-day interactions with people from different cultures.

4.4.2 Transaction Approach

This approach views a culture being created as a result of the communication or the multifarious interactions between people. In other words, culture emerges and evolves as people go about transacting their thoughts and responses. The everyday communication between people leads to creation of patterns which are distinguishable and over a period of time these patterns get reinforced as the transactions continue to take place over and over again.

The transaction-view of culture recognizes the importance of going beyond nation-states and geographical regions to broaden the scope by encompassing groups which display a certain distinctiveness in their behaviour and the manner in which they communicate. From their communication it is said that the culture is symbolically transacted.

For instance, medical doctors, share brokers/traders, musicians and online gamers all share a certain vocabulary and display common styles of communication which is essentially an outcome of the daily transaction of their distinct businesses. Interestingly, studying and adopting the styles of communication can potentially help one in gaining acceptance or even membership of various cultural groups.

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EXERCISE 1

1 Look back at your personal and social life and try to pen down the number of distinct cultures you have come across.

2 Based on the above, do you think cultures change strictly with nationality?

3 Try to remember the longest interaction you had with a person from a different.

4 Make an effort to isolate the key points of difference between your culture and the other person.

4.5 CROSS-CULTURAL COMMUNICATION

The interaction between people of different cultures, whether between those from different geographical regions, nation states, religions, etc. is called **cross-cultural communication or intercultural communication**. The process of exchanging messages between people of different cultures can potentially lead them to interpret the verbal and non-verbal signs differently. Cross-cultural communication involves the study of culture mostly from the structural perspective to identify the differences from one's own culture to develop strategies to align with the target to improve understanding and the probability of a successful engagement.

Cross-cultural communication deals with how people from varied cultural milieus interact and the that challenges they face in the process. These challenges are not confined to differences in languages or dialects but extend much beyond to differences in non-verbal signals, perceptions, metaphors, and so on.

The biggest hindering factor when it comes to cross-cultural communication is perception and pre-conceived notions. You really don't know what to expect from the other person because you are not aware of the values and accepted behaviours in his / her culture. Due to this unawareness, perception and stereotypes dominate your thoughts thereby potentially ruining the chances of success.

Another factor that acts as an impediment in cross-cultural communication is ethnocentric bias or ethnocentrism. Ethnocentric bias compels people to see and judge other cultures under the influence of one's own culture.

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AN ILLUSTRATION OF ETHNOCENTRIC BIAS

An American and a Chinese were visiting a cemetery where their friend had been buried. The American was carrying a beautiful bunch of flowers to put on his friend's grave. The Chinese was carrying a bowl of cooked rice and some fruits. The American found it ridiculous that one would leave food at a grave. "Do you really think", asked the American, barely hiding his contempt, "that your dead friend will come and eat the food you leave at the grave?"

"Yes, of course," retorted the startled Chinese after a moment's pause, "my friend will come and eat the food around the same time your friend comes out to smell the flowers you're leaving for him."

It was a friendly dig at each other's culture. It grew from the difficulty the American had in understanding the logic of a Chinese custom. Fortunately for the two, the cultural differences did not threaten their friendship. However, one's culture can be a major block, especially in international communication.

Source: Monipally, M.M. (2001), Business Communication Strategies, p. 44.

For the purpose of this lesson, we will delve deeper into the structural construct of culture to be able to develop strategies for successfully communicating in a cross-cultural environment.

4.5.1 Understanding Cross-Cultural Communication through Structure-View of Cultures

The structure-based approach leads us to classify cross-cultural characteristics into the following divisions:

a. Context
b. Individual / Collective
c. Time
d. Conflict

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✓ Context

Context refers to the setting, environment, relationship, etc. in which the communication is taking place. The extent to which this communication relies on being explicit or implicit varies from culture-to-culture. The portion that is left unsaid is decoded based on the situation and the relationship between the parties in communication. Based on the degree of what is left unsaid, cultures are classified as high-context and low-context.

High-Context

Cultures that attach high importance to circumstances / setting / environment and are not very explicit in verbal terms are called high-context cultures. Such cultures tend to be ceremonial, and protocols exist for conduct in meetings and gatherings. In South Africa, great importance is given to a person's tribal lineage when comprehending a conversation. Its culture considers it fair to assign higher priority to friends, family and close associates even in business transactions. Therefore, what may seem unethical in, say American culture, is regarded as ethical in South African culture.

Low-Context

On the other hand, in Low-Context cultures, the message itself does most of the communication and the context and background are of no or very little consequence. In such cultures, success would depend greatly on how well-prepared and logical your argument is and how well it is presented. The relationships in such cultures are consciously removed to make an unbiased decision, which is why it is common for people to step aside from making decisions involving family and friends. In fact, such clauses are usually built into contracts that make it an obligation for the contracting parties to declare any related individuals in the business under negotiation.

✓ Collectivist / Individualist

There are collectivist cultures and individualist cultures based on whether importance is given to individual identity or collective identity. It is common knowledge that eastern societies tend to be more collectivist, whereas western societies are individualist.

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Collectivist

Societies in the east have been collectivist and assign enormous importance to groups. Decision-making is a consensus-making exercise in such societies. In the villages of India, the institution of *panchayat* is a perfect example of how the interest of the community is assigned paramount importance and individual interests are often sacrificed for the larger good of the community. In collectivist societies, focussed pursuit of personal goals only would be considered selfish. It is quite common for the elders to intervene in such a situation to bring the individual back on the "right" track. In collectivist cultures, much care is taken not to hurt the sentiment of the community. Therefore, criticism is often very oblique, especially when it is about seniors / elders.

Individualist

The societies that regard personal pursuits to be more important than collective pursuits are called individualist cultures. Western societies are classified as individualist and the aspirations of the individual combined with the liberty to make the decisions for him/herself are regarded as fundamental to their existence. Individual achievement is celebrated in such societies. The most remarkable of such societies is the American society which is quintessentially individualist. In individualist cultures, such as American, relationships are not diffused, but specific. It essentially means that a boss will just be a boss and would not be perceived as, say an elder brother, the way sometimes it is in India. This gives them the leeway to be direct in their criticism. The degree of straightforwardness or bluntness would vary in Western cultures, for instance Americans are quite blunt whereas the British would understate.

✓ **Time**

The views of different cultures on time is one of the most frequently quoted characteristics of cultures. It is also perhaps one of the most common factors that acts as a potential dealmaker or deal-breaker in a cross-cultural business environment.

How many times have you heard the cliché – "Time is money"?

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It precisely characterises the perception of time prevalent in the Western cultures, such as the United States and the United Kingdom. Therefore, adhering to timelines goes a long way in creating a favourable impression that lays the foundation for business to take off.

Cultures can be classified into the following two types based on their views on time:

Monochronism

Monochronic cultures take a linear view of time and essentially means that full attention is focussed on one thing and multitasking is avoided. People from such cultures strictly observe and respect timelines. They do not appreciate people reaching late for meetings and digressing too much from the matter under deliberation / discussion. In such cultures, time is an asset of great value and therefore there is little room for being "flexible".

Polychronism

Polychronism is characterised by a flexible view as regards time and assigns greater importance to relationships and multitasking. The objective is to get the job done, rather than to complete the job within a strict schedule. Examples of polychronic cultures include South American and Arab cultures. Polychronism is also characterised by members attempting unrelated tasks simultaneously and switching frequently between tasks. The insistence of people from monochronic cultures to adhere to timeline may be perceived in polychromic as being too pushy and rude.

Table 4.1: Comparison ofMonochronic and Polychronic Characteristics

Monochronic Culture	Polychrionic Culture
Focus on one thing at a time	Focus on multiple tasks at a time
Builds schedules and timelines	Importance on completion of task than adhering to deadlines
Low context	High context
Time is important	Relationship-building is important
Task-orientation	People-orientation

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An interesting scale was developed by R D Lewis that rates Eastern and Western countries on what is termed as a Linear-Active and Multi-Active Scale. As the names suggest, Linear-Active people focus on one thing at a time and are not too flexible. Multi-Active, on the other hand, are known to multi-task and do not bother too much about time. Most Linear-Active cultures, as per Lewis, were German, Swiss, American, Canadian and British, whereas the most multi-Active cultures were Indian, Latin American, Arab, Pakistani and Spanish.

CASE STUDY

A Lost Opportunity

Lindsey is a mid-level manager from a UK-based exhibition company that wishes to organize a trade expo in New Delhi. She seeks appointment with the Manager in-charge of a leading venue complex in the National Capital Region (NCR) and visits his office at the scheduled time. To her surprise, Lindsey finds that the venue Manager is in another meeting at the time that was allotted to her.

She waits for about 30 minutes after which the venue manager arrives in his office. They start the meeting and Lindsey is perturbed to see that the venue manager keeps engaging in brief conversations with his subordinates on matters unrelated to the ongoing meeting with Lindsey. He also attends to walk-in guests and responds to phone calls during the entire meeting. Lindsey had this unpleasant experience due to the unawareness of the venue manager about the cultural sensitivities of his potential client. The venue ended up losing the event to a smaller competitor in the city.

✓ Conflict

Different cultures deal with conflicts differently. An understanding of the various attitudes towards conflicts can assist in managing conflicts in a better way. As per Martin and Nakayama (2007), based on the writings of Augsburg (1992), there exist two different cultural views to conflicts, namely conflict as opportunity and conflict as destructive.

It has been observed that individualist societies see conflicts as opportunities, whereas collectivist societies view conflicts as destructive.

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Opportunity-Approach to Conflicts

The cultures that view conflicts as opportunities regard conflicts as normal and a potentially useful process. Attempts are made to resolve the conflict through negotiation with the underlying assumption that matters may change if confronted and negotiated.

Destructive-Approach to Conflicts

Conflicts are regarded in some cultures as aberrations that need to be addressed by disciplining those responsible for the conflict. Such cultures see conflicts as unnatural, futile and harmful for the general harmony and greater good of the community.

Conflict Management

There are five distinct conflict management styles identified by Rahim (1983): (i). avoiding, (ii). obliging, (iii). compromising, (iv). integrating, and (v). dominating.

- ✓ *Avoiding*: This style of conflict management entails withdrawing from a conflict situation.
- ✓ *Obliging*: It involves giving in to the demands of the other party to end the conflict situation.
- ✓ *Compromising*: To arrive at a solution, both parties take a step back / forward due to which neither feels fully satisfied.
- ✓ *Integrating*: It entails active negotiations by all parties involved to understand each other's positions and deliberate on alternative / available options. The idea is to arrive at a solution that is acceptable to all.
- ✓ *Dominating*: It is merely coercing of one party by the other who may be in an advantageous position. It may have negative consequences in the long run.

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EXERCISE 2

1 What is your view on time?

2 Would you classify yourself as monochronic or polychromic?

3 Find out using the table above that classifies the characteristics of monochronic and polychromic cultures.

4 Do this exercise with your friends from different cultures and compare the results. If you don't have friends from other cultures, forget this exercise and get some!!!

4.6 COMMUNICATION ACROSS CULTURES THROUGH DIFFERENT MEDIUMS

The most widely accepted mediums or channels in the context of cross-cultural communication are - (a) Listening, (b) Verbal, (c) Non-Verbal, (d) Written. Out of these different modes of communication, the verbal, face-to-face version is the oldest and the most common.

4.6.1 Active Listening

Listening is one skill in communication that is usually underappreciated and overlooked. Active listening warrants a person to be attentive to what the speaker is saying and to align himself with the speaker to constantly validate and maximise the understanding.

In cross-cultural communication, listening becomes all the more important, as a genuine effort at paying attention helps in building trust and rapport. However, in every culture there are appropriate behaviours for listening that helps in building trust and gaining acceptance.

How to be a good listener?

Prepare yourself! If you want to be a good, active listener, you should do some homework and learn about the people that you are going meet. Better preparedness will give you an edge over people who simply walk-in.

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Make an attempt to ascertain if the person you are communicating with comes from a high-context or a low-context culture. (Go back to the section in this lesson on Characteristics of Cultures under Structure-view)

Pay attention! If the speaker notices that you are not being attentive or showing signs of losing interest, the communication will suffer and so will the business underway.

If the speaker says something that you find rude, do not take offence and try to reconfirm if the non-verbal signals corroborate the spoken word.

4.6.2 Verbal Medium

Verbal communication is perhaps the most commonly used medium in a cross-cultural environment. It comprises of spoken / oral communication and the written mode. The verbal medium relies on language, dialects, tone and tenor, loudness, level of education and so on.

✓ **The Spoken Word**

Spoken communication can happen face-to-face or through telephone, computer and mobile phone applications that run on the Internet, radio, television, and so on.

In high-context cultures, such as Chinese, oral communication is decoded and understood in the context of non-verbal signals manifested by the communicator. For this reason, if the non-verbal cues are not consistent with the verbally coded message, the receiver may go with what the non-verbal signals suggest. Therefore, the importance of non-verbal medium can hardly be exaggerated, especially in the high-context cultures.

On the other extreme of the cultural spectrum i.e., American, a low-context culture, the explicit verbal message is considered almost final for the purpose of interpretation. It must be evident by now that two people from cultures far apart on the cultural spectrum will do best by studying and understanding each other's cultural nuances to have a successful engagement.

Even within the Western culture, there are differences that warrant closer study to be able to navigate successfully in a global business environment. For example, the British are accustomed to being rather formal and polite in asking for things in contrast with, say the Germans who are quite straightforward. The British enthusiastically follow courtesies and

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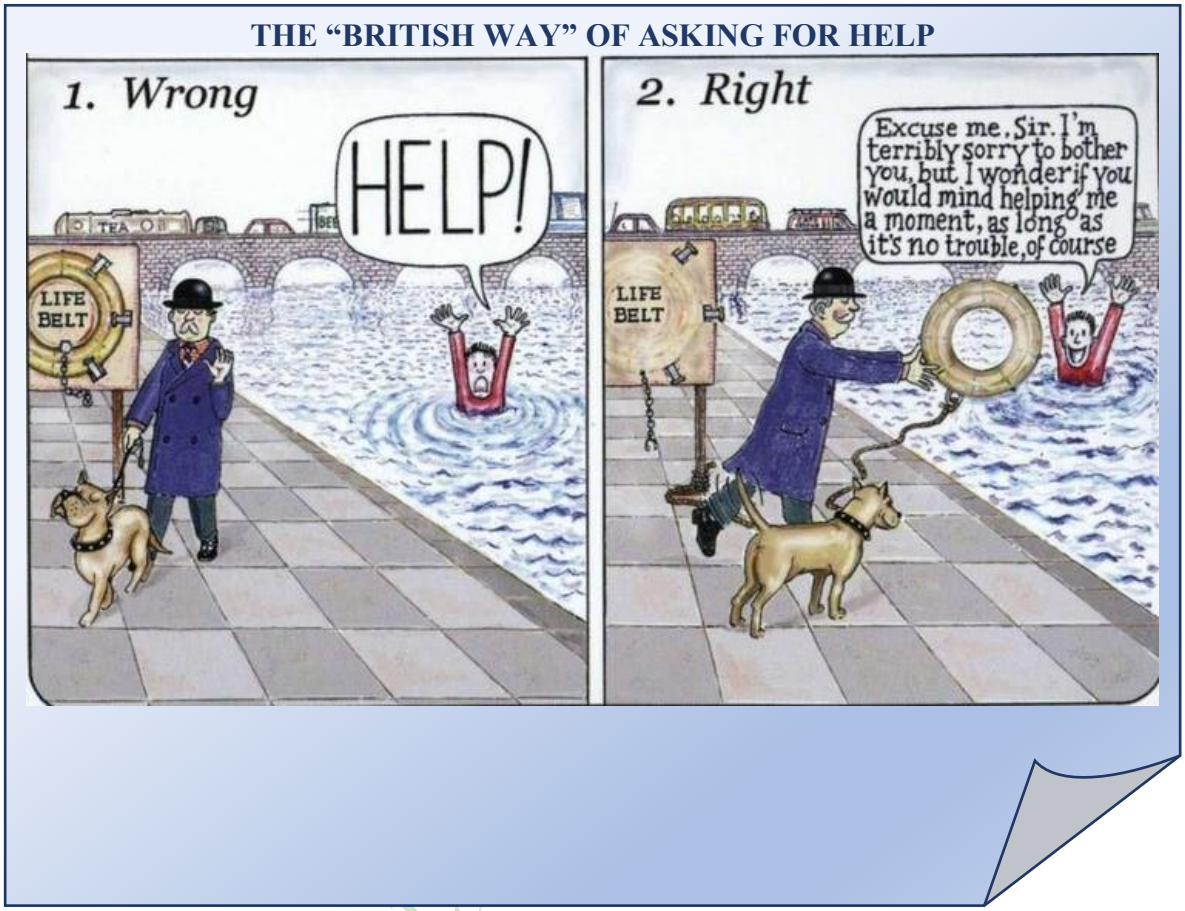
words and phrases such as, “please”, “sorry”, “thank you”, “beg your pardon”, etc. are used very frequently.



Source: From the Internet

✓ Written Communication

The written mode of communication is considered relatively easier than the oral mode as the sender has more time at his disposal to strategize and encode the message. However, the flipside is that one doesn’t get instant feedback as in verbal communication, that helps you modulate and fine-tune your strategy during the conversation. In a global business environment, the written mode is the most commonly used method of communication, and hence becomes the most important to be mastered. The written word stays forever as it may be preserved as record. It is reason enough for one to be extremely aware and thoughtful when communicating through the written medium. The written medium includes letters, emails, memorandums, reports, contracts, proposals, etc.

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How to write effectively in a cross-cultural context?

To write effectively and be impactful and clear to your reader, the first step is to be aware of your own culture. An awareness of one's own cultural characteristics and biases will help in neutralizing the influence it would have on your communication with people from other cultures. Once you clearly have your own culture in mind, you can compare it with the culture of your target to have a strategy in place to write in a tone and tenor neutral of ethnocentric biases.

The tone and tenor of the written communication should be consistent with what the target would be expecting based on whether the latter's culture is skewed towards low-context or high-context. Therefore, a mix of theoretical and hands-on approach derived from one's own experiences or from that of your seniors / mentors should be employed when writing to people of different cultures.

Extent of Detail

People from low-context cultures, such as Germany and United States prefer detailing at minute levels because whatever is explicit is more important for them. Contrast this with high-context cultures like Japanese, where the writer would expect the reader to have the basic understanding of the subject matter and therefore will be less-than explicit. You should have this at the back of your mind to avoid the reader from taking offence at being provided excess or less information. However, this doesn't hold true for the decision-making process in the US and Japan. Corporations in the US tend to be quicker in decision-making as the powers are sufficiently delegated as individual contribution is important to the Americans, whereas in Japan the decision-making is a consensus-building process and may take somewhat longer.

You must select your words carefully and arrange the text in a logical, organised fashion after building-in sufficient context. **Articulation is of much more importance in written communication than eloquence.**

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One should avoid using slangs, idioms and proverbs when writing to a counterpart or a colleague who is from a different cultural milieu, as it can obscure the understanding of the latter. Roundabout and ornate language is also best avoided in the written medium.

Use universally recognized conventions rather than the ones in vogue only in a particular region or culture. For instance, the format of dates can cause confusions as shown below

Table 4.2: Use a Culture-Neutral Convention

American	British	Neutral
08.02.2022	02.08.2022	2nd August, 2022
As you can see, the British and American conventions of dates differ which can cause confusion between the month and date. Therefore, it is best to use the neutral convention which is quite explicit.		

Decoding the written communication received by you from somebody from a different culture is also an art. Imagine that you had sent a request asking for something from your business associate in Japan and if the latter wants to decline it, there are high chances that you will **not** get a direct 'no'. The Japanese tend to avoid using 'no' as an answer as it is considered rude, so they would try to write obliquely hoping that the other party would get the message.

4.6.3 Non-Verbal Medium: Speaking Sans Words

Non-verbal communication involves communicating without the use of spoken words and instead using facial expressions, hand / body gestures, posture and physical distance. It also refers to the communication that happens at a subconscious level while the oral communication is underway. The most interesting thing about non-verbal communication is that it can send out signals that are inconsistent which what is being said thereby leading an intelligent listener to discover the contradiction. There are certain emotions that are universal and culture-neutral, such as happiness, sadness, fear, anger, etc. which are expressed by

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means of non-verbal communication in similar ways throughout the world. However, there are accepted cultural norms for how emotions are expressed in front of others. For example, in Arab culture it is quite acceptable to mourn-out loud to express grief. Whereas, in China or Japan expressing feelings of great happiness or grief openly is considered unacceptable.

CASE STUDY

Cultural Shock

A recent Indian migrant to the United States who was used to pulling cheeks of even unacquainted kids back in India was shocked when a young American kid snapped back aggressively saying, "You don't wanna mess with me!!!," on getting his cheek grazed by the Indian man with his hand. It is because the expression of affection through non-verbal medium varies across cultures.

It is quite acceptable for friends to embrace in some cultures, whereas it is considered inappropriate in others. Even the distance maintained by people during a conversation can have a profound impact on the communication as we shall learn later in the lesson.

✓ **Gestures (Kinesics)**

Movements of the body made in particular ways carry meanings that are manifest and clear only to those initiated into that culture. Most common gestures include the thumbs-up / thumbs-down, the OK sign, the beckoning sign, etc.

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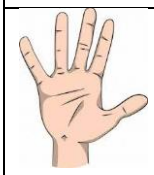
Table 4.3: Some Common Gestures and their Meanings Across Cultures

	The thumbs-up or thumbs-down gesture are used to convey approval or disapproval, respectively, in the US.
	Whereas in some Arab cultures, it is a highly offensive gesture equivalent to the middle finger in the US. In India, this gesture is used with the right hand to disappoint and taunt somebody.
	This is perhaps the most recognizable hand gesture. It means "OK" or approval of something in the US.
	However, it is an obscene gesture in Brazil and an insulting gesture in Turkey and some Arab cultures.
	This gesture is also known as the beckoning sign and can be made using just the index finger or a curled palm. It is a common gesture used for beckoning.
	However, in some Asian cultures, such as Japan and Philippines, it is an insulting gesture considered fit only for beckoning animals.
	This gesture is called the **Moutza**. It is used by spreading out all fingers of a hand and showing it close to the face of a person. It is an insult gesture traditionally used by the Greek. You will see the use of this gesture in demonstrations and protests in Greece.
	In India, especially in the northern states this gesture is used when cursing (*la'anat*) somebody.

✓ Postures

Postures convey emotions and intentions and can be classified into open and closed postures. Adopting certain positive postures will help you to make an impact on the people you communicate with during the course of your professional and personal life.

The basic postures are standing, sitting, squatting and lying down (Hargie, 2011). Out of these the most relevant for cross-cultural business communication are standing and sitting

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postures. In western cultures, putting one's hands just above the hips in a standing position is considered as an attempt to dominate and be assertive.

Open and Closed Postures

The open posture suggests friendliness or receptivity. It can be identified by a person with his legs apart in a relaxed position with open arms facing outward. In the American culture, people adopting an open posture are perceived to be more convincing than those who adopt a closed posture. A closed posture involves folding your arms across your chest, crossing your legs in the standing / sitting position, etc.

✓ Proximity and Personal Space (Proxemics)

The physical distance maintained by people communicating with each other is also a function of the cultural background. The appropriate distance to be maintained in each culture largely depends on the relation between the people in communication. In the Western cultures, the personal distance is classified into – intimate, personal, social and public. *Intimate distance* is close contact that is reserved for a person with whom you share a very close relationship. *Personal distance*, around 1-1.2 metres apart, is the space between two people shaking hands and is considered most appropriate for face-to-face communication. *Social distance* is the distance between people who are in a social gathering or in a business environment, for instance people working in an office. *Public distance* is maintained between speakers and the audience in a public event, teachers and students in a lecture hall, etc.

For the Americans, the comfortable distance for conversation is about arm's length to around 3-4 feet. Any intrusion into this space will be perceived as either intimacy or aggressiveness. Whereas Arabs stand closer to each other than the Americans and perceive it as a sign of warmth.

✓ Para-Linguistics

Para-linguistics refers to the non-verbal cues that are sent out through intonation and modulation of voice, pauses, rate of speech, etc. In fact, the famous English sarcasm is also a para-linguistic medium of communication.

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✓ **Oculesics**

It is the study of communication through the eyes, for example eye-contact, blinking of eyelids, gazing, etc.If you make eye-contact and keep nodding while listening to somebody from the US, it would be appreciated. Whereas, if steady eye-contact is maintained while listening to a Japanese person it will be construed as inappropriate and even rude. The Japanese also perceive nodding as merely listening as opposed to valuing what is being said. They also place great importance on silence and taking pauses as they speak, for these behaviours connote earnestness and genuineness in the Japanese culture.

EXERCISE 3

1 Studying the idioms in a language can potentially assist in developing a better understanding of the non-verbal cues in the culture that is associated with that language. One such idiom been suggested below.

2 Keep at arm's length – to avoid from getting close.

3 Find out if there are more in English and other languages that you speak.

4.7 BUSINESS ETIQUETTE ACROSS CULTURES

A code of conduct in the society, professional setting or a group in general with rules, protocols, courtesies, conventions, customs, proprieties, etc. is called etiquette. It is a part of culture and human behaviour and has variations across different cultures.

Table 4.4: How are etiquettes different from manners?

Etiquette	Manners
The code of conduct that acts as a set of guidelines for positive and polite behaviours in the society.	The way of behaviour consistent with the expected behaviour.
Set of rules of behaving in the society or in a group.	It refers to the actions themselves.

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Business Etiquette

A set of guidelines that helps people behave and interact in a business setting with stakeholders, clients, vendors, etc. in a way that is professional and accepted by the fraternity and helps portray the right image.

It is clear that business etiquette is a key social skill that is indispensable for success in the business world. Business etiquette is also a function of the culture under study. Therefore, in a cross-cultural setting, it is important for you to research about the culture of the people with whom business is to be transacted.

Now, we will delve into the business etiquette followed in India and some of the major countries / cultures in the world.

Table 4.5: Business Etiquette in India

Greeting	*The common way of greeting people is by shaking hands and it has overtaken the folded hands greeting almost completely at least in business.* *The most appropriate way to greet women is to wait a moment to see if they move their hands forward for a handshake, else the folded hands gesture can be used. However, in most big cities it is common for women to shake hands while greeting someone.*
Eye Contact	It is not considered appropriate in the Indian context to maintain eye contact with seniors though it may be construed as being evasive or even dishonest in other cultures.
Exchange of Cards	Though exchanging cards is not as ceremonious as it is in some other cultures, cards are formally presented with the right hand, sometimes with the left hand under the elbow of the right which connotes respect.
Appointments	Appointments can get cancelled even at the last minute, therefore it is best to give as much warning as to your travel schedule as possible and confirm your appointment before you leave your office or country!

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Time	Indians tend to be flexible with time, especially for social events / gatherings. However, the practice of punctuality may vary within India too from the north to the south and so on.
Hierarchy	Indians follow hierarchies in social as well as professional relationships. This hierarchy is always there at the back of their minds. Those in positions of authority will not be seen doing manual work even if it is their own. This is more true of the public sector.
Dress Code	The business dress code is mostly smart yet comfortable clothing. The dress code varies based on hierarchy. Women tend to wear sarees, tunics and western formal attire which is getting more and more common.
Meetings	Meetings tend to start late and overrun the allotted time. A clear agenda may not be there, and the meetings will usually commence with unrelated casual banter.

Table 4.6: Business Etiquette in the United States

Greeting	**A firm and warm handshake with proper eye contact is offered while greeting. If you are meeting a delegation, make sure that you don't lose eye contact with the person with whom you are shaking hands.**
Eye Contact	Maintaining proper eye contact during a conversation is perceived as a sign of sincerity, genuineness and confidence.
Exchange of Cards	If interacting with someone for the first time, it is not appropriate to start a conversation by exchanging business cards, until the conversation turns business oriented. However, if it is a formal business meeting, the exchange of cards takes place before the start of the meeting so that those attending are familiar with each other's names and roles. Writing on the business cards is not considered inappropriate, in fact it may be appreciated if you write your personal mobile phone number on the back of

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	the card and hand it over.
Appointments	People in America like to keep their appointments and there are hardly any cancellations except in case of emergency.
Time	US culture is monochronic and events are scheduled one at a time. They are particular about punctuality and adhering to schedules.
Hierarchy	The culture in US corporates is less hierarchical because of their inherent belief in equality.
Dress Code	Business Suits in navy blue or grey and tie with solid white shirts for formal meetings. Women wear dresses or suits in classic colours of grey, white, navy, etc.
Personal Space	The US being a no-touch culture, Americans are very particular about their personal space. In fact, there is concept of personal bubble within which no intrusion is tolerated. So, at least an arm's length distance is always maintained.
Meetings	Meetings are taken seriously and have clear agendas. Side-activity is not appreciated at all and may be perceived as disinterest.

Table 4.7: Business Etiquette in England

Greeting	**Handshake is the norm for men as well as women.**
Eye Contact	Persistent eye contact should be avoided as it can make people uncomfortable. The best thing to do is to make eye contact every now and then.
Exchange of Cards	Card etiquette is quite relaxed in Britain. Business cards are considered as an easy way of handing out your contact details to a potential vendor or client.
Appointments	Appointments are honoured, except in case of emergency or some genuine reasons.
Time	Punctuality is important. Arriving a little early is acceptable.

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Hierarchy	British society had been traditionally class-based and hence, hierarchy is taken seriously. Titles are very important. So, if a person has been knighted, he will expect himself to be addressed as "Sir" followed by the first name.
Dress Code	For business meetings or engagements, formal conservative attire is the norm, which includes dark suits for men. Though for women there aren't much restrictions as to colour.
Personal Space	For English people, personal space is important and touching in public is considered inappropriate. Also, personal questions are to be strictly avoided as privacy is very dear to English people.
Meetings	Meetings are pre-arranged by taking appointments. Documentation of the meetings, including circulation of agendas, minute-taking, etc. are of importance.

Table 4.8: Business Etiquette in the Arab World

Greeting	**Handshakes are the norm, though they last longer than handshakes in the western cultures. It is best to wait for your counterpart to withdraw his / her hand before you do. Men are recommended not to initiate a handshake with an Arab businesswoman unless she extends her hand.**
Eye Contact	Eye contact is acceptable.
Exchange of Cards	Please ensure to get your business cards printed in Arabic and English, keeping in view that the former is written from right to left.
Time	Most of the Arab world follows a different working week from the rest of the world. Weekends fall on Fridays and Saturdays, barring a few exceptions. Business hours are truncated during the month of *Ramadan,* so it is advisable to avoid business and meetings during this month. The concept of time is more relaxed in the Arab world, and it is common for people to be late for meetings. However, it is advisable for you to be on-time as a visitor.

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Hierarchy	Arab societies are hierarchical and organisational functioning is mostly top-down with decision-making in the hands of the powerful few.
Dress Code	Dark coloured business suits for men. Avoid wearing shorts and t-shirts when travelling in the Arab world. Women are expected to dress conservatively and modestly in the Arab world.
Personal Space	Arabs stand closer to each other during conversations than Americans do. Touching is also observed between members of the same gender and in fact, Saudi men can be seen walking hand-in-hand in public, without being judged as to their sexual orientation.
Meetings	Meetings are not planned much in advance and need to be confirmed a few days beforehand. Meetings usually start with an initial round of small-talk. Interruptions during meetings are common as the Arab culture is polychronic.
Hospitality	You may be offered refreshments during a meeting. Please accept it graciously. There is a lot of socialising before the food is served. It is common for men and women to dine separately. When socialising, avoid taking about religion and politics, especially Israel, as it may be taken offensively.
Other	As the month of *Ramadan* is for fasting and austerity for the Muslim people, it is advisable to eat and drink indoors and away from the public eye, that is, if you are in the Arab world during the holy month.

Table 4.9: Business Etiquette in China

Greeting	**Between people of the same gender, handshake and a nod at the time of meeting and departing is the norm. Between people of the opposite gender, a handshake or a nod is considered appropriate.**
Eye Contact	Eye contact is acceptable and considered polite.
Exchange of Cards	Make sure that your card is printed in Chinese on one side. Present your business card with both hands with the Chinese side up. Please see the card carefully before you place it and never write on a card that is presented to you.

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Time	Punctuality is valued so arrive for meetings on time or a little early.
Hierarchy	Chinese corporates are hierarchical and based on age and position and each individual has a specific position and role in the organisation.
Dress Code	Formal business suits are the best for meetings with the Chinese as it conveys respect.
Personal Space	Chinese are comfortable standing less than arm's length apart, though this distance increases with strangers. Touching is not observed unless with family.
Meetings	Meetings are a formal affair with a ritualistic approach. The senior member of the host speaks first, introducing himself and his team, followed by the leader of the visiting party. The Chinese like the visiting party to know who is in command and the latter should make that evident too during the meeting.

4.8 STRATEGIZING FOR EFFECTIVE CROSS-CULTURAL COMMUNICATION

Now that you are equipped with a sound understanding of the theory and practices in cross-cultural communication, it is time to evolve a strategy to communicate effectively in a cross-cultural context. Given below are steps that will assist you in developing a strategy and fine-tuning it.

✓ ***Be Receptive***

Your receptiveness and openness will help you in exploring and dwelling on certain aspects of your own or the target's culture that may help you overcome certain biases.

✓ ***Improve Your Awareness***

Awareness of the existence of vast or subtle differences in cultures is crucial to get on to the next step.

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✓ ***Always Prepare Well***

Read as extensively as possible and watch a movie based on that culture. The movie will help you understand the non-verbal communication styles and subtleties of the culture under study.

✓ ***Decide on the Language***

If you do not speak the language of your counterpart, hire the services of a competent interpreter. However, if you are fluent in the language, make sure that you brush up your skills based on the peculiarities of how it is spoken in your counterpart's region or country as a native speaker.

✓ ***Be Careful with Humour***

You need to be extra cautious when it comes to using humour in a cross-cultural context, for it can go wrong badly. For instance, the English use self-deprecating humour combined with understated sarcasm, whereas for the Japanese humour is a private thing as they want to avoid embarrassment for themselves or for the other party.

4.9 SUMMARY

- Culture refers to a set of ideas, beliefs and customs based on which certain norms are evolved over a long period of time which becomes a way of leading life for the members who are a part of it. A culture typically traces its origins to a particular geographical region.
- There are two distinct approaches to studying a culture, namely Structure-based and Transaction-based. The former involves examining the constitution and forms of cultures, whereas the latter studies its evolution through the multifarious interactions between people.
- Cross-cultural communication is the process of individuals or groups from different cultural backgrounds interacting with each other, recognizing their similarities and differences for a successful engagement.

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- The four characteristics of culture under the Structure-based approach of studying culture are: -
  - Context – Refers to the environment or setting
    - High Context Cultures - Attach high importance to circumstances / environment and less to verbal communication.
    - Low-Context Cultures - the message itself does most of the communication and the context and background are of no consequence.
  - Individual / Collective – Based on whether importance is given to individual or collective identity.
  - Time – Classified as monochronic and polychronic cultures.
    - Monochronic - Linear view of time, focus on one item and avoids multitasking.
    - Polychronic - Flexible view on time, greater importance to relationships and multitasking.
  - Conflict - Individualist societies see conflicts as opportunities, whereas collectivist societies view conflicts as destructive. Styles of conflict management:
    - Avoiding
    - Obliging
    - Compromising
    - Integrating
    - Dominating
- The important mediums or channels in the context of cross-cultural communication are - (a) Listening, (b) Verbal, (c) Non-Verbal, (d) Written.
- Cross-cultural business etiquette refers to observance of certain accepted rules, customs and behaviours for mutual consideration of people interacting for an effective engagement.

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LESSON 5

CAREER MANAGEMENT AND COMMUNICATION

STRUCTURE

5.1 Learning Objectives

5.2 Introduction

5.3 Career Planning

5.3.1 Steps in Career Planning

5.4 Career Management and Communication

5.5 Résumé Writing

5.5.1 Résumé Styles

5.5.2 How to write an eye-catching and convincing résumé?

5.6 Cover Letters

5.6.1 Structure of a Cover Letter

5.7 Group Discussions

5.7.1 Purpose of a Group Discussion

5.7.2 What are some of the key features of an effective group discussion?

5.7.3 Group Discussion as a tool in the recruitment process

5.7.4 How to communicate effectively in a Group Discussion?

5.8 Interviews

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5.1 LEARNING OBJECTIVES

After a careful reading and understanding of the concepts in this lesson, you will be able to:

- ✓ Articulate your career objectives and prepare a career plan for achieving the objectives.
- ✓ Write compelling résumés and cover letters to ensure that you get an interview call.
- ✓ Perform well in a group discussion and interview.
- ✓ Communicate effectively in an exit interview.
- ✓ Understand the ethical aspects of communication and implement it in your career.

5.2 INTRODUCTION

A typical span of one's career is around 35-40 years, which may seem like a long time to enable proper planning to accomplish career objectives. Yet, very few people tend to succeed in this endeavor. **Career Management** is a continuous process of orienting and reorienting your career based on the evolving sets of goals and objectives. These goals and objectives are embodied in certain milestones that one strives to achieve through career management strategies.

> *"I always wanted to be somebody, but now I realize I should have been more specific."*
>
> - Lily Tomlin

The above quote from Lily Tomlin hits the nail right on its head as career management starts with setting of specific goals and objectives. However, with for longer time horizons, the objectives tend to become less specific which is quite understandable. Therefore, the time scale is the most important factor when it comes to formulation of these goals and objectives. Time-horizon based goals and objective are classified below.

- ✓ **Short-Term** goals tend to be rather specific as one has the advantage of less uncertainty and therefore are easier to articulate. The time horizon for short-term goals would be up to two years. Formulating the right short-term goals that align with your long-term objective is of paramount importance.

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- ✓ **Mid-Term**goals are larger in scope but less specific when compared with the short-term ones. The time horizon for mid-term objectives is around three to twenty years. As the timeframe increases, so does the uncertainty which makes mid-term and long-term goal-setting much more difficult.
- ✓ **Long-Term** objectives are the most difficult ones to set due to very high uncertainty about the future. Though these objectives are easily modified due to the time advantage.

The key takeaway is that the responsibility for your career advancement is entirely yours. You cannot expect promotions, salary raises and so on to come your way simply with time. It is sufficiently clear that setting of goals and objective for successive time horizons is the crux of career management.

5.3 CAREER PLANNING

The ongoing process of goal setting, devising the means of achieving the goals, and reviewing and assessing it continuously is known as career planning. It has to be borne in mind that career planning is not just about the jobs and the positions that you see yourself occupying in your career. It involves many more activities, including going for higher education, taking professional certifications, joining membership of professional bodies, networking, etc.

5.3.1 Steps in Career Planning

- ✓ The **first step** in career planning can be called - writing the preamble of your career plan. So, how should the preamble of your career planning document look like? You must clearly articulate your areas of interest; present skill sets and preferences. The preamble will keep guiding you as to the overall direction of your career, though it is quite possible that you may want to rewrite the preamble itself as you go along your career path.
- ✓ The **second step** and the most important one is that of goal setting. Based on the preamble that you have written, start by setting goals for the very short-term for it is the easiest to do. The goals should be realistic and objective. You may also use the SMART criteria of goal setting devised by George T. Doran.

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Exhibit 5.1: Doran's SMART Criteria of Goal setting (*Source: https://www.slingshotapp.io*)

- ✓ The **third step** involves an analysis of the opportunities that are available to you. This step would automatically be akin to making a career choice. An objective and informed analysis of the opportunities would help you in making the right choice.
- ✓ The **fourth step** is to make a strategy and implement the plan. If the attainment of the goals necessitates acquiring new skills, you must budget enough time for the same and keep resources ready.

5.4 CAREER MANAGEMENT AND COMMUNICATION

In the process of career management, one of the most important tools at your disposal for success is effective communication. However, it can potentially turn out to be a perfect recipe for failure, if not done properly. Therefore, learning to communicate for career management should be an essential part of your career planning. There is a series of steps involved in communicating with a prospective employer. It all starts with applying for a position by means of a cover letter enclosing your résumé. This will be followed by

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interviews, group discussions, etc.The life cycle of communication involved for a job and exiting from the job has been shown in the exhibit below.

Exhibit5.2: The Life-Cycle of Communication in Career Management

5.5 RÉSUMÉ WRITING

Let us start with the correct pronunciation of the word résumé. The word is of French origin and is pronounced as ˈ**rezjuːmeɪ**. You will be surprised to learn that the first resume to be drafted and sent to a prospective employer was from the Italian polymath Leonardo da Vinci to the then *de facto* ruler of Milan, Ludovico Maria Sforza.

A résumé is a formal document containing information about your contact details, educational qualifications, work experience, skills, achievements, accomplishments, etc. Its purpose is to attempt to convince your prospective employer about your suitability for the opening.

5.5.1 Résumé Styles

As mentioned earlier, a résumé is a summary of your educational qualifications and work experience along with other details. This summary can be organized and presented in

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different layouts and styles. Please remember that it is a "summary", therefore it has to be brief and yet attention-inviting. The following styles of résumés are popular: -

✓ ***Chronological or Reverse-Chronological Résumés***

This style of résumé is the most common and best for a work history that is free from any gaps. The focus is obviously on your work experience. The practice is to start with the latest job followed by the second most recent and so on.

✓ ***Functional***

Functional style is adopted when a candidate does not possess the relevant experience that is required for the job. This style of résumé writing focuses on the skills that are required for the job that you have applied for, based on the details given in the job description.

✓ ***Hybrid / Combination***

This style of résumé writing tends to utilize the best of both functional and chronological styles. It is best when you have a sizeable work experience behind you along with skill training / education. You may start with an objective seeking the right positions followed by a summary of professional training and skills, which in turn will be followed by a chronological history of work experience.

✓ ***Targeted***

Targeted résumés are specifically designed for a particular opening that interests you. These résumés are be written in any of the aforementioned styles, viz. Chronological, Functional or Combination. The prior experience, education and skills are carefully calibrated and drafted to suit the requirements of the position. Targeted résumés require you to conduct in-depth research on the organization that you are applying to, its vision and mission statement, the various business units in the organization, etc. Such résumés also help in online job portals, where it is important that your résumé ranks higher in searches.

5.5.2 How to write an eye-catching and convincing résumé?

A complete résumé will include the following five parts with the length of each part varying from individual-to-individual.

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Identification Details

- ✓ It should have your name, city name and contact details, including Email Address, Contact Numbers and Address to your LinkedIn profile.

Objective / Résumé Caption / Introduction

- ✓ The career objective is usually seen in the résumés of those who are recent graduates and who do not have much experience or achievement behind them for the objective to be replaced with a résumé caption or introduction.
- ✓ You can fine-tune your career objective or introduction based on the nature of the position and / or the company / industry of which you intend to be a part.

Education

- ✓ You must include the Degrees, Diplomas and Certificates along with the respective Universities / Institutions attended along with the city name.
- ✓ Remember to include the month and year of award of the Degrees, Diplomas and Certificates.
- ✓ Highlight special achievements, if any, in academics.

Experience

- ✓ Mention your work experience reverse-chronologically, i.e. starting with the present on top, followed by the next latest and so on.
- ✓ If you are a fresher with no professional experience, you may include any part-time work or summer internships, volunteering work, etc.
- ✓ For each entry under experience, add around 2-5 statements. You may write more for the current position, if required.
- ✓ Try to use a bulleted format and use indenting for ample clarity and bundling of relevant things together.
- ✓ The entry under the experience head should look like the following:

State Bank of India, Ahmedabad - *Assistant Manager*

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January 20XX- December 20XX

- In-charge of Banking Operations in the branch reporting directly to the Chief Manager.
- Responsible for Alternate Channels, including Internet Banking (Retail and Corporate), Mobile Banking, ATM, etc.
- ……

Skills

✓ Skills that are relevant to the position that you are applying for may be prominently mentioned, including technical skills, soft-skills, foreign language, etc.

Awards / Honours

✓ Fellowships, awards, medals and other such recognitions may be listed.

References

✓ Based on whether the prospective employer has sought references, you may write the names and details of the references. However, please ensure to take permission from each of them before you go ahead and mention them in the résumé.

The one thing that you need to keep in mind at the time of writing your résumé is – "What purpose is the résumé going to serve for the prospective employer? "The résumé as a document will be used for shortlisting potential candidates for interview. Therefore, it has to catch the attention of the HR Executive or Manager whose task is to sift through hundreds of résumés. Your drafting should be an exercise in assessing the keywords and information that your reader will be looking for. Therefore, you must add as many actionable words as relevant and necessary in your résumé. It will also help your résumé to appear in searches on online job portals, that is, in case you are applying for a job through an online platform.

What is a Curriculum Vitae (CV) and how is it different from a résumé?

The term Curriculum Vitae (CV) is more popular in the UK, whereas résumé is more popular in the US. Though, there is a technical difference between the two. A Curriculum Vitae is a more elaborate version of the résumé with details of your research work, publications, seminars and conferences attended / delivered and so on. A CV is usually made

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for applying to research institutions, educational institutions, international jobs, etc. Therefore, a CV has an academic orientation whereas a résumé is meant for applying to non-academic positions.

Full Name

New Delhi, India

70420XXXXX

xxxxxx@xxxxxxx.com

LinkedIn: www.linkedin.com/in/xxxxxxxxxxxx

PROFILE

Management Professional with 7+ years of experience in strategy building and marketing of very large-scale international trade fairs, policy making for events and marketing of the largest expo venue in India.

EXPERIENCE

2015-09 - till date

Company Name, Location– *Manager*

- Instrumental in making the two flagship trade expos of Company - ABC and XYZ - the highest revenue generators in the history of the organisation.
- Worked on introducing policy-level changes to strengthen [Company Name]'s flagship event ABC, the largest ever in the history of exhibitions in India.
- Launched the Tender Desk for Foreign Events of for streamlining appointment of vendors.
- Part of the core negotiations team for rescheduling exhibitions lined up in the expo venue due to the ongoing redevelopment work.
- Conducting training on various topics, including transition to e-Office, official drafting, soft skills, change management, etc.

2015-02 to 2015-08

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Company Name 2, Location–*Deputy Manager*

- In-charge of Banking Operations in the branch reporting directly to the Chief Manager.
- Disbursement of Govtsubsidies to farmers & other target groups under various schemes.
- Responsible for cross-selling of the PMSBY and other such schemes of the government.

EDUCATION / QUALIFICATION

- Management Development Program (**MDP**) from **Indian Institute of Foreign Trade (IIFT),** One-Week Programme in Global Trade Management
- Qualified**UGC-NET in** Management
- **Post Graduate in Global Business Operations** (2-yrs full time) from **Shri Ram College of Commerce (SRCC),** University of Delhi
- **MBA-International Business** from Pondicherry University
- **B.Sc. (Hons) Physics** from University of Delhi

CERTIFICATIONS

- **Certified Trainer** from Indian Society for Training and Development (ISTD).
- **Certified Project Manager** with an Executive Diploma in Project Management (EDPM) from International Institute of Project and Program Management (I2P2M).

AFFILIATION

Life Member of the Indian Society for Training and Development

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	(ISTD).

Exhibit 5.3ASample Résume

5.6 COVER LETTERS

A cover letter is your first communication to a prospective employer that acts as an introduction to your résumé, which is a mandatory enclosure with the cover letter. It is also known as an application letter. Separate cover letters should be written for different positions that you wish to apply for and should be demonstrative of your keenness for the job or the employer or both.

The objective of a cover letter is to convince a prospective employer that you are really interested in the opening and qualified for the job. You should avoid writing things in the cover that you have already mentioned in the resume.

5.6.1 Structure of a Cover Letter

Just as any other formal letter, a cover letter is also divided into three parts, namely introduction, body and closing. You need to **present three basic ideas** in the cover letter:

- ✓ **Reason for your interest in the position and the prospective employer.**
- ✓ **Why should the prospective employer consider you?**
- ✓ **Contact details and plan for follow-up.**

Let's see how you can incorporate these ideas in an organized and interesting manner so as to invite the attention of the hiring managers. Given below is the explanation of the format of a cover letter with each item elaborated for ease of understanding.

Contact Details

The usual format is to mention your contact information on the top, followed by the date and the name and contact details of the addressee, all aligned to the left-side of the page.

Salutation

The most widely accepted salutation is Dear Mr./Ms. [Last Name]. If the name of the concerned hiring manager is not available, you may simply use Dear HR Manager.

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Introduction

The letter starts with an introduction where you have to try to captivate the attention of the reader. You can briefly introduce yourself and mention the source from which you learned about the position.

Body / Main Content

- ✓ Objectively describe your suitability for the position with corroborating facts from your past job(s).
- ✓ Describe how your education and training have equipped you well for the job.
- ✓ Mention your successful projects and how your skills were pivotal in making them a success.
- ✓ Focus on the skill sets that are required for the position being applied. This is where your reading of the job description will be of great help to you.
- ✓ Be careful not to repeat what is already there in your resume.

Closing

- ✓ The closing must include the next plan for follow-up. Ensure that you observe the courtesy of thanking the prospective employer for considering your candidature.
- ✓ The letter ends with "Sincerely".

Your Name
Address 1
Address 2
City
State PIN
Email:

12th August, 2022

Ms./Mr. / Dr. [Full Name of the Addressee]
[Company Name]

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Address

City

State PIN

Dear Mr./Dr./Ms. [Last Name of the Addressee],

I am writing to express my interest in applying for the position of Deputy General Manager (Corporate Strategy and Planning) available at [Company Name]. I learned about the position from your colleague Mr. [Full Name] during the automotive aftermarket Buyer-Seller Meet (BSM) that we attended last week in New Delhi.

I am a Strategy Professional with 12+ years of relevant experience in Strategy Planning and Execution of Inorganic Growth (Mergers & Acquisition and Joint Ventures). I am currently employed at the Corporate Headquarters of [Company Name]. Our function provides captive strategy consulting services to our business units based in India and overseas.

I was a part of the core team that established the Strategy Planning Process at [Company Name]. I helped develop a robust framework for the Strategy function and devised periodic review mechanisms for continuous assessment and evaluation of the approved Strategy Plan. All this was accomplished with minimum intervention from external experts.

My strength as a seasoned strategy consultant has led me to work very closely with all our business units and the senior leadership team in particular for assisting them in identifyingpotential targets for acquisitions, joint venture and mergers. Based on my work, over the past five years, two acquisition - [xxxx] and [yyyy], and one JV with a Japanese brand were completed successfully. All three have been going strong and have emerged as turnaround stories.

As an industry professional, I regularly read the literature of your company and I have come to understand that the strategy function at [Company Name] would benefit from my experience and expertise as having had hands on experience of multiple acquisitions / JV.

I would really appreciate an opportunity to discuss this more elaborately in person with

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you at the time. I am available at the contact details mentioned in my resume (enclosed).

Thank you for your consideration.

Sincerely

[Name]

Enclosure: Résumé

Exhibit 5.4: Sample Cover Letter

5.7 GROUP DISCUSSIONS

A Group Discussion (GD) is a type of group activity where the group is given a common topic on which each individual is expected to exchange ideas, views and opinions and try to arrive at a conclusion. A group discussion may be moderated or completely free from any moderation and allowed to take its own course.

5.7.1 Purpose of a Group Discussion

- ✓ Generation of new ideas
- ✓ Arrive at a solution to a problem
- ✓ Recruitment / Selection of suitable candidate(s)
- ✓ Used in a training environment for learning new skill(s), etc.

Depending on the purpose of the GD, time and resources in hand, and so on, the number of individuals in each group may vary. A typical group consists of around 6-10 persons. A group discussion is a just like a meeting, yet there are certain important differences and are listed below:

- ✓ There is not fixed agenda in a group discussion.
- ✓ There are no roles and responsibilities that one has to fulfil. Though the group may be asked to appoint a leader / moderator from among its members.
- ✓ The emphasis on the process rather than on the outcome.

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5.7.2 What are some of the key features of an effective group discussion?

- ✓ All individuals in the group have a chance to speak and express their ideas and views about the topic of discussion.
- ✓ Members who are not sure about the topic under discussion or have not formed an opinion, have the chance to hear what the others have to say and respond afterwards.
- ✓ New ideas and those that have not been fully developed can be tested.
- ✓ A wide variety of ideas and views can be obtained in a very short span of time.
- ✓ The discussion is not hijacked by one dominating member.
- ✓ There is a tacit understanding among members that the group has to arrive at a conclusion which leads them to engage constructively even when confronted with disagreements.
- ✓ Arguments are considered a healthy way of testing theories put forward by members.
- ✓ Feedback is exchanged in a constructive manner.

5.7.3 Group Discussion as a tool in the recruitment process

GD is a tool used in the recruitment process in campus recruitment, special recruitment drives, recruitment to government organizations, etc. In some of these, GD may be used as the first level of elimination that makes is a formidable challenge. You may be allowed to attend the interview rounds only upon clearing the GD, therefore you must prepare well for it.

5.7.4 How to communicate effectively in a Group Discussion?

Communicating in a group is always more challenging than communicating with an individual, simply owing to the presence of more people, which can potentially make things chaotic. With an increase in the number of members in a group discussion, the task becomes even more challenging. Yet, by following some basic steps you can expect to perform well in the group discussion and increase your chances of succeeding in the same. These steps are discussed below: -

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✓ ***Prepare yourself***

It is always a good idea to have some mock discussions with your friends so that you get accustomed to a group setting. Selects a few current topics that you can discuss at length. This little practice session will help boost your confidence level and will assist you in smooth sailing on the day.

✓ ***Don a Positive Attitude***

Thinking positively and being warm to the other candidates will help you break the ice. A brief introduction with all participants will help you be more comfortable with them and will positively impact your performance.

✓ ***Practice your pitch and tone***

Group discussion is a type of public speaking where you have to be audible and clear to the audience. Practice speaking at an appropriate pitch and learn intonation and modulation of your voice which will make your speech appealing. The tone should be polite but assertive. It will help you sound convincing.

✓ ***Take the leadership role and encourage others***

Remember that it is a group discussion, and everyone has to speak. If you notice that a fellow participant has not got the chance to speak even after a long time into the discussion, you can interject and say "Before we carry the discussion forward, I think we should listen to Mr. X." Such initiatives will not go unnoticed, and you will get credit for encouraging others.

✓ ***Don't Clamour***

You should avoid clamoring for your turn to speak. Instead, you should smartly try to initiate your speech between momentary pauses during the discussion. If the discussion is degenerating into a clamour, somebody has to take the initiative to bring order back into the discussion. It will be a great opportunity to demonstrate your leadership capabilities and intellectual maturity.

✓ ***Maintain an air of sophistication***

You should maintain your dignity throughout the activity and sound professional throughout.

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✓ ***Don't Speak too Much***

Speaking just to hog the limelight is not a good strategy. After your opening remarks, you should let others speak. Be an active listener and try to build further on the points being discussed. Interject if you have something to add or a counter argument to make. Whatever you speak has to be in articulate and professional language.

5.8 INTERVIEW

An interview is a formal conversation between an applicant for a job or an educational programme in which the former responds to the questions put forward by one or more members of the interview board. Interviews can be structured or unstructured based on the objective to be achieved.

Interviews are formal occasions where verbal communication, non-verbal communication and business etiquettes are all under scrutiny. Therefore, as a candidate you must prepare well for it.

5.8.1 Non-Verbal Communication

- ✓ Knock the door before opening it and seek permission to let yourself in. Walk in confidently with your head straight with a relaxed disposition.
- ✓ Greet the interviewer with a firm handshake and if it is a panel, you may offer a polite and warm greeting collectively; say "Good Morning Everyone" or just "Good Morning" warmly.
- ✓ Wait for the panelto ask you to sit down. Say thank you before you sit down and make yourself comfortable yet attentive.
- ✓ The interview is to be conducted by the interviewer or the interview panel. Therefore, after the initial greeting, wait for the panel to ask you something. Maintain the right posture while sitting and do not slouch.
- ✓ No fiddling with the pen.
- ✓ Please try not to carry any coins or bunch of keys in your pockets to avoiding clinking.
- ✓ Maintain eye-contact with positive facial expressions conveying sincerity.

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- ✓ Refrain from responding to questions only with gestures or facial expressions as it will be considered as rude and may convey that you are not interested enough.
- ✓ Using your hands in graceful and professional gestures while responding to questions from the panel will demonstrate your self-confidence and that you are not nervous.
- ✓ Try to sport a gentle smile as and when deemed appropriate as it would assist you in building rapport.

5.8.2 Verbal Communication

- ✓ You will get ample opportunity and time to speak, however you will have to wait for the interviewer to finish the question. So, listen carefully to the question uninterrupted before you go ahead and begin your response.
- ✓ Try to give concise and concrete responses rather than giving long-winded answers. Try to come straight to the point without long introductions.
- ✓ Use formal language and avoid using short-forms and slangs, etc. It is considered unprofessional to use slangs.
- ✓ Prepare yourself well, at least for those clichéd questions that most interviewers happen to ask. Some of the questions are:
    - *"Tell me something about yourself."*
    - *"Five reasons for why we should hire you."*
    - *"Where do you see yourself in the next five years?"*
    - *"Describe yourself."*
    - *"What is your biggest weakness?"*

  These questions are very common, and you should make it a point to prepare well for these questions. If you falter with these questions, you will have no one else to blame.
- ✓ Incidental humour in a manner that is accepted contextually is considered acceptable. In fact, the appropriate use of humour is always a great way of establishing rapport with the interviewer.

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- ✓ If you do not know the answer to a question, simply regret by stating that "I do not know the answer to that. However, I will try to find out". No beating-about-the-bush. An interviewer will appreciate your courage to say that you do not know. It is alright not to know. Nobody knows everything.
- ✓ Refrain from making any sort of excuses and show the courage to accept your past failure. Make a case of how you learnt from the failure and used it to work on your next success.
- ✓ Refrain from using speech fillers, such as "you know", "um", "like", "uh", etc. as it may sound annoying and unprofessional. The interviewer will, most certainly, view it as your lack of fluency in the language. Instead, if you replace these fillers with pauses you can possibly turn it into strength.
- ✓ Rate of Speech: Many people have a misplaced notion that speaking fast is the same as being fluent. It is important that you speak at an optimum rate so as to enable your audience to receive your messages and process them to have a perfect understanding of the same.

5.8.3 Etiquettes for Interview

✓ ***Be on time***

The most basic etiquette is to reach the interview venue on time. Start early so that you get to the venue even if you have any hassle finding the route. However, avoid reaching too early as there is a reason why you have been given a fixed time. The interviewer may have other things to attend to before getting on with your interview.

✓ ***Remember Names***

Make an extra effort to remember the name of the interviewer, i.e. if you have corresponded or spoken before. Forgetting names reflects lack of preparedness and even indifference.

✓ ***What if you are offered refreshments?***

The best thing to do is to have a glass of water as it would help you rehydrate your dry throat and help you in case you are nervous. For other things you may politely decline as it would really be awkward.

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✓ ***No Mobile Phones***

Keep your mobile phone off or on silent mode. It is very unprofessional if your phone rings in the middle of an interview. In case it happens by mistake, please ensure that you apologize genuinely and immediately switch it off.

✓ ***Do not share confidential details***

You should never share confidential details about your previous employer as it is unethical and will be taken adversely by the interviewers. Badmouthing or complaining about your previous employer or job or reporting managers also reflects badly on you. Employers are looking for professionals who have unquestionable integrity and are reliable.

✓ ***Express Gratitude***

After the interview gets concluded, remember to thank the interviewer(s) for their time and the opportunity to discuss your suitability for the position at length. It is also good if you send a thank you email as a follow-up.

5.8.4 Stress Interviews

A style of conducting interview where a candidate is asked unsettling questions, using a confrontational manner or using stressful conditions or a combination of all these to understand how the candidate responds to stress.

Some of the tactics used in a stress interview are listed below.

✓ ***Using seemingly offensive questions***

An interviewer may ask questions which you may find offensive, for instance "why did you get fired from the previous employer?"

✓ ***Intimidating behaviour***

The interviewer may show hostile body language in a way that is intimidating. You may be asked questions in a demanding tone and your answers may be dismissed altogether.

✓ ***Aggressive manner***

The interviewer may be aggressive in his / her manner and ask back-to-back rude questions.

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These questions are used to gauge if they unsettle you and how well you are able to handle the situation. The objective is to see if the candidate gets unnerved by the tactics.

CASE STUDY

Mr. X was attending an interview for the post of Management Trainee in a reputed consulting firm. After his introduction, Mr. X was asked about his father's occupation which he found quite offensive. (Mr. X's father was a stenographer and typist in a government department)

The interviewer did not stop there, he continued, "Why don't you become a stenographer yourself"? Such questions are offensive and may dent the self-esteem of an individual.

How should Mr. X have responded to these questions?

There are many ways in which one might respond to such questions. One of the better ways to respond is in the manner mentioned below.

It is obvious that the interviewer has deliberately asked this question to see whether it unnerves you. So, do not show any visible sign of you being upset or perturbed by the offensive questions. Gather your composure and start responding in a way as if nothing was amiss.

Try to be as logical as possible. Tell the interviewer that stenography is an art that is hardly being used in the current context, expect in certain professions, such as legal / judicial. Most of the younger executives prefer to do their own writing / typing.

Further, you may mention that you have a certain domain expertise which will be best utilised in the positions such as the one that you are being interviewed for. Also, mention that as a professional, your efforts are always directed at the actualisation of your potential.

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5.9 COMMUNICATION DURING EXIT INTERVIEWS

An interview held between an employer and an employee who is getting separated from the organization is known as Exit Interview. Through the exit interview, the employer attempts to get feedback of the exiting employee on the key reasons for leaving, culture of the organization, policies, work environment, learning opportunities, work-life balance, management, reasons for joining the next organization and so on. The purpose of the exit interview is to improve various aspects of the organization, devise strategies for retaining the employees and thereby reducing employee turnover.

Some of the most commonly asked questions in an exit interview are mentioned below.

- ✓ Are there reasons for your decision to leave the organisation that we should know about?
- ✓ The most satisfying aspect about your job was?
- ✓ The least satisfying as aspect about your job was?
- ✓ Is there anything about your own job that you would like to change?
- ✓ What is the best thing about working for the organisation?
- ✓ What is the one thing that you do not like about the organisation? How can we improve?
- ✓ Is there anything that you'd like to change about the way the organisation functions?
- ✓ Was the management supportive during your service period?
- ✓ If a suitable opportunity comes your way to re-join the organisation, would you take it?
- ✓ Would you recommend / refer your friends to join the organisation?

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Source: https://brainstuck.com

Exhibit 5.5: Exit Interview on a Lighter Note

5.9.1 How to communicate during an exit interview?

✓ ***Go with a neutral and balanced state of mind***

You should aim at attending the exit interview with a balanced state of mind and try to be objective in your responses. It is an occasion for the final formal interaction between you and the management and should be seen as an opportunity to make sure that you leave on a positive note.

✓ ***Be Candid, Not Virulent***

Exit Interview is not to be considered as your chance to give your employer a piece of your mind and to settle personal scores with your reporting managers. Criticism of your managers is completely acceptable;however, it should be articulated constructively. If done the right way, the employer may well take action as per your suggestions for improvement, which will make life a little easier for your successor.

✓ ***Be Specific***

Your points will be taken seriously depending on how specific your responses are, and how you can supplement your responses with examples or actual instances. Please focus on the larger picture of your Business Unit / Department and the organization as a whole

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rather than dwelling on petty personal issues. It will demonstrate that your responses are valuable and insightful and may compel the employer to take action. The employer will take it favorably and give you an excellent review and may even make a counteroffer.

✓ ***Don't Give a Completely Negative Feedback***

If you give only negative feedback, or even a fully positive one for that matter, it will likely be taken as an unfair / uninterested / not-so-genuine response and may be simply discarded. On the other hand, if you give a mixed bag of both positive and negative responses, it will be taken as fair and honest.

5.10 ETHICS AND COMMUNICATION

As per the Oxford Dictionary, "ethics" are *"moral principles that control or influence a person's behavior.* "So, it is a set of "moral" principles. What is meant by that? Morality is about the principle of whether something is right or wrong, good or bad and so on.

So, we can say that **ethics** are a set of principles which governs the conduct of an individual or a group and indicates whether their actions or inaction, for that matter, are right or wrong and whether the intent behind it is good or bad.

Ethics and Communication

Communication is an essential and inseparable part of your careers and there would hardly be any day in your professional life when you do not make any sort of communication with your bosses, colleagues, vendors, clients, prospective employer, etc. It is of paramount importance that your communication passes the necessary scrutiny of being ethical, by which you mean that it is honest and bona fide. The underlying thought behind it is that your communication should not cause any harm or damage to the receivers. Therefore, your communication should be free from any manipulation, obfuscation, misrepresentation, discrimination, perception bias and exaggeration.

Why is ethical communication so important?

Ethical communication helps in building trust and credible relationships that are essential for business. By following ethics in your communication, you will ensure that your dealings are perfectly lawful. Business can take place only with trustworthy people which

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makes ethical communication all the more necessary to gain the confidence of your stakeholders.

5.10.1 What are the Principles of Ethical Communication?

There are certain principles that guide us in communicating ethically. These principles are listed below: -

✓ ***Honesty***

Honesty is obviously the most common principle that comes to mind when we think about communicating ethically. If you are honest in your interaction with people, you have fulfilled one of the most important criteria of ethical communication.

✓ ***Transparency***

The second principle is that of openness in your dealings and interactions. It is one of the key principles on which building and maintaining the trust of your stakeholders rests.

✓ ***Confidentiality and Privacy***

You must maintain confidentiality of information at all times and strictly refrain from divulging any information that is sensitive and concerns other parties. There are some industries where confidentiality is even more important, such as defense, industrial research, etc.

✓ ***Acting Responsibly***

Being responsible in your actions is seminal to the concept of ethics. At every point in the process of communication, one must take ownership of things and think responsibly. Wherever you think that things are going beyond your control, you should escalate the channel of communication to put things back on track. You must also bear in mind conflicts of interest that may arise every now and then in an organization.

Examples of how Ethical Communication is Critical in Business

- Suppose that you are a member of a committee whose job is to make recommendations for appointing a vendor for providing Golf Carts to be used in the factory campus. If one of your relatives who runs a Golf Cart company has bid for the job, it would be unethical

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for you to be on the Committee and therefore you should immediately communicate the same to the appropriate authority.

- Ethical communication has great bearing on the marketing industry. Companies advertise about their brands routinely and often they use hyperbole and deception in advertisements. An interesting example is that of food photography used in advertisements of popular burger chains. In the photographs, the burgers appear much bigger and more stuffed that what it is in reality. It is a clear case of deception and misrepresentation of facts. The companies engaging in such deceptive advertising tactics should come clean about it to be fair to its consumers. Such companies risk losing their market share as the consumers gradually become aware of the deception.

5.11 SUMMARY

- ✓ Career Management is a continuous process of orienting and reorienting your career based on the changing sets of goals and objectives.
- ✓ The ongoing process of goal setting, devising the means of achieving the goals, reviewing and assessing it continuously is known as career planning.
- ✓ A résumé is a formal document containing information about your qualifications, work experience skills, achievements, contact details, etc.
- ✓ A cover letter is your first communication to a prospective employer which acts as an introduction to your résumé that is a mandatory enclosure with the cover letter.
- ✓ A Group Discussion is a type of group activity where the group is given a common topic on which each individual is expected to exchange ideas, views and opinions and try to arrive at a conclusion.
- ✓ An interview is a formal conversation between an applicant for a job or an educational programme in which the former responds to the questions put forward by one or more members of the interview board.
- ✓ Interviews are formal occasions where verbal communication, non-verbal communication and business etiquettes are all under scrutiny.

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- ✓ A style of conducting interview where a candidate is asked unsettling questions, using a confrontational manner or using stressful conditions or a combination of all these to understand how the candidate responds to stress is known as a stress interview.
- ✓ **Ethics** are a set of principles that governs the conduct of an individual or a group and indicates whether their actions or inaction, for that matter, are right or wrong and whether the intent behind it is good or bad. Ethical communication helps in building trust and credible relationships which are essential for business.

5.12 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of career planning and the steps in involved in it.
2. What is the purpose of a résumé and how is it different from a Curriculum Vitae (CV)?
3. How can you communicate effectively in a group discussion?
4. What are the etiquettes that you should follow in the interview process?
5. What is a Stress interview?
6. What are ethics? What are the principles of ethical communication?

5.13 REFERENCES AND SUGGESTED READINGS

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LESSON 1

INTRODUCTION TO COMPUTERS

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STRUCTURE

1.1. Learning Objectives
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1.1 LEARNING OBJECTIVES

After completing this lesson, you will be able to:

- Explain the term Information Technology.
- About Computer generations & Languages.
- Elements of Information Technology & Computers.
- Usage of Information Technology & Computers for Business Organizations.

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- Emerging trends in Information Technology & Computers.

1.2 INTRODUCTION

Information Technology (IT) is related to all Information and become a strategic necessity. Nowadays computers and IT is part of the life of every human being such as used in government, for commercial purpose, in-home, etc. Computers have many usages in business organizations. Computers started in this world a long and describe five generations. Computers are interacting with the help of main elements i.e., hardware and software. The integration of hardware and software with the end users required different computer languages for distinct purposes. Business Organisations are growing enough with the help of information technology and the use of computers. New trends in business organizations, planning an Information Technology as part of it working on growing pace. There are many emerging technologies growing well and users are adopting them at a growing pace such as Cloud, Social Media, IoT, Robotics, etc.

1.3 COMPUTERS: AN INTRODUCTION

Computers and IT is spreading rapidly all over the world and revolutionized business as well as the personal activities of human beings. Either good or bad, computers have infiltrated every aspect of our society. Today`s computers not only compute for which it was but do much more. It works in every field or profession. As computers adopt in commerce and governments new ways to harness their potential developed. So, a small unit becomes more powerful, it is linked together or networked, to share software, memory space, and any kind of data for communicating with society.

A computer is an electronic device that accepts data and instructions, processes the data and produces the desired output. It can be said as data processing machine or a problem-solving machine that accepts data, stores data, processes data and display results. Computers are ahead to human beings for speed, accuracy, memory and diligence but cannot beat the human brains, they are not intelligent.

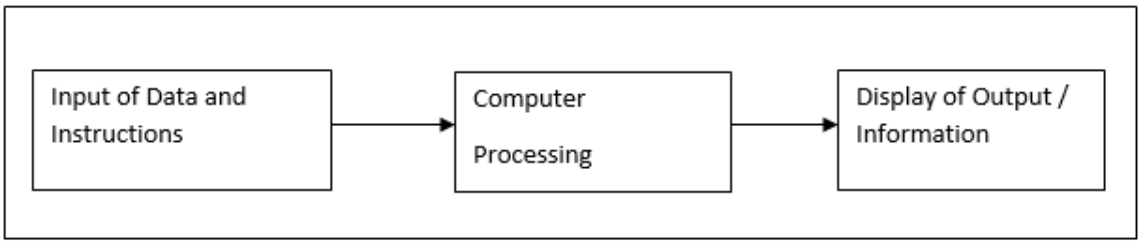

Fig1: Processing diagram

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Computers can perform a variety of tasks. They are used for programming, graphics presentation, data management, word-processing, spreadsheets, communications and much more. The ability of computers to do all tasks i.e., processing is built around the two operations of computers – arithmetic operations and logical operations. Functions of computers have been done by software (a set of instructions written by human brains to computers for processing). Software directs all the processing sequence to the computer and allows it to perform specific tasks. So basic operations perform by any computer are:

1) Input function
2) Storage function
3) Processing function
4) Output function
5) Control function

1.4 COMPUTERS IN BUSINESS ORGANIZATIONS

The present computing era is playing important role for the growth of Business Organisations and management of organization. Information Technology is very well designed to improve the growth of business. It is seen that computers are an invaluable assistant for businesses even for small ones also. Information Technology has many dimensions, e.g., mobility.

As business environment is no more as stable as previous era, nowadays much more competitive. So, for the survival of businesses, it become mandatory to be techno savvy with full use of IT. Most of the businesses are IT oriented taking help to plan any kind of critical response activities for dealing with today`s consumer.

Due to changed policies of government, Business organizations are under pressure to be IT-oriented over a long period of time. The Government gives enough time to respond to changed policies but changes in the behavior of the consumers ask organizations to come up with IT solutions fast. So, IT helps us to anticipate and stay ahead of problems. The Organization can be with proactive measures instead of firefighting measures. Business organizations are supported with strategic systems of IT to increase their market value/share.

Nowadays the most need of the Business is Business process engineering (BPR), where IT and computers play a major role. Here, organizations work with the technology of networking. Internet and Intranet are part of networking technique, it helps an organization in changing their processes and reduce cycle time and time to market a product. Employees of the organizations are also accessing information at different levels with the help of IT tools and rising business. So, employees are more independent to take decisions for the business. Through ERP (a major IT tool for business) integration process of an organization is very easy.

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Information Technology means gathering, storing, organizing, and displaying of processed data. Here, IT describes an integral part of it as a `Database`. Database is very important tool of any business organization, which is a collection of related files, tables, relation, data etc. that works for the growth. IT tools help organizations in accessing database and processing of information further for communication and knowledge and facilitates business. So, it can be said that IT is an important tool for the business and must be used properly.

1.5 GENERATIONS OF COMPUTERS

A computer is such an electronic machine, which is present in this world since long. Now we can say that computers passed many generations. Firstly, people know it only as a fast-counting tool. But over the time, computer is characterized by major technological changes or development. The characterized technological developments of computer fundamentally changed the working of computers i.e., the way it operates, stores, processes, and results. Then resulting it to increasingly smaller, cheaper, more powerful, reliable and more efficient as well as multi-tasking device. These technological development (which are categorical) are recognized as progression of generations with specific changes. So, now we learn about different generations of computers with progressive changes.

1.5.1 ZEROTH GENERATION COMPUTERS

Zeroth generation of computers can be marked by the invention of first mechanical device Pascaline in 1642. Next in 1822, Charles Babbage, developed Difference Engine for naval navigation. Further in 1834, Babbage attempted to build Analytical Engine, which was considered as first computer. So, Charles Babbage called as father of computers, his computer had memory unit, computation unit, input unit (punched card reader) and output unit (punched output printer), all basic parts of modern computers.

1.5.2 FIRST GENERATION COMPUTERS

First generation of computers (1946-1959) was marked with the invention of Vacuum Tubes for circuits and magnetic drums for memory. These computers were very large in size because of the massive number of vacuum tubes required. They consumed too much power and generated too much heat. These systems were very slow with poor reliability and low accuracy. First generation computers were based on machine language for performing operations and using punch cards and paper tapes. They were very expensive also. Examples of these systems are **UNIVAC, ENIAC, EDSAC, EDVAC** etc.

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Fig 2: First generation computers

1.5.3 SECOND GENERATION COMPUTERS

Transistors marked the second generation of computers (1954-1964). Transistors were the breakthrough in the technology of second generation, that make computers small in size and more powerful. The use of transistors made second generation computers less expensive and more reliable, even faster also. Second generation computers moved from machine language to assembly language. They used magnetic core for memory, card readers for input and printers for output. Although, they required less electricity and emitted less heat than earlier computers, but also had many disadvantages. These systems had limited storage capacity, need regular maintenance but much better from first generation. Examples are UNIVAC III, IBM series, HONEYWELL series etc.

1.5.4 THIRD GENERATION COMPUTERS

Third generation of computers (1965-1980) was marked with the use of Integrated Circuits (IC`s), a progressive change in technology. This technology was more reliable, more efficient than previous generations. IC`s were more compact than transistors, which reduced the size of computers and generated less heat with less consumption of power.

These systems were introduced with operating systems and the concept of computer families. Third generation computers were with secondary storage devices outside the systems. These systems were enabled with faster input/output devices like keyboard and monitor for enhancing the ability. Concept of multiprogramming also introduced and using high level language for programming.

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This generation of computers was introduced with some disadvantages like less storage capacity, slow performance as expected. Examples are IBM 360, CRAY-1, PDP-8 SERIES, UNIVAV-1100, 9000 series etc.

1.5.5 FOURTH GENERATION COMPUTERS

Fourth generation of computers (1981-1995) was the marked generation of Large- Scale Integration (LSI) of chips with several thousand transistors and microprocessors. And further this was followed by Intel series of Microprocessors. This was introduced with very large - scale integration (VLSI) technology for the development of popular personal computers (PCs), also called as Microcomputers. These Microcomputers were introduced for home and business users to adapt computers as part of their working by using word processing, spreadsheet, file handling, graphics, animation and much more. For those purposes, the input/output devices used in fourth generation are very much advanced like graphic tool, animation tools, audio terminals, optical devices etc.

Most importantly, fourth generation introduced with graphical user interface (GUI) and mouse optical devices with very large storage capacity. These systems had very high speed, high level of accuracy and reliability, also diligent and versatile with small size. Examples are CRAY-2, IBM PC/AT, INTEL 386 SERIES etc., but systems were not intelligent.

1.5.6 FIFTH GENERATION COMPUTERS

Fifth generation of computers (1995-till date) are enabled with intelligence. Artificial intelligence is the main part of today`s systems working with `Knowledge Processors` (which can find the solution of problem itself). They are using IC`s with ULSI (ultra -Large -Scale Integration) technology and applications with intelligent software. These systems are more efficient and capable to understand the problem of user, based on intelligent programming and knowledge-based problem-solving techniques. These system performing tasks according to the user intelligently with a specialised technique of AI called as parallel processing. Next goal of this generation is to understand natural language processing and development of such intelligent devices which are capable enough to learn and self - organized.

All this is possible with the help of Internet and Mobile computing, which is again a great achievement of this generation. This era is developing continuously with much more technologies day by day and enabling the world with well performing applications and great devices. That is done only through great human brain, so `Human Brain` is powerful organ, which is business oriented. Examples are all AI based application or Robots etc.

1.6 COMPUTER LANGUAGES

Programming is technical skill of computers which involves designing, creating and refining of code for solving the problems by building applications. For the purpose of programming many computer languages are available for accomplishing the tasks of end users. For

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understanding computer languages can be categorized as: Low level languages and High-level languages.

1.6.1 LOW LEVEL LANGUAGES

These languages are languages of computer in the form of 0 and 1. They have direct connection with machine, which machine can understand easily based on machine hardware itself. As they very near to machine, so have fast execution speed and efficient use of primary memory but writing of code in low level languages is a tedious task and time consuming.

They are again divided into two: Machine Language and Assembly Language.

1.6.2 HIGH LEVEL LANGUAGES

High level languages are close to human beings and mathematical notations. These languages require less time and effort in writing code with them. High level languages often use English like words as instructions, but further translate those commands into machine language instructions. To boost the capability of the system they also use assembly language for translation purpose. All high-level languages are different for variety of tasks and specialised for certain purposes. These are categorized according to the specific tasks, examples are as calculation-oriented language (BASIC, FORTAN, ALGOL, and APL), Data processing languages (COBOL, RGL, SQL etc.), List processing language (LISP, PROLOG), object-oriented languages (C++, JAVA, .NET etc.).

IN-TEXT QUESTIONS

1. Differentiate between High-level and Low-level programming languages?
2. Give examples of High-level languages.
3. What are the limitations of High-level languages?

1.7 ELEMENTS OF INFORMATION TECHNOLOGY

We have been using and talking about Information Technology, is not an element or a single device. Information Technology is the collection, storage, processing, dissemination, and use of information. It is not only confined to the information, instead a collection of many elements of technology as: Hardware, (Memory units, Storage Units, Processing Units) Software, and Data for processing. But all these elements have to be organized in such a way that each element works smoothly and efficiently. During the computing process, computer integrates all these elements. Thus, computing process includes all elements to accomplish any activity or performing task. All are named and explained as: *hardware, software, data, telecommunications, and people.*

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1.7.1 HARDWARE

The term `Hardware` means the physical parts of the computer, which we can touch. It consists of interconnected electronic devices that controls the system.

Hardware can be further subdivided into:

- Processing units
- Memory units
- Storage units
- Input / Output units

1.7.1.1 PROCESSING UNIT

Processing unit is processor, that transforms data into information with the help of memory. Processor act like a brain of the computer, it organizes and process all the instructions given to the system by user. This device is also called as Central Processing Unit (CPU), which involves computations and decision making. It also responsible for controlling all the devices connected. CPU comprises of three parts: *control unit, arithmetic unit and logical unit*, all work with the help of CPU memory called *registers*. CPU works at a very fast pace of sequence i.e., collecting data, transforming data, then generating output; at the rate of one computational cycle at a time. There are many types of processors present in the market for systems based on the working of the CPU.

1.7.1.2 MEMORY UNITS

The memory of computer is storage medium to store data electronically. It holds the data from CPU and other components of the computer for carrying out its operations. Every computer has certain amount of physical memory (storage space), usually referred as main memory / primary memory. It is a semiconductor device that is built using integrated circuits. Primary memory is internal storage of the computer, where programs and their data stored. This memory provides temporary storage during execution of the program, so also called as volatile memory, but its access is very fast. Some part of the primary memory also contains permanently stored instructions that tell the computer what to do, when it is switched on.

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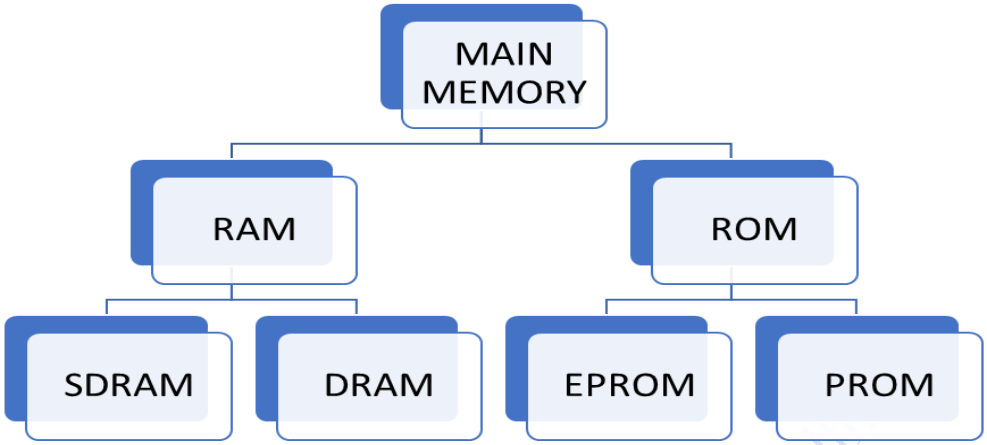

Fig 3: Types of memory diagram

Main memory can be divided into two parts as Random-Access Memory (RAM) and Read Only Memory (ROM). RAM is that part of main memory where data and instruction held temporarily while being executed. It allows user to enter data into the memory and retrieve (read & write) with continuous power supply. On the other hand, ROM is a part of computer storage that cannot be erased or changed (non-volatile) i.e., its contents are not lost without power supply. The data can be read only, cannot be write into it. ROM is necessary for the system, which tells or stores booting program to start the computer. This part of the memory is not for application software, only boots the operating system which cannot be changed due to any failure.

1.7.1.3 STORAGE UNITS

Information needs to be stored on the system with the help of different types of storage media. Storage devices are used to store data permanently or semi-permanently. The data is stored in binary form in memory by storage media. The storage media are distinguished by their relative capacity, speed, and resilience to failure. Broadly, it can be of two types: *volatile storage and non-volatile storage.*

Volatile storage devices need continuous power supply, content will lose if power supply switched off. Access to volatile storage is very fast because of technology used and access method. Examples are main memory, cache memory etc. we have already learnt about primary memory/ main memory or volatile storage in previous section.

Non-volatile storage devices do not need continuous power supply, content will be retained after power supply switched off. The technology used for and access method to non-volatile storage makes them slower than volatile storage. Examples are magnetic storage (disks or tapes), etc. So, further we will learn about secondary storage to store data permanently.

Secondary storage is non-volatile providing permanent data storage supplements main memory, having much greater capacity than main memory. It is less expensive but slower

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access than main memory, stores large amount of data permanently. Secondary storage used for keeping backups or archival storage of data. Various technologies are used for access of secondary storage, some provide random access, and others provide sequential access. These technologies effect on speed of data retrieval from then amount of data stored effect on the performance of the storage device. For example, if device having sequential access and it is storing large amount of data then its data retrieval speed will be slow.

1.7.1.4 INPUT & OUTPUT UNITS

For the purpose of communication with the computer and user, medium is required. The collection of devices for input and output of data is called as input/output units. The input is given to the computer through input devices and the display of processed data for the user is provided through the output devices. These devices are controlled by the CPU. Basically, these devices are designed for human beings to interact with computer system in seamless manner. These are links between man and machine, depends on the processing requirement.

INPUT DEVICES

The input device is an interface between the user and the machine, for inputting the data and instructions and transformed into machine readable form. Data can be input in many forms such as audio, video, text, graphics, etc. Some common input devices are:

- Keyboard
- Mouse
- Light pens and Digitizers
- MICR
- OCR
- OMR
- Bar code reader
- Joystick
- Web camera
- Voice recognitions
- Scanner

OUTPUT DEVICES

The output device is an interface between the machine and user, that accepts data from the machine and transform into readable format for the humans. The output generated by the computer can be transferred to the user by several devices and media. The output also can be in many forms such as audio, video, text, graphics etc. Some common output devices are:

- Monitors
- Printers

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- Plotters
- Audio devices/speakers/headphones
- Projector
- Touch screen
- Braille reader
- Secondary storage devices

1.7.2 SOFTWARE

The term `software` means which we cannot touch. Software is interface between computer hardware and users. In the last two decades, there is a great development in the field of software. The computer hardware cannot perform any activity without any instructions; these instructions are given by Software. The software is the set of instructions that hardware units follow to work done. The process of writing the instructions is called the programming, in order to communicate for solving problems. There are many types of software available for almost every type of need. The software available from stores on internet, open source, or paid software. The different types of software are available but broadly classified into two categories: *system software and application software*.

SYSTEM SOFTWARE

The system software directly interacts with the computer hardware and manages all the hardware components as well as supervises the execution of all applications running on the computer system. It also controls the saving and retrieval of data from the secondary storage devices. Operating system and language translator, utilities are main examples of it.

APPLICATION SOFTWARE

Application software enables the computer to solve the specific data processing task. Application software creates a communication bridge between user, system software and computer hardware to perform specific task. Nowadays, numbers of application software and packages have been developed to make life easier. These are easy to learn and use, although they perform many general and specific functions. However, there may be much kind of situations, where specific types of application software are not available which can be design are called as custom application software. The most important categories or types of packages available are:

- Data communication software
- Database Management software
- Statistical and Operational Research software
- DTP package software
- Presentation and graphics software

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- Spreadsheet & Word processing software
- Accounting packages etc.

1.7.3 DATA

Data is the basic element of information technology for the business organisations. The modern business runs on data. Business organisations keep their data with the data centres. Data centres is physical place where computer servers, networking, data storage, backup facility, environmental controls etc.

Data is a stream of raw facts, a collection of unprocessed items such as text, pictures, audio, graphics etc. Today organisations are accumulating vast and growing amount of data in different formats and different databases. This mainly includes:

- operational or transactional data such as inventory, sales, cost, payroll, accounting
- non-operational data such as industry sales, forecast data, macroeconomic data.
- Meta-data, data about data itself, such as logical database design or data dictionary

Data should be processed before usage; data processing typically is manipulation of data to get information. Data processing activities includes collection of data, conversion or transforming, manipulation or computation, then storage and communication of information.

These activities can be grouped into functional categories, viz., data input, data processing, data output, and storage, is called as data-processing cycle. In other words, data processing is re-structuring or re-ordering of data to increase their usefulness and add values for particular purpose. A data warehouse contains all of the data in whatever form that an organization needs. Databases and data warehouses have assumed even greater importance in information systems with the emergence of "big data," a term for the truly massive amounts of data that can be collected and analysed.

1.7.4 TELECOMMUNICATIONS

Telecommunication is next component of information technology for working with business organisations. It is the process by which information is exchanged, it includes sharing, transformation, or retrieval of information etc. So, conveying and understanding of information is the basic characterized feature of telecommunication. All this is possible only through networking of organisations, and connections can be established physically or by wi-fi connections among themselves. Business organisations follow all basic technologies of networking i.e., LAN, MAN, WAN through wires or wireless with different kinds of hardware.

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1.7.5 PEOPLE

Information technology of business organisations is based on important element i.e. People. They are main, because of them whole system works. People the important element that are needed to run the system and the procedures, so that data collected in databases and data-warehouses turned into knowledge and information.

People are involved in information systems in just about every way, people imagine information systems, people develop information systems, people support information systems, and, perhaps most importantly, people *use* information systems.

IN-TEXT QUESTIONS

1. Define Software and discuss its types.
2. Explain, why people are involved in information systems.
3. Differentiate between input and output devices.

1.8 PERSONAL COMPUTERS IN BUSINESS

Computers & IT has been impacted tremendous to the Business Organizations. It has many advantages as well disadvantages also. On one hand IT increases labour cost of IT professionals in every field, on the other hand cost-performance ratio of business is towards betterment. Vast capabilities and powers of computers increasing the usage in this field. There are many characteristics of computers, make very useful for Business Organizations such as

- *data processing speed,*
- *vast amount of data storage,*
- *capability to solve complex problems,*
- *high accuracy,*
- *automation of tasks, and a*
- *steady decline of cost of per unit of data processed.*

So, nowadays the IT has been used in every business and for every function or process of business. Some of the basic and popular applications used in business are as follows:

- Finance & Accounting
- Sales & Marketing
- Manufacturing
- Human Resource Management

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- Project Management
- Data Analysis
- Marketing & Research
- Healthcare
- Education Sector
- Public Relations etc.

1.9 PLANNING INFORMATION TECHNOLOGY SETUP FOR AN ORGANIZATION

The business organisations, today requires real-time responsiveness to change, whether to meet new demands, changes in the supply chain, or unexpected competitive proceed. In order to be able to respond quickly, enterprises must provide their employees with immediate access to accurate and updated information. This greater vulnerability on information translates into greater dependence on the effectiveness of IT infrastructure as a whole. So, there should be well planned setup of information technology for an organisation.

IT act as channel of communication, software development tools, and social networks. The responsibility of business organization is, infrastructure should be facilitated, secure, logical, powerful, waste disposable, and management of large chunks of information technology. A flexible and robust IT infrastructure also plays an important role by empower employee productivity and globalization. IT infrastructure allowed pervasive and secure business communications anywhere and anytime and managing operational complexity and providing greater utilization of resource assets. Over the years, computer-based systems are larger and more complex, the importance of and dependence on IT systems have grown substantially. Information technology has all the indication of an infrastructural technology. Information technology is, first of all, a transport system. It carries digital information like as railroads carry goods and power grids carry electricity. In IT, companies have worked hard to reduce the cost of IT infrastructure data centre, networks, databases, and software tools that support businesses.

Planning an information technology setup for organisation, proposes an eight-step process that can help decision-makers:

- Choose the solution that best fits their needs and context.
- Obtain the external help and expertise they need.
- Develop, scale, and then sustain their chosen solution.

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There are eight steps in the process of planning an information technology setup includes:

- **Define outcomes**: At the start of any major ICT project, the project management team should create a project charter or terms of reference document that summarizes what the project will accomplish and where and when they will implement it. That way, there is no confusion about the project's objectives, targets, and scope.
- **Form your team**: To avoid misunderstandings and to make sure that your team possesses the required skills, consider the roles that will be required. Select personals or organizations that will fulfil these roles. Completing roles and responsibilities, a matrix should be required.
- **Define what your system needs to do**: Defining of business processes first, helps to think about the way people work (or could work) before diving into the details of what your system will look like. This process enhances the likelihood that the system will adapt itself to people and their work objectives.
- **Find the right solution**: organisation will find an appropriate system solution that aligns with the context, which can be find out by adopting a system and architecture of business organisation.
- **Select right vendors:** It is easy to be overwhelmed by vendors with more experience selling their service or product than business organisation buying it.
- **Estimate implementation and operational costs:** The cost to maintain the system should provide an ongoing benefit that outweighs this cost. When seeking to manage the cost of operations, the organization should review ways to reduce the cost and best estimate whole cost.
- **Create an implementation plan:** Just as costs are often underestimated, so is the time it takes to implement a successful information system. This sometimes leads to hurried analysis phases, unclear requirement and scope definitions, and skipping necessary quality controls. In the end, this results in even longer timelines. Having a plan and following a project methodology is the key to ensuring success. This step highlights some attention points like define work plan, track milestone then implement.
- **Understand and manage risks of the system:** Following the seven steps described previously should lower project risk by aligning requirements to organizational objectives, understanding costs, planning appropriately, and choosing the right vendors and partners. However, despite the planning that takes place, a significant number of projects have a different outcome than expected. For that just find out critical factor of failure, then solutions to remove or low down the risk.

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1.10 EMERGING TECHNOLOGIES

Emerging technology generally means a new technology, but it can also meant for the continuing development of an existing technology; it should have slightly different meaning when used in different fields, such as media, business, science, or education etc.

Emerging technologies having importance for the modernization of industries. New technologies work for digitization of business organisations, these technologies are mainly helpful in manufacturing, energy and mobility markets etc. These technologies continue to affect the way we live, work, and interact with one another and having great impact mainly to increase our productivity, make the services we need more accessible, and, overall, make our lives easier.

Emerging Technologies enables learning experiences which are difficult to recreate. They have positive effects (less expense, better efficiency, communication networks etc.) and negative effects as well such as social isolation, job loss, health issues, scams etc. So, the main objective of IT is to make tasks easier and to give solutions of many problems. Day by day technology is more emerging, few of the examples of it are artificial intelligence, cloud computing, virtual reality, robotics, social media, machine learning, IoT, big data etc. We will learn here about few of them.

1.10.1 Cloud Computing

Recently, cloud computing has been an emerging computing technology of the IT sector, which is acting as a revolutionary set up for the IT infrastructures and provides flexibility to the system. Cloud computing is introduced basically for the business environment that provides internet based interactive environment for using virtualised resources such as storage space, software, working platforms. It has many benefits as resource pooling, on demand benefit, broad network access, location independence, files transfers, software for hire, secure storage, servers for rent, databases etc.. Nothing is there in the world without drawbacks, so some of the disadvantages of cloud computing are less reliable, loss of information, unsecure connections, exposure of your information to many platforms etc.

The major cloud computing models are in use today; **Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS)**. Few of the examples of cloud platforms are **Amazon (Amazon Web Services, or AWS), Microsoft (Azure), and Google (Google Cloud Platform)** maintain the most in-demand.

Cloud computing is emerging on one hand but have many security issues on other hand as lack of privacy, full of legal issues, some compliances, and issue of long term viability etc.

1.10.2 IoT

Nowadays Internet is the most important part of the life in the world. So, world is dependent on internet, everything is connected to internet, all communications are with the help of

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internet, human being are working with internet, almost all devices are connected to internet and performing task. This gave birth to new term of IoT (Internet of Things), it is an

interconnected network of smart devices using internet, sensors, and RFID for transferring data without human intervention over the network.

IoT works on few main elements as identification of device, sensing of data for transferring, then communication of devices to transferring of data. This is the main working of IoT with the world of Artificial Intelligence and Machine Learning. The IoT creates opportunities for new products, services and business models. Some of the basic examples of IoT are: Automotive Industry, Pharmaceutical industry, manufacturing industry, agriculture & breeding, supply chain management, etc.

Some major challenges face by IoT are of security & privacy, scalability & interoperability, low power communication, security threats from devices etc.

1.10.3 Robotics

Advancement in AI, machine learning, IoT and big data are driving robots into every aspect of life. Robots can make life easy for humans as by eliminating dangerous jobs for humans because they are capable of working in hazardous environments. They can handle lifting heavy loads, toxic substances and repetitive tasks. This has helped companies to prevent many accidents, also saving time and money. So, from here term ROBOTICS originated.

The main aim of robotics is to design machines that can help and assist humans. Robotics integrates many fields of mechanical engineering, electrical engineering, information engineering, mechatronics, electronics, bioengineering, computer engineering, control engineering, software engineering, mathematics, etc. They need special hardware with sensors and effectors.

1.10.4 Social Media

Social media is virtual community within the network, interactive technology that facilitate the creation and sharing of information, ideas, interests, and other forms of expression. In today's society, the use of social media has become a necessary daily activity. used for social interaction and access to news and information, and decision making. In fact, it is a valuable communication tool, to share, create, and spread information. Social Media is fast evolving as one of the most reliable ways to connect and stay informed about the most recent developments in a particular industry. So, it is very useful for businesses.

1.11 SUMMARY

The computer is an electro-mechanical device, which provides assistance in storing and processing data for business organizations. The personal computers are now in use, which were introduces in 1980`s, a computer that is used by single user or people working in same

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field by sharing. They are so popular, that are used in every working field of the human being – small organisation, large organisation and even in homes. According to the trend, PC`s are reducing size, cost but not the performance.

Computers include CPU, input units, output units, storage units and software. The data is entered into the system then transformed into machine readable form is input, then after processing into CPU, data is transformed into human readable form machine is output. Then it is stored into secondary storage permanently. Collection of all these elements is necessary for information technology. So, *hardware, software, data, telecommunication and people* are important elements of information technology to work with business organisations.

So, we have learnt the main components of an IT system that are used in business organisations. They follow the sequential path for installation of PCs into the business organisation with IT setup. These systems are also enables for telecommunications as well as emerging technologies. Today`s emerging technologies are including AI, Robotics, cloud, social media etc.

1.12 SELF-ASSESSMENT

1. Define Information Technology and list its major elements.
2. Discuss how IT is supporting the business organisations.
3. What are the components of a computer system?
4. Differentiate between RAM & ROM.
5. What are the major trends in business organisations for Information Technology enabled PCs / systems?
6. Describe the business benefits of implementing information technology.
7. What are the main types of software and describe their functions?
8. Write a detailed note on the advantages of telecommunication as a component of information technology.

1.13 GLOSSARY

CPU: central processing unit, having arithmetic unit, logical unit and control unit.

HARDWARE: physical parts of the computer system, which we can touch and interconnected to each other for performing or solving complex to complex problems.

SOFTWARE: sophisticated part of the computer system, which we cannot touch and act as interface between user and computer hardware components.

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INFORMATION TECHNOLOGY: Information Technology means gathering, storing, organizing, and displaying of processed data.

COMPUTER GENERATIONS: Over the time, computer is characterized by major technological changes or development. The characterized technological developments of computer fundamentally changed the working of computers i.e., the way it operates, stores, processes, and results. The sequential changes in computers over the period name it as computer generation.

COMPUTER PROGRAMMING & LANGUAGES: Programming is technical skill of computers which involves designing, creating and refining of code for solving the problems by building applications. For the purpose of programming many computer languages are available for accomplishing the tasks of end users.

Cloud Computing: Cloud computing is introduced basically for the business environment that provides internet based interactive environment for using virtualised resources such as storage space, software, working platforms.

IoT: IoT (Internet of Things), it is an interconnected network of smart devices using internet, sensors, and RFID for transferring data without human intervention over the network.

Robotics: Robotics is to design machines that can help and assist humans. They need special hardware with sensors and effectors.

Social Media: Social media is virtual community within the network, interactive technology that facilitate the creation and sharing of information, ideas, interests, and other forms of expression.

Telecommunication: It is the process by which information is exchanged, it includes sharing, transformation, or retrieval of information etc.

RAM: RAM (Random Access Memory) is that part of main memory where data and instruction held temporarily while being executed.

ROM: Read-Only Memory (ROM), is a type of memory that comes built in to a device during manufacturing and non-volatile.

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LESSON 2

INDIAN COMPUTING ENVIRONMENT

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STRUCTURE

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2.2 Introduction
2.3 Growth of the IT sector in India
2.3.1 IT Software and Service Industry
2.3.2 Status of IT Software and Service Industry in India
2.4 Trends in IT and ITes sectors
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2.9 E-Governance as a social transformational tool

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2.10 Summary

2.11 Answers to Intext Questions

2.12 Self-assessment questions

2.13 Suggested Readings

2.1 LEARNING OBJECTIVES

The target of this chapter is to learn about Internet Technology, which has a significant impact on the future:

- To gain essential information in the space of the computing environment, which portrays Internet Technology - its key areas, advantages and disadvantages, and ongoing application trends in the IT sector.
- To get fundamental applications of IT in business, government, and service sectors.
- To grasp the extent of the effects of IT on the general public, with its benefits and hindrances.
- To adapt the standards of versatile and remote innovations whose turn of events and applications are turning into the most noticeable parts of the present IT.

2.2 INTRODUCTION

Our life has been influenced by Technological development to a reasonable extent that has resulted in the emergence of a replacement of the international economy. It has remodeled the globe into a worldwide village. With a click of a button, the answer to the problem appears on the screen. Despite its excellent use, some flaws must be corrected, or else hackers or any wrong organization will play with the confidential information of many firms or people. That is why it is necessary to grasp the IT idea at ground level to avoid any circumstances of fraud.

Information Technology (IT) is the bedrock of current venture associations. The term rotates on the bottom of computer frameworks, programming, web, and different foundation that empowers an association's center skills. Liberal associations read IT as a superiority that allows them to figure out much intelligence and attain their business objectives.

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Our society has modified a good deal owing to the significant advancements within the field of IT that style the standard of our lives, economic processes, education, social relationship, etc. The social group impacts of the IT area deal with each negative and positive aspect. Technology and society go hand in hand and should complement one another. They are the two sides of an identical coin.

2.3 GROWTH OF IT SECTOR IN INDIA

2.3.1 IT Software and Service Industry:

Information technology (IT), a knowledge-based sector, has enormous potential to stimulate economic growth, boost overall economic productivity, and facilitate effective governance. It improves information access, safeguards consumers, gives people access to government services, increases the effectiveness of skill development and training effectiveness, enhances healthcare service delivery, and encourages transparency. It offers excellent employment opportunities and connections between the government and the popular in rural and urban areas. The extent of the nation's leading position in the global economy over the next two decades will be determined by investment in knowledge-based businesses.

2.3.2 Status of IT Software and Service Industry in India:

The Indian IT programming and administration industry has arisen as the quickest developing area in the Indian economy, with a development rate surpassing 50% in commodities and 40% in the all-out IT industry throughout recent years.

India holds a 55% market share of the US$ 200–250 billion global services sourcing industry in 2019–20, making it the top sourcing location globally. India's standing in the 2021 edition of the Global Innovation Index increased by four spots to 46th place (GII). National Association of Software and Service Companies (NASSCOM) reports that the Indian IT sector generated US$ 227 billion in sales in FY22, representing a 15.5% YoY growth. Gartner forecasts that India's IT spending will rise from an estimated US$ 81.89 billion in 2021 to US$ 101.8 billion in 2022. By 2025, it is anticipated that the Indian software products market will be worth $100 billion. Indian businesses are concentrating on investing abroad to broaden their global reach and improve their global delivery hubs.

The IT software and service industry has been categorized into three broad sectors:

- **Software Product and Technology Services:**

It gives the Indian software business a tremendous growth opportunity. The market for developing software products, such as enterprise software (e-business solutions, ERP, and e-corporate governance), consumer software (personal productivity tools), and embedded software, is open to Indian enterprises.

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Indian businesses have created many highly regarded and well-liked software packages, including HR management and company accounting by TCS, banking automation software by Infosys, ERP tools by RANCO, etc.

- **IT Services:**

IT Services are transitioning from client-server to the web- and package-based services. This will make up the bulk of the IT services. The most significant opportunity will continue to be in the expansion of IT services, but other areas of the IT software industry will also play a significant role. The need for IT services, domestically and internationally, will increase quickly as new opportunities in management/consulting, application maintenance, and Internet services arise. The government, banking and financial services, manufacturing, retail, and distribution are the primary consumers of IT services.

Communication, healthcare, and utilities are likely to experience new developments due to the deregulation of these industries. However, top-notch personnel, cutting-edge abilities, a top-notch telecom environment, and an environment based on IT knowledge are fundamental requirements for IT services.

- **IT Enabled Services (ITES):**

The Indian ITES sector has established itself as a significant growth driver for the country's IT sector and technology-driven services sector. Seventy thousand people are employed in this sector, which grew from Rs. 2,400 crores in 1999–2000 to Rs. 4,100 crores in 2000–2001.

It includes a wide range of services, some of which include:

- Call center and other customer-interaction services
- Back offices, revenue accounting, data input, data conversion, and HR services
- Transcription and translation services.
- Animation and content creation.
- Additional services include network consulting, market research, GIS, data search, and remote education.

ITES has significant employment potential and a shorter gestation period than other IT-related industries. It demands consistent performance with high-quality standards and a lot of human resources.

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IN-TEXT QUESTIONS

1. What is the position of India in the Global Innovation Index 2021?
2. Economic trends include information relating to
   a) Consumer and employment
   b) Productivity, capital investment, etc.
   c) All are true
   d) None is true

2.4 TRENDS IN IT AND ITES SECTOR

The IT industry is constantly evolving. This quick-changing business has many new technologies, tools, software frameworks, and creative concepts. In the present IT world, the development of every economy is connected with the development of Data Technology. The data innovation industry is encountering a blast more than ever, which is just the beginning; more brands are hoping to extend in this space.

The world's basic structure has changed due to the COVID-19 epidemic. The virus started in China in late December 2019 and has since spread to every continent and infected millions of people. Global economies have been shut down in response, and various degrees of lockdowns have been encouraged. One of the strictest lockdowns, prohibiting the flow of people and products and essentially turning every city into a ghost town, has probably been in place in India.

The economy has been dealt a deadly blow due to such onerous limitations on movement. When the virus entered India, the nation was already experiencing difficulties due to a falling GDP growth rate and a widening fiscal imbalance. The lockdown has only made the financial situation worse, driving several enterprises and industries into a condition of moribundity. Other nations have seen a comparable situation, especially in the US and Europe, which were both centers for virus transmission.

However, a closer examination of the global economy reveals that several IT-related sectors appear to have experienced an upward mobilization. These industries appear to have substantially expanded their operational footprint and generated sizable revenues.

If we examine how the global IT/ITeS market is developing, we can see that all areas that have succeeded throughout this challenging period have one thing in common: adaptability. These industries have chosen a more adaptable strategy for handling the lockdown. They have not been afraid to alter the game's rules, whether through flexible working practices or the adoption of newer, more technologically advanced working methods in keeping with the

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demands of our day. Let us examine a few of these tech-related fields that have been successful in overcoming the shutdown.

- **Artificial Intelligence and Machine Learning**

Artificial intelligence and machine learning have taken center stage in recent years in terms of new information technologies. Many multinational companies have started integrating AI and ML into their operations, reaping noticeable advantages, including enhanced customer experiences, faster business processes, fewer production concerns, and increased profits.

'Semrush' figures show that 86% of CEOs expect AI to be standard technology in their workplace by 2021. Moreover, in 2022, the tendency will continue to pick up speed. More SMBs will ensure that their development approach includes deep learning, machine learning, and artificial intelligence.

Intelligent tools and algorithms will increase across various industries, including manufacturing, healthcare, finance, and education. Businesses that disregard or delay implementing AI within the next five years run the danger of going out of business.

- **Social Media**

Social Media is a web-based connection among people. It permits clients to have discussions, share data and make web content. There are many types of web-based entertainment for everyone's taste, including online journals, miniature sites, wikis, informal communication destinations, photograph sharing, texting, video-sharing sites, digital recordings, gadgets, and virtual universes. Lockdowns worldwide have kept people stuck at home with nothing to do. As a result, the social networking site reported a spike in user engagement during the lockdown period.

- **Data-Mining Enterprises**

The lockdown has made all the difference for information mining organizations. This restrictive expansion in the number of hours spent on web-based and online platforms all over the planet has given these organizations admittance to more extensive information arrangements than they could have imagined.

- **Cloud Computing**

Cloud computing has been rising for the last couple of years as the pandemic has made it the de facto king of computational services. With a rising dependence on remote working, the capacity to store information in one secure area has become essential.

- **E-Commerce**

Social isolation measures have made it unimaginable for individuals to genuinely go out to shop for food and different necessities because of the apprehension about the

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transmission of the infection. Online businesses have been the genuine victors in this dilemma of worldwide commercialization. With only expectations of cleanliness and at-home conveyance, these locales have given a simple choice to retail locations.

- **OTT (over-the-top) Platforms**

Web-based streaming stages like Netflix, Prime, and so forth comprise a generally more current way to deal with diversion. They had, as of now, in any case, laid out a name for themselves before the lockdowns and became worldwide famous for the wide variety of shows and movies among a large set of different aged populations.

- **Video-Conferencing Platforms**

We need everything over the Internet, and nobody wants to go out. In the current scenario, this fact is transforming into the new norm in our master culture: learning, family meetings, etc. Also, this "Work from Home" culture is preferred over full-time office jobs in the current scenario. Sound or text, yet video conferencing is the need today.

- **Mobile Apps**

Mobile Apps and Portable applications have just filled in omnipresence and popularity throughout recent years. This year, they are surfacing in far superior ways by executing new assets that can make chipping away at the go more effective.

- **Automation**

Automation is a pattern that is essentially catching assembling and creation areas and is supposed to increment further before long. Computerization has likewise empowered cycles to work quicker, easing the human workload.

- **Artificial Intelligence**

The previous year saw the presentation of a few new mechanisms of man-made reasoning. This year, enterprises are taking different steps and measures by which they can develop these assets and carry out their work. Man-made intellectual prowess is, as of now, seeing execution for a greater degree, which is set to foster more all through the following couple of years.

- **Virtual Reality**

The gaming business has forever been one that has encountered development close to the field of data innovation, and computer-generated reality has made this one stride further, giving clients the actual encapsulation of advanced insight. Computer-generated reality gaming has previously become well known because of innovation, which works on how the business can develop.

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- **Cyber Security**

With the development of computerized mediums and innovation, the potential dangers that individuals can confront are just rising. Because of this, cybersecurity and network safety has needed to develop broadly throughout recent years. Industries all around the world likewise understand the significance of putting resources into network protection, which is why the field is experiencing growth at such a rapid pace.

- **Growth of IoT Networks**

The Internet of Things is the idea that all computerized gadgets are associated with a solitary medium through which one would have the option to control everything. More brands are starting to consolidate this idea encountering development at such a quick speed so that they can gain more and more profit as the idea of IoT is becoming vaster and vaster these days.

- **Rise Of Chatbots**

Chatbots are a program to respond to detailed inquiries somehow or another and are planned to help clients with a piece of the more fundamental capacities they would require. These are, clearly, still not in a position wherein they are a complete substitute for genuine live client care, which has assisted them with the remaining development.

Also, there are a lot more fields like those referenced previously. The end here is that it is inevitable that the IT business, regardless of its overall youthfulness and more settled areas, will stay a central participant in the country's financial scene and continuous development and evolution.

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IN-TEXT QUESTIONS

3. ITes refers to:
   a) Information Technology enabled Services
   b) Information Technology end Services
   c) Information Technology enabled Server
   d) None of the above
4. A type of _____ based computing is cloud computing
   a) Iot
   b) Internet
   c) Bluetooth
   d) Big data
5. Full form of VR is_____.

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2.5 APPLICATIONS OF INFORMATION TECHNOLOGY IN

With more advancements in innovation, new organizations are made. With more business, innovation acts as the hero by making things simpler. The two exist in something of a cooperative relationship that guarantees they will continuously coincide or coexist. The role of Information Technology in the business environment is ever-increasing. The application of IT is beneficial and profitable to organizations.

2.5.1 What is information technology?

Information Technology (IT) integrates the review and usage of PCs and any kind of transmission correspondences that store, recover, study, pass on, control information, and send data. Data innovation includes a blend of equipment and programming to play out the fundamental errands and the role that individuals need and use on an ordinary premise.

There are many facets of Information Technology which are listed below:

- **Governance:**

  It refers to how working units implement operational boundaries and how individuals use engineering, organizations, and IT frameworks. In plain English, they approve the guidelines for how our group, and we may use the organization's invention and the purposes for which we may do so.

  Similar to information affirmation, which the IT office is also capable of, this is crucial for traditional IT security. The actual parts of Information Technology go under the equipment of IT. It incorporates setting up and keeping up with the hardware like telephone frameworks, switches, servers, and PCs.

- **Infrastructure**:

  It alludes to any tangible elements required for an IT system. Depending on the requirements and size of the business, it includes hardware, network, and circuits of the equipment.

- **Functionality:**

  It is conceivably the most significant and practical work an IT department performs, and for this reason, other departments within a company take notice of and remember an IT department.

  It includes designing and managing operational applications, creating, protecting, and storing the organization's electronic data, and aiding all functional areas of the company with software and data management.

The creation and management of communications networks for small and large enterprises are centered in the IT department. The importance of an effective IT department

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to a company's day-to-day operations can be seen in the fact that few businesses, large or small, could operate without one. Information Technology assists every step, from sending an email to changing a password, accessing databases, and everything in between. The ultimate goal of IT in a company is to increase productivity and efficiency.

2.5.2 Information Technology in Business:

Every business plan now includes information technology (IT) as a crucial and vital component. IT is used by various organizations, including tiny enterprises with one computer and multinational corporations that manage mainframe systems and databases. The easiest way to understand the drivers behind computer technology's pervasive use in business is to examine how it is applied globally.

- **Data and Information Security**

  The primary objective of safeguarding is to keep data secure. The IT division will guarantee confidential information. To prevent crucial data from being corrupted, compromised, or lost, IT must also ensure they adhere to data protection rules. Its criticality has further increased globally with the implementation of the "General Data Protection Regulation" by European Union.

  Examples of data breaches include information theft by hackers or data safeguarding, which means that industry-standard security measures are in place throughout the entire organization to guard against the loss, misuse, unauthorized disclosure, alteration, or destruction of data related to the company or **team member** the misuse or sharing of personal information about a company's personnel.

- **Investigation of Issues**

  In the digital sphere, problem-solving is referred to as troubleshooting. Repairing malfunctioning digital items or processes on a PC or system is one example of how troubleshooting can be used. When a problem is troubleshot, a methodical and logical search is done for the problem's cause to fix it and restore the process or product to full functionality. When something is incorrect, troubleshooting is also utilized to determine the symptoms.

- **Database maintenance and security**

  The era of massive file rooms, rows of filing cabinets, and document shipping are quickly passing by. Most businesses now keep digital copies of their documents on servers and storage gadgets. Everyone has immediate access to these documents, no matter where they are located within the firm. Employees profit from quick access to the papers they need, and businesses can store and manage a vast amount of historical data inexpensively.

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- **Controlling cloud-based solutions**

A cloud-based solution is an on-demand service for nearly anything and everything we can "store," such as computer network data, storage, programs, or resources accessed through the Internet and an outside provider's shared cloud computing infrastructure (servers accessible over the Internet). Cloud-based solutions are used by both large and small businesses, from the neighborhood candle store to worldwide industry leaders like Microsoft and Google, to maintain control over their virtual or physical offices and staff members.

- **Examine data**

Specific data may be analyzed by information technology, and using the trends and facts in the data, can assist in planning the organizational journey appropriately. IT can effectively provide organizations with a wide range of tools to help them plan their future growth and overcome complex business challenges. Nowadays, with everything moving online and people having constant access to the Internet via their smartphones, businesses cannot survive without digital marketing. The global market can be reached by firms using the Internet's digital marketing platform, which they can access from the convenience of their own home or remote office.

- **Effective Communication**

We live in a time where we can often get in touch with a company immediately. Understanding a customer's demands, purchasing trends, behaviors, and satisfaction levels is crucial to a business's success. Adequate and prompt communication is ideal for handling consumer requests, issues, and solutions. The beauty of information technology is that it enables companies to interact instantly and globally with millions of clients. Through IT, clients may communicate in a plethora of ways without ever leaving their homes. These channels include emails, social media conversations, video calls, webinars, member forums, email newsletters, and smartphone access.

2.5.3 Information Technology in Service Organization:

The service industry is impacted by the market's increasing competitiveness and emphasis on client satisfaction. Following the conventional approach, nevertheless, does not always work for such situations. As a result, technology is increasingly being introduced to enhance the consumer experience. Many companies have been encouraged by the role technology plays in the service sector to cut back on wasteful costs and uncertainty. Additionally, by minimizing client interaction, the influence of technology on the service sector has been utilized to standardize the services.

More than only service automation and lower-cost service delivery are benefits of technology's entry into the service sector. Additionally, it allows us to collect, examine, and use client information to understand their wants better and satisfy them. Technology is

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defining not only the trend of consumer wants but also the ability of staff to receive and give their clients personalized service.

As is apparent, technology has been the main driver of innovation in the service industry. Because of emerging technology, automated voice mail, interactive voice response systems (IVR systems), fax machines, ATMs, and other commonplace devices are conceivable.

- **Quick access to services**

Incorporating technology into services makes the task easier and provides customers with speedy and dependable service. Every stage of the process may be automated, improving the entire customer experience while saving time and human labor. Thanks to technology, a wide range of services are now at clients' fingertips.

Access to any information is made simple by the digital transition. Customers may hunt for any service by conducting a simple Internet search on their smartphone. Consequently, we may use the search to get all relevant results and even save time.

- **Improved Method of Service Delivery**

Every person, whether a buyer or a merchant, eventually has to adjust their everyday tasks. The utilization of technology is now coming. It could improve the interactions between service users and providers. Given the widespread adoption of technology, it is reasonable to state that technology makes it easier to do fundamental customer service tasks like paying bills, getting information, reviewing financial records, monitoring shipments, etc. However, the emergence of automated voice response systems has enhanced the sector's customer service. Similar to how technology has advanced and affected nearly every industry, delivery services have also undergone significant changes.

- **Friendly Interactions with Customers**

Companies in public and private sectors are heavily utilizing technology and working hard to develop friendly relationships with their clients. Distribution of products businesses frequently set up order terminals, inventory management terminals, and other technical devices on their client's premises. This offers the consumer a wonderful experience and helps the business incorporate a customer relationship.

Every firm offers a range of facilities and services to help its clients advertise their businesses. However, thanks to technology, customers may now get services right at their doorstep without any wait time or line-ups.

- **Services' Global Reach**

The customer's ability to access services globally has significantly grown with the introduction of technology in the service sector. The Internet is a vast network that crosses all geographical boundaries and links every person to the services offered. Access

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to the Internet enables international travel and the conveyance of information, customer service, and global transactions. Thanks to technology, people may work from home for any multinational corporation. Client living has increased significantly as a result of the technology-based service.

- **Great Service Quality**

Thanks to technology, a specific consumer may get services that are tailored to their needs. This forges strong customer ties and fosters trust in the business and its offerings. Customers are more dependable when using technology to get services than manual access since services are easy to access and of high quality.

2.6 E-COMMERCE: A WEB-BASED BUSINESS

Web-based selling has changed immensely since it started; the advancement and history of e-commerce, also known as an online business in simpler terms, is interesting – and it is progressing at an even rapid speed today. E-commerce is trading labor and products utilizing the web and exchanging cash and information to finish deals. It is otherwise called electronic trade or web business. E-commerce mainly evolved during the pandemic, enabling businesses to survive and thrive. Unlike a brick-and-mortar store, running an e-commerce store does not require us to spend much money on overhead, and we can reach a global audience.

2.6.1 Introduction:

E-commerce works just like how a physical store works. Customers search their individual choice of e-commerce stores; browse various products they want to buy and finally make a purchase. The significant distinction is that they do not must get off their sofa to do so, and the purchaser base is not restricted to a selected geographic place or region. These web applications follow specific steps to sell their products to the customers. Those steps are as follows -:

1. Accept the order: As soon as the customer places an order, the e-commerce site will be alerted of an order being placed. The alert description will show the details of the respective order, like the product name, company name, quality, quantity, etc.

2. Process the order: Next, the charge or payment is processed, the sale is logged, and the order is marked complete. Payment transactions are typically processed via what is referred to as a payment gateway which contains various modes for a payment to happen.

3. Ship the order: Shipping a product is considered the last step in this process. It is to be ensured that the products are delivered to their correct and respective addresses. The duration of the delivery process depends on the location.

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There are various examples of e-commerce businesses such as Online retail, Wholesale, Drop shipping, Subscription, Digital Products, Physical Products, and Services. Companies such as Amazon, Flipkart, Lenskart, Myntra, MakeMyTrip, and many more provide e-commerce facilities.

2.6.2 E-commerce Business Models:

There are various online business plans because of what is sold and to whom. These are the three most ordinary and everyday models-:

1. Business to Consumer: This business sells items or administrations straightforwardly to the consumer. The B2C e-commerce business is the most well-known web-based business type and covers an expansive cluster of items, from clothing to daily needs. Instances of B2C web-based business stores incorporate Amazon, Netflix, and Overstock.
2. Business to Business: When a business offers items or administrations to another business on the web, it is viewed as B2B online business. These organizations could sell things like office supplies, furniture, and gear. They also give online business arrangements, such as archive marking programming and other cloud-based administrations.
3. Marketplaces: Marketplaces or internet business commercial centers are sites where outsider shippers can offer their items or administrations to consumers. Walmart.com and Etsy are different instances of online Marketplaces. For a cut of the deal, we can list our items on their website and access their client bases.

2.6.3 Pros and Cons of e-commerce:

As we know that every technology is not perfect. It can be almost perfect but will have minor flaws. Let us examine some pros and cons of e-commerce trading.

Table 2.1: Pros and Cons of e-commerce

Pros	Cons
1. It has fewer overhead costs than an actual store.	1. Lacks customized sales and personal touch.
2. Compiles client information.	2. Information, Debit, and Credit card extortion are widespread.
3. It can be operated 24x7, with no staff.	3. It offers limited loyal customers.

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4. The business can scale on the fly.	4. There are expenses for carrying on with work on the web.
5. It has proven to be pandemic resilient.	5. Web-based business is a ferocious business.
6. It is not difficult to follow the sales and shipments.	6. Clients need quick, free delivery.

IN-TEXT QUESTIONS

6. E-commerce is also known as
   a) Electrical Commerce
   b) Electronic Commerce
   c) Entertainment Commerce
   d) Electrochemical Commerce
7. Which E-commerce category includes businesses like Flipkart, Amazon, and Myntra?
   a) B2B
   b) B2C
   c) P2P
   d) C2B
8. The idea of online marketing and purchasing goods and services is _____ E-commerce.

2.7 E-GOVERNANCE: A SMART ADMINISTRATION

Electronic governance or e-governance suggests government working with the use of ICT (Information and Communications Technology). Thus e-Governance is fundamentally a move towards SMART administration, inferring: Straightforward, moral, responsible, responsive, and transparent administration. For this reason, a comprehensive resident administration portal should be set up, with so many administrations like the issuance of general declarations, administrations related to charges, income, transport, permits and

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licenses, enlistment of various types, benefits plan, the government managed retirement and government assistance plans, instruction preparation, work, lodging, foundation, monetary help plans, businesses, horticulture, and other various administrations. This will not just assist in carrying out e-governance smoothly but will likewise teach and make an IT culture in the perfect state. There are four types of E-Governance interactions.

1. G2C (Government to Citizens): It refers to interaction between the government and the citizens. The Digital India programme, the National Portal of India, the Prime Minister of India portal, Aadhaar, online tax filing and payment, digital land management systems, Common Entrance Test, etc. are some examples of e-governance with relation to the G2C.

2. G2B (Government to Business): It is an interaction between the business community and government using e-governance tools. A government website where businesses go to pay taxes is a prime example of G2B.

3. G2G (Government to Government): It refers to interaction between various government entities. Example of G2G is the Bhoomi Project. A self-sustaining e-government initiative called Bhoomi automates the distribution of 20 million rural land records to the 6.7 million farmers in Karnataka. The "Bhoomi" project was taken on and developed by the Karnataka State Government. In order to computerize all of Karnataka's land records, this was done. The State Government of Karnataka and the Ministry of Rural Development of the Indian Government, however, both co-sponsored the programme.

4. G2E (Government to Employees): Interaction between the government and its employees. E-Mitra, E-Seva project, CET (Common Entrance Test), etc are some examples of the G2E governance.

2.7.1 Promoting E-Governance:

There are some steps taken to promote e-governance in India are as follows:

1. In 1998, A National Task Force on Information Technology and Software Development was set up to promote digital plans that will benefit the future.

2. The Ministry of Information Technology was formed at the Center in 1999.

3. A 12-point plan was recorded for e-Governance for execution in every one of the focal services and divisions.

4. The Information Technology Act (2000) was authorized. This Act was corrected in 2008.

5. The primary National Conference of States' IT Ministers was coordinated in 2000 for showing up at a Common Action Plan to advance IT in India.

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6. The government set up NISG (National Institute for Smart Government), where they can train the officials to use digital platforms.

7. The state legislatures sent off e-Governance projects like e-Seva (Andhra Pradesh), Bhoomi (Karnataka, etc.)

8. The National Policy on Information Technology (NPIT) was embraced in 2012.

9. The National e-Governance Plan (NeGP) was launched, consisting of 31 Mission Mode Projects (MMPs) and eight support components. This project gives a comprehensive perspective on e-Governance drives across the nation. Around this thought, a monstrous countrywide foundation arriving down to the remotest of towns is developing, and colossal scope digitization of records is occurring to empower simple, dependable access to the web. The government has proposed to carry out "e-Kranti: National e-Governance Plan (NeGP) 2.0" under the Digital India program.

2.7.2 E-Kranti: Electronic Delivery of Services

E-Kranti is a fundamental mainstay of the Digital India drive. Considering the essential requirement for E-Governance, portable governance, and excellent governance in the country, the methodology and critical parts of E-Kranti have been supported by the public authority and approved by the government. The E-Kranti structure tends to the electronic conveyance of administrations through an arrangement of mission mode projects that cut across a few government divisions.

Objectives of E-Kranti-:

1. Rethink NeGP with groundbreaking and result-arranged e-Governance drives.
2. Improve the arrangement of resident-driven administrations.
3. Guarantee ideal use of center Information and Communication Technology (ICT).
4. Advance quick replication and mix of e-Governance applications.
5. Influence arising advancements.
6. Utilize more coordinated execution models like agile implementation.

2.7.3 Advantages of E-Governance:

1. Develops conveyance and productivity of taxpayer-driven organizations
2. Developed government connections with business and industry
3. Resident strengthening through admittance to data
4. More efficient government administration and high transparency among officials
5. Cost decreases and income increases
6. Expanded authenticity of government

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7. Diminishes desk work and red-tapism in the authoritative cycle, which brings about better preparation and coordination between various degrees of government
8. Developed relations between the public specialists and everyday society

IN-TEXT QUESTIONS

9. E-Governance is a technology that progresses.
   a) Accountability
   b) The efficiency of government processes
   c) Transparency
   d) All of the above
10. E-Governance has four types of interactions, namely:
   a) E2G E2E E2W E2B
   b) G2C G2B G2E G2G
   c) G2A G2R G2W G2G
   d) G2E G2G G2P G2R
11. The National Policy on Information Technology (NPIT) was embraced in _____.
12. The idea behind e-Kranti is:
   a) More crop per drop
   b) One-stop service center
   c) Changing the face of Rural India, electronic way
   d) Transforming e-Governance for Transforming Governance

2.8 LATEST DEVELOPMENTS IN INFORMATION TECHNOLOGY

Technology is quickly developing. More technical evolution is notably made possible by developments in information technology such as artificial intelligence, geotargeting, automation, and others. Even our thermostats and refrigerators can be connected to the Internet as robotics become smarter.

Some of the advancements are stated below -:

1. Artificial Intelligence and Machine Learning:

In the past, artificial intelligence and machine learning represented computer science's bleeding edge. When these technologies were developed in the 20th century, they primarily served academic purposes and had few practical uses. These technologies,

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however, have developed applications throughout time and are today among the most recent in computer science. They have even made it into the hands of regular people via mobile phones.

A computer science area known as machine learning uses an algorithm to predict future data based on already created data. The advancement of machine learning into artificial intelligence allows an algorithm to acquire knowledge based on data and even perform necessary tasks independently.

2. Data Science:

Data Science is a more recent advancement in computer science. Data science was the hottest topic for much of the twenty-first century's first decade. The data science field has existed for much longer than the last 20 months. Data analysis has been crucial for businesses, the government, organizations, and departments for millennia. Data analysis is helpful for understanding process effectiveness, surveying the workforce, and assessing the overall mood among the populace.

Today, however, a lot of data analysis is done digitally—one of the earliest tasks for which computers were used for data analysis. Data analysis was so standard in the early 2000s that schools started offering introductory courses on the topic.

Having a profession in data science has the advantage of making us an integral part of the company's entire operation, regardless of the industry our company operates in. Any organization we work with will likely use the data we provide and the interpretations we offer as an essential component of their business plan.

Data science is frequently used in retail and e-commerce to assess the effectiveness of campaigns and the overall trajectory of the expansion of different items. This, in turn, aids in creating plans for the promotion of certain items or product categories. Healthcare data informatics may be crucial in offering affordable alternatives and packages to patients and enabling clinicians to select the most effective but safe therapies.

3. Full Stack Development:

One of the most popular and in-demand technologies of 2021 will undoubtedly be full-stack development, which refers to creating both client-side and server-side software.

Beginning with the dot com boom, the Internet—a relatively recent phenomenon—began to permeate households worldwide. Back then, websites were little more than plain web pages, and web development was not the sophisticated discipline it is today.

Nowadays, both a front end and a back end are used in web development. Websites consist of a client-side, or the website we view, and a server-side, or the website that

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the business manages, particularly in industries connected to services, like retail and e-commerce.

4. Robotic Process Automation:

Robots are simply one aspect of robotic process automation. More than anything else, it is about automating procedures. Most procedures required some human involvement before computers. Individuals operated even the manufacturing machinery, and massive production employed thousands of people.

However, as computers have mostly replaced manual labor, manufacturing has also been affected. Automation is increasingly used in all industries, including manufacturing and information technology. The amount of human involvement in these processes is steadily declining, and this pattern is probably here to stay.

Robotic process automation jobs frequently require a substantial level of coding expertise. Typically, we would need to build code to enable automated, human-free completion of computerized or non-computerized procedures.

5. Blockchain:

Recently, Blockchain has come up in conversation, primarily concerning cryptocurrencies. However, blockchain technology has developed to have a variety of uses. Because Blockchain is consensus-driven, it is essential to note that no single party has complete control over it. The information we keep on the Blockchain, frequently used to share medical data in the healthcare sector, cannot ever be changed.

This data may be distributed among parties very quickly because blockchain technology offers security. Blockchain technology is also used to protect payment systems' security. External assaults and theft are extremely difficult to commit against blockchain-based payment systems. Additionally, a supply chain may utilize the Blockchain to track the status of its items.

2.9 E-GOVERNANCE AS A SOCIAL TRANSFORMATIONAL TOOL

A recent couple of years have seen a gigantic blast in Information Technology worldwide. The conversion of hardware and broadcast communications has opened new vistas of transmission, storing, and recovery of data which was never expected. These are, by and large, progressively utilized for navigation in the corporate world and even in policy implementation. The rising population and its monstrous weight on community conveniences and the financial framework are far from imagination. With this change, e-Governance becomes a need as well as a necessary piece of every country. E-Governance drives in India have customarily been defied with the double difficulties of robotizing government divisions and taking web-based administrations to the average citizens.

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E-Governance has moved past government divisions. It is tied in with changing how states work and reexamining individuals' support in the popularity-based process. E-Governance gives a stage to coordinate arrangements and administrations between Government-to-Citizens (G2C), Government-to-Business (G2B), and Government-to-Government (G2G), engaging both the government authority and the citizens.

2.9.1 ICT: The Revolution

Building trust among state-run administrations and citizens is crucial to excellent administration and Information and Communications Technology (ICT). It is continuously becoming a fundamental instrument for advancing responsibility, comfort, and straightforward administration. States around the country are pushing hard to send data and innovation in their activities. From using ICT for races, registration, and mechanizing all the public authority workplaces to computerized storage spaces e-Transportation, e-Health, e-Education, and e-Taxation, the new India has cleared its direction in the domain of e-Governance. The public authority is working with partners to construct India on this progressive dynamism to extend, augment, and scale up its computerized economy before long, making enormous economic worth and engaging many individuals across varying backgrounds.

Various plans presented by the public authority like Jan Dhan Yojana to give financial incorporation to unbanked individuals have empowered banking, benefits (PMSBY and PMJJBY), and protection (Atal Pension Yojana) administrations to ordinary residents, accordingly, carefully engaging the residents.

2.9.2 E-Governance in Various Fields

The framework brings together administration of things, for example, ongoing security and traffic camera film, ambulances' GPS data, temperature, humidity level, water levels, smart foundation, and horticulture sensors, and air contamination information in every territory around the state, and afterward imagines the information, which is then utilized in risk scanning. For instance, when a typhoon hits, the water levels of a stream can be evaluated, and prompt directions to clear can be given to those in danger utilizing the prediction ability.

Further, as the set of experiences develops, it offers input for the following time when the examination is directed. Catastrophe reaction precision has improved decisively and routinely depended exclusively upon human experience. The framework can likewise be utilized to increment farming efficiency by introducing and halfway overseeing water level sensors in water system trenches to handle the dry season or flood harm and to forestall harm to agricultural fields and crops. Moreover, soil, climate, and water system conditions can be applied to the calculation, making it conceivable to decide the ideal yield for each plot of land and increment the reap.

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2.9.3 Financial Tool

With private and public-area activity advancing computerized use, financial innovation advancement has developed quickly. India's widespread banks have likewise determined massive advanced development across economic administrations. Their controller, the Reserve Bank of India, illustrates potential strides for the reception of blockchain innovations in the financial area.

To screen the dangers and security episodes overwhelmingly, the organization incorporated Identity Access Management (IDAM) and SIEM (Security Incident and Event Management Solution) into the digital structure. Thus, it contributes carefully to safeguarding the primary financial data in the developing computerized network situation, guaranteeing a large number of residents in distant areas across India, admittance to very protected and dependable computerized financial offices, and giving a powerful channel to constant financial exchanges.

With the initialization of the government's E-Governance methodology, it has been in excellent sync with the public authority's drives to remain open to different potential outcomes and a large-scale point of view. The result is another degree of e-Governance, centered on expanding financial development and working on the existence of the residents.

Hence, we can bring up that e-administration is a vital component of Good Governance for agricultural countries like India to decrease corruption and give compelling and productive or perhaps quality administrations to the residents of theirs. Adjustments to government processes, for example, by regular decentralization to upgrade adequacy and productivity and save costs. E-governance is, as of now, not a trial in regulatory change but a super durable piece of the overseeing system.

E-governance permits continuous cooperation in the majority rule and legislative cycles. It ensures much better arrangement results, better quality administration, and higher commitment to residents. These might be internet providers and data that improve popularity based on support, straightforwardness, responsibility, quality, and speed of administration.

2.10 SUMMARY

Information Technology assumes an undeniably significant part in citizens' work and individual existences. PCs, communication, computerized data, and programming — the constituents of the data age — are all over the place. However, along with this, there is a need to understand the IT sector's working and growth. Information technology (IT) has great potential as a means of accelerating economic growth, increasing productivity in all sectors of the economy, and effective governance. The application of IT is beneficial and profitable to organizations in the respective E-commerce and E-governance fields. The latest innovations have helped the nation build a robust infrastructure and economy. Thus, creating more opportunities for the youth for the betterment of the country on the digital path.

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2.11 ANSWERS TO IN-TEXT QUESTIONS

1. 46th
2. All are true
3. Information Technology enabled Services
4. Internet
5. Virtual Reality
6. Electronic Commerce
7. B2C
8. B2C
9. All of the above
10. G2E G2G G2P G2R
11. 2012
12. Transforming e-Governance for Transforming Governance

2.12 SELF-ASSESSMENT QUESTIONS

1. State the applications of information technology.
2. What is Virtual reality? Outline the benefits.
3. Describe the benefit of E-commerce to society.
4. Discuss in detail the types of issues to be considered in E-commerce.
5. Explain the B2B business model with the help of suitable examples.
6. Explain the four models of e-governance.
7. Describe smart governance in the context of e-governance.
8. Discuss in detail the types of information technology we use as a student use on a daily basis. What would have been different if this technology was not present in our life?

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LESSON 3

MODES OF DATA PROCESSING

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STRUCTURE

3.1. Learning Objectives
3.2. Introduction
3.3. Computer System Software
3.4. Software Development Life Cycle (SDLC)
    3.4.1. What is SDLC?
    3.4.2. Why use SDLC?
    3.4.3. Stages of SDLC
3.5. Software Development Process
    3.5.1. What is SDP?
    3.5.2. Types of Models
        3.5.2.1. Waterfall Model
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3.1. LEARNING OBJECTIVES

We will be able to respond to queries concerning where, when, and how data is stored and used by the end of this course. Following are some pointers that we can locate in this unit:

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- Data File Organizations
- Relevance of Database
- Master and Transaction Files
- Use of Data Files in Programming
- Input-Process-Output Analysis
- Management of Data Processing Systems in Organizations.

3.2. INTRODUCTION

'Data' has been a buzzword for a very long. Every type of information that we access is a class of data. Data has always been in close association with electronic devices. Accordingly, there is a need to store and code this data as a concept in devices in an optimized form for better usage of this relevant information. At the same time, when we are talking about storing this data, it is vital to learn about how this data storage is used in computing environments and problem-solving. Seamlessly managing data has resulted in modern-day fields like Data Science, Machine learning, and development, with a joint base concept of 'Data.'

3.3. COMPUTER SYSTEM SOFTWARE

Let us break down the heading into two parts, i.e., System software and Application software.

System software is a set of programs, data, or instructions to perform a well-defined function. A program is a set of instructions written to solve a particular problem.

When these programs are designed to perform functions on a computer system, they are categorized as Computer System Software. System software is a collection of programs defined to operate, control, and optimize the processing potential of the computer system.

System software manages the computing and works closely with the hardware. These are generally written in low-level languages that are easy for the hardware to understand.

Example: Operating Systems - A very prominent system software used in every type of computer. Windows, Android, Linux, and macOS are some popular system software that everybody comes across whenever they use some computing device.

The OS is subject to handling computer software and hardware resources. It can be said that the OS acts as a platform between the hardware and the application software that needs to use computer resources.

All these functions correspond to control of the computer system and hardware environment.

To understand the features that system software should hold, let us consider OS as our basis:

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1. High Speed
2. Secure
3. Written in Low-level language
4. Close to the system hardware
5. Versatile in handling the processes

After evaluating all these points, it can be said that a system software maintains primary system resources and processes. It must meet specific hardware needs and interactions. It also acts as an abstraction as it works in the background, and users usually do not access it directly. It is essential for the system to have the software that administers it to run the application programs in a computing environment.

Computer programs known as "application software" carry out particular tasks. Application software can carry out a variety of tasks, including personal, professional, and academic ones. Application software is frequently referred to as productivity software or end-user software. Each piece of software is designed to help users with specific productivity, efficiency, or communication process. In contrast to System software, application software is focused on its functionality and completes the goal for which it was created. On our smartphones, the vast majority of the apps we use are examples of application software.

Example: Microsoft products such as Office, PowerPoint, etc., music application software, etc.

IN-TEXT QUESTIONS

1. The software which performs a specific task is known as _____.
2. Word processing software is an example of application software. True / False.

3.4. SOFTWARE DEVELOPMENT LIFE CYCLE (SDLC)

Software development is expanding, and so is the need to deliver high-quality software faster. This has put software development teams under constant strain to produce high-quality software that meets customer expectations, finishes within time, and is feasible economically and technically.

3.4.1 What is SDLC?

It is essential to understand that when we work to build a product or software, it is essential to go through a series of familiar stages—a road map or flow that helps us create a timely and generate high-quality result. This flow we follow is called the "Software Development Life Cycle."

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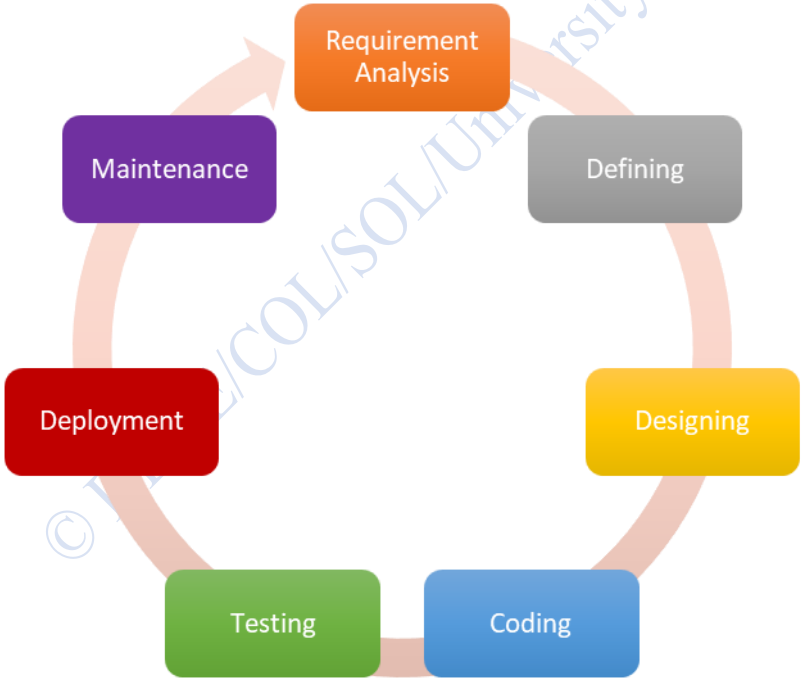
Accordingly, Software organizations follow a methodology that boosts the overall development process with an intent to describe a software's communication, development, testing, deployment, and maintenance.

3.4.2 Why use SDLC?

- It supports effective planning prior to the actual development to avoid software crises in the future. This is due to the fact that they adhere to a well-organized approach that enables them to test the software before it is released.
- It helps in regulating costs required for the development. Proper reasoning and studies can predict the cost risks allowing stakeholders to look after costly mistakes.
- It provides methods to assess the effectiveness of the software as each iteration produces a software increment that provides investors with a subclass of overall software features and functionality to keep track of time and quality.

3.4.3 Stages of SDLC



Stage 1: Requirement analysis

Requirement Analysis is the most crucial and necessary stage in SDLC. All the project stakeholders communicate quality assurance requirements that cater to the users' needs. The phase also analyzes the risks and costs that may occur during the life cycle.

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The project managers and analysts set up meetings with the other stakeholders to discuss the scope and intended audience and perform a rough feasibility analysis followed by probing the customer, the users, and others what the requirements for the system or product are, what is to be achieved, how the system or product fits into business proving a core understanding of what is to be built.

In case of any ambiguity, elaboration, negotiation, specification, and validation is performed by executing follow-up meetings.

Stage 2: Defining Requirements

All the conclusions from the requirement analysis are then drawn into the SRS (Software Requirement Specification) document, which is thoroughly followed and reviewed by the stakeholders. This further defines all types of requirements, i.e., functional, non-functional, hardware, etc., and gets them authorized by the stakeholders.

The SRS document defines the whole project and serves as a basis for ensuring all the teams are synced, and the process model is followed.

Stage 3: Designing

Now that all the requirements are defined, the designing of the product starts by understanding the software project's requirements.

The project is modulated and designed to provide the developers with a line on which they have to build the project. This provides a blueprint to the developers in the form of Data Flow Diagrams and UML diagrams such as use cases, state diagrams, class diagrams, etc.

Stage 4: Development

The development really starts to take off at this point. The blueprint provided by the design phase is trailed while writing the code. Various IDEs, compilers, debuggers, and development tools and languages are used at this stage to implement the project as per the requirements and constraints.

All this gives a working product as an output, but there is still a lot to do with it in order to enhance its quality and effectiveness.

Stage 5: Testing

After all the code is generated, it is tested or validated against the requirements to ensure that the code is developed per the requirements and constraints.

The testing strategies are as follows:

1. Black Box Testing
2. White Box Testing

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All this is carried out by unit testing, integration testing, system testing, and acceptance testing.

Stage 6: Deployment

The product is created, tested, and ready to be presented to the user at this stage. Hence, it needs to be hosted for the users to use it. All the authorizations and reviews are performed with all the stakeholders, and based on the assessment; the product version is released.

Once the deployment is done, feedback/suggestions may be given by the users or stakeholders to improve the quality of the product. All these suggestions are taken care of in the next phase.

Stage 7: Maintenance

The issues or suggestions collected once the deployment is done solved at this stage. The real-time issues are solved, thus, maintaining the working and the quality of the product throughout its life.

IN-TEXT QUESTIONS

3. Find the incorrect phase of SDLC (Software Development Life cycle).
   a) Requirement Gathering
   b) System Analysis
   c) Software Design
   d) All of the above
4. The first stage in SDLC framework is _____.
5. SDLC stands for _____.
6. Find the incorrect testing technique.
   a) Collaboration testing
   b) Integration testing
   c) System testing
   d) Unit testing

3.5. SOFTWARE DEVELOPMENT PROCESS

3.5.1 What is SDP?

The software development process divides the software development into small, sequential steps to reinforce the product, project, and style altogether. The term "Software Development

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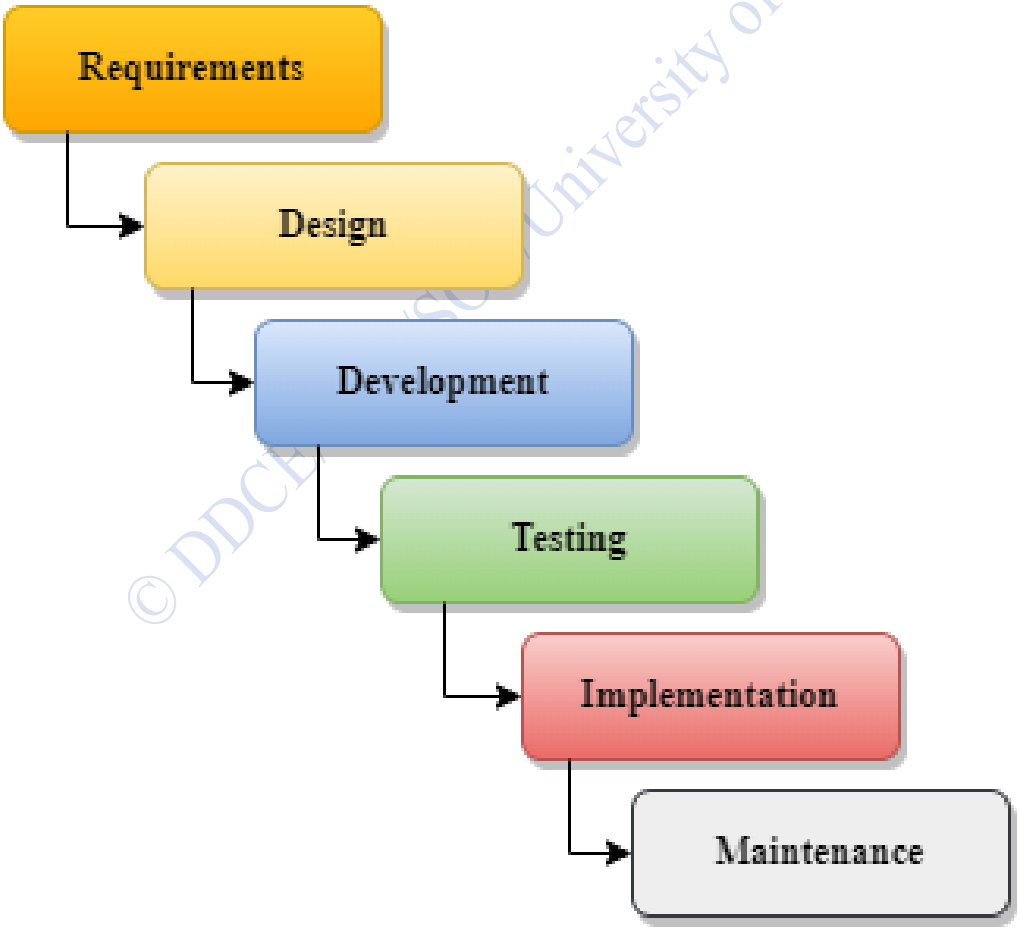
Process" refers to the iterative, logical procedure used to create software programs that meet the needs of any corporate or personal goal.

3.5.2 Types of Models

In the software development phase, various software development life cycle models are specified and designed. "Software Development Process Models" is another name for these models. To ensure success in the software development step, each process model adheres to a set of steps that are specific to its type.

3.5.2.1 Waterfall Model

The software development process divides the software development into tiny, sequential steps to reinforce the product, project, and style altogether. The software development process is an iterative, logical method for creating computer programs that meet the needs of any business or personal goal.



Waterfall Schematic Diagram

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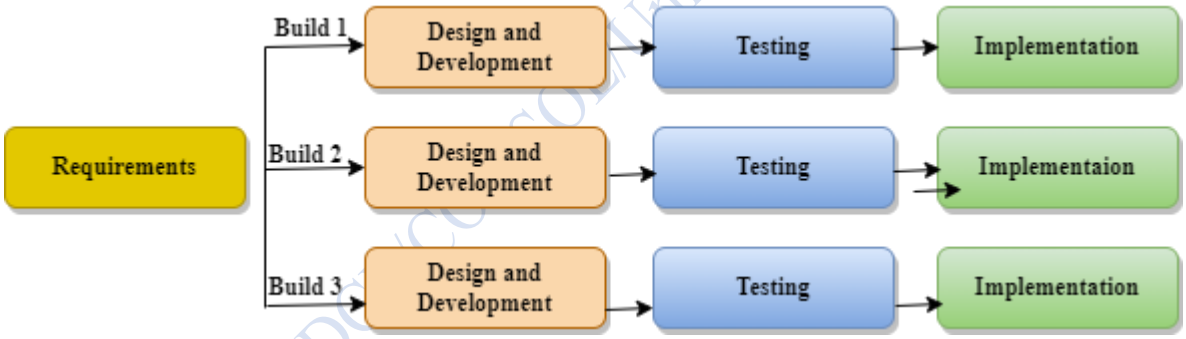
Advantages of waterfall model:

- This model is simple and easy to use and understand.
- It is easy to manage due to the rigidness of the model – each phase has specific deliverables and a review process.
- Clearly defined stages.
- Well-understood milestones.

3.5.2.2 Iterative Model

Here Iterative development software changes after every iteration to evolve and grow. Since each iteration is based on the previous one, the software design remains consistent. As software is delivered in fragments, there is no need for a comprehensive specification from the project's initiation, and minor changes to requirements are possible during the development process. Major requirements, especially those for system architecture in the event of incremental development since further integrating the created software components can become a problem, cannot be changed after they are established.



Iterative Schematic Diagram

Advantages of Iterative Model:

- Less expensive to alter or repair the scope and requirements.
- Produces working software swiftly during the software life cycle.

3.5.2.3 Incremental Model

The incremental model is a process of software development where requirements are fragmented into multiple standalone modules of the software development cycle. Every version of the system adds functionality to the preceding release as each iteration progresses through the processes of requirements, design, coding, and testing. This process continues until all intended functionality has been realized.

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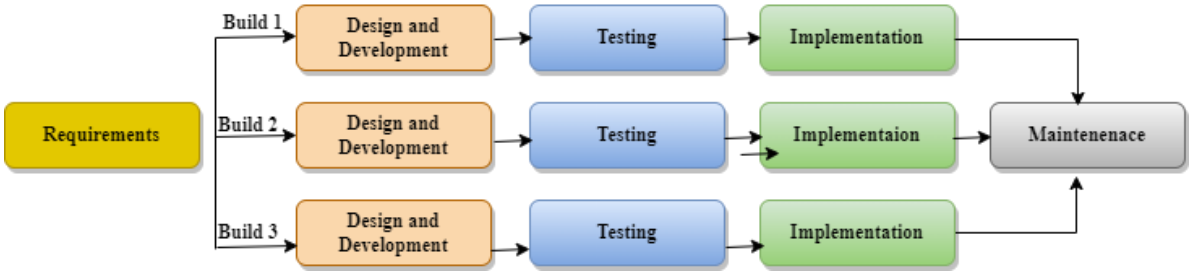

Incremental Model Schematic Diagram

Advantages of Incremental model:

- It is easier to debug and test during a small size iteration.
- Here users can respond to each build.
- Decreases initial delivery cost.

AGILE MODEL

The agile software development life cycle (SDLC) model combines iterative and incremental process models with a focus on process adaptability and customer satisfaction through quick delivery of functional software. The product is divided into smaller incremental builds using agile methods. Iterations of these builds are supplied. Usually, an iteration lasts between one and three weeks.

Cross-functional teams work simultaneously on several different topics during each iteration, including:

- **Planning**
- **Requirements Analysis**
- **Design**
- **Coding**
- **Unit Testing**
- **Acceptance Testing**

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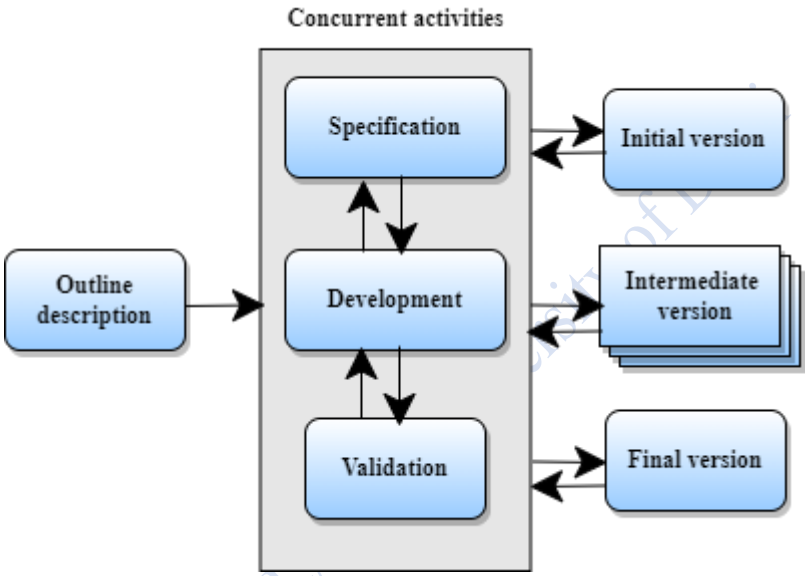
3.5.2.4 Evolutionary Model

Within the evolutionary model, all the work is completed during the development phase. During this model, all work is divided into small chunks or modules. For instance, the Waterfall Model, during which all the users can access the product at the end of each cycle. This model may be a combination of incremental and Iterative models. The drawback of all models is that it takes a very long time from the start of the project to offer a solution. The evolutionary model finds a different solution to this issue.



Evolutionary Model Schematic Diagram

Advantages of Evolutionary Model:

- The process of determining how likely a risk will occur in a project is called risk analysis. It examines the ambiguity of prospective risks and how, if they materialised, they might affect the project's schedule, quality, and costs. It is easier to analyse risk in this model.
- It supports changing environment.
- Better suited for large mission-critical projects.
- The software is produced swiftly during the life cycle, facilitating customer evaluation and feedback.

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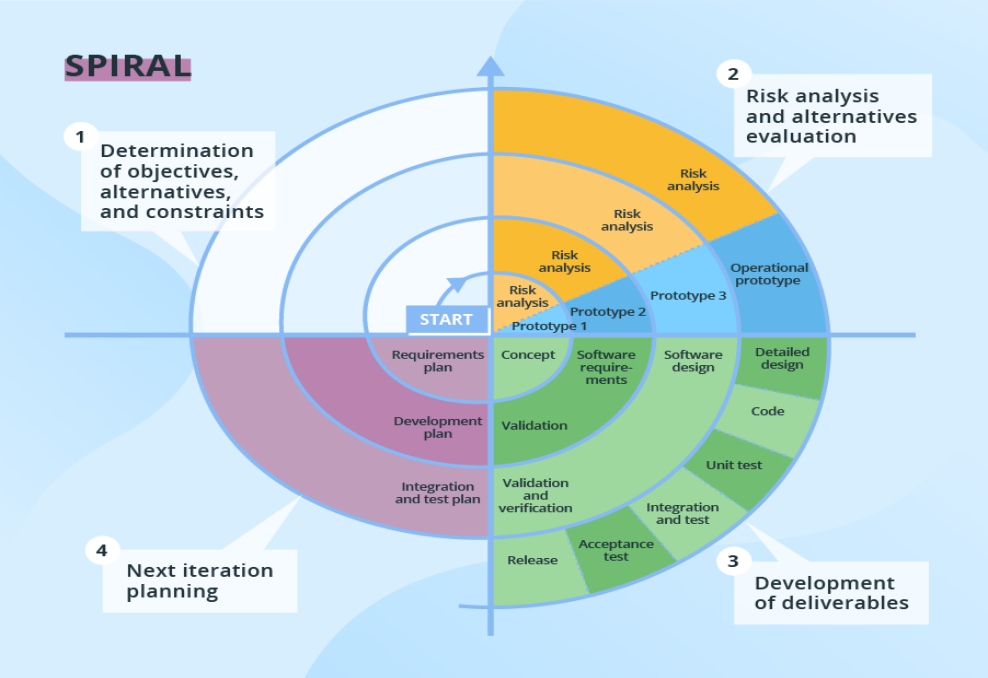
3.5.2.5 Spiral Model

The Spiral model provides insight into complete risk analysis. Therefore, if we want to benefit entirely from the approach, we must work with individuals with solid risk analysis experience. A particular Spiral iteration lasts about six months and starts with four essential activities - thorough planning, risk analysis, prototype creation, and evaluation of the previously delivered part. Spiral cycles that are repeated significantly lengthen project timelines.



Spiral Model Schematic Diagram

Advantages of Spiral model:

- With a more significant amount of risk analysis; hence, Prevention of Risk is enhanced.
- Suitable for large and mission-critical projects.
- Strong approval and documentation control.
- Additional functionality can be added later on.

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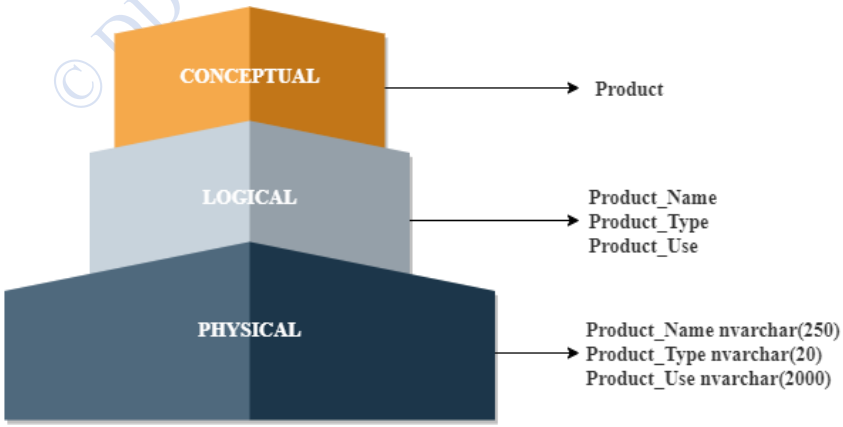
IN-TEXT QUESTIONS

7. What is the Spiral Model's biggest flaw?
a) Higher amount of risk analysis
b) Additional functionalities are added later on
c) Strong approval and documentation control
d) Does not work well for smaller projects
8. The incremental model is the combination of which models?
a) Build & FIX Model & waterfall model
b) Linear model & waterfall model
c) Linear model & Prototyping model
d) both a & b

3.6. DATA DESIGN

Consider a situation where we need to locate a particular data file among many data files. Evidently, it is a rigorous process since we have to check every data file. However, what if we design a structure to arrange the data in a specific pattern? It will not only save us time but will lead to an efficient mechanism. That is what data designing is about.

To sum up, data designing demonstrates the types of data stored in the system and how we can group the related data together in a well-organized manner to create a robust design. It helps to design the databases on a physical and logical level. Producing an entity relationship diagram (ERD) helps to visualize the mechanism.



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3.6.1 Levels in Data Design

This architecture has three levels: the physical level, logical level, and conceptual level.

- **Conceptual Level**

  A conceptual model should be focused on things related to the business and its requirements. This explains what the system contains. The purpose is to define and organize business rules and concepts and therefore is created by business stakeholders. Entities and relationships modeled in such ERD are evidently around the business's needs. It is the simplest among all.

- **Logical Level**

  The logical model defines how the system should be implemented. It should be focused on the design of data about those things without reference to a particular physical implementation. It is created by data architects, and the purpose is to develop data structures. It typically refers to implementation details like relational, Hierarchical, Key-Value, Object-Oriented, and Graph.

- **Physical Level**

  A physical model describes how data is stored, like data formats, indexes, data partition, distribution, etc. It represents the actual design blueprint of a relational database and how data should be structured. The goal is actually to implement the database. It explains the relation in a specific DBMS, so it is vital to consider the convention and restrictions of the DBMS we use when designing a physical ERD. This means that proper use of data type is needed for entity columns, and the occurrence of reserved words should be inhibited in naming entities and columns. It is created by DBA and developers, so they may also add primary keys, foreign keys, and constraints to the design.

3.7. REPORT DESIGN

The report is the document that explains the process, outcome, and all the work we have done to accomplish the final design.

Now, we might have gathered all the relevant information, but there is no certainty that it will be engaging. Some might find it verbose; we have to design the report in such a way that it highlights and reflects what we want to convey to the users/readers. In order to accomplish that, report designing comes into play. Today, we have many tools to design our report. We can get ready-made templates, and even one can add their specific type of requirements and designs.

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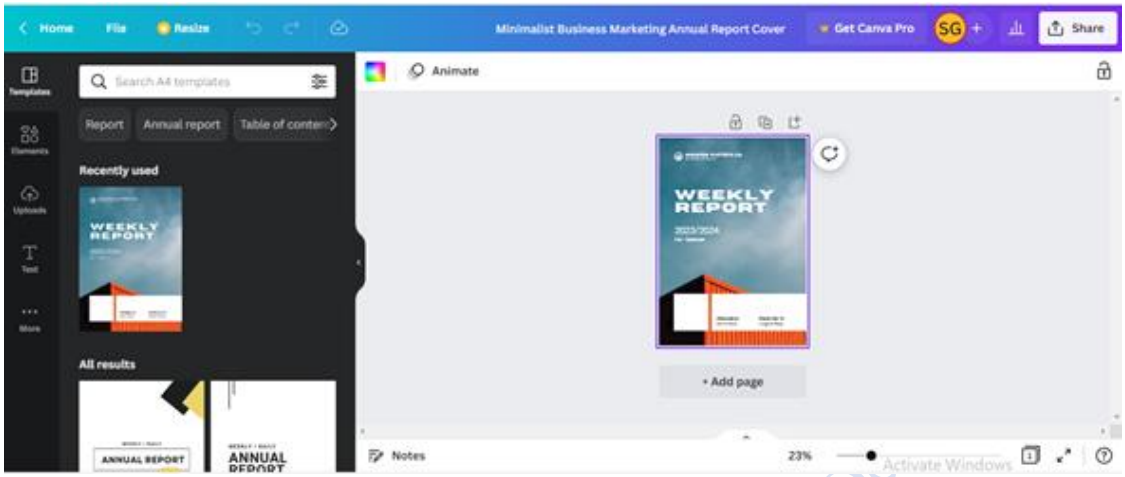

One has to also look into report styling. It includes some features like:

- Report layouts to make it presentable
- Charts, maps, and other data-bound items to make it engaging.
- Various styling capabilities like conditional formatting etc.

Thus, the reports can be styled and exported in any format.

3.8. ORGANISATION OF DATA FILES

A file is a named structure that holds related data and can be stored on various secondary storage devices. Since the data can be organized in different ways, there are various organization types available for files.

Some File Organizations:

1. Sequential File Organization
2. Random File Organization
3. Indexed-sequential File Organization
4. Serial File Organization

3.8.1 Sequential File Organization

F1	F4	……..	F5	F6

Starting of the file

End of the file

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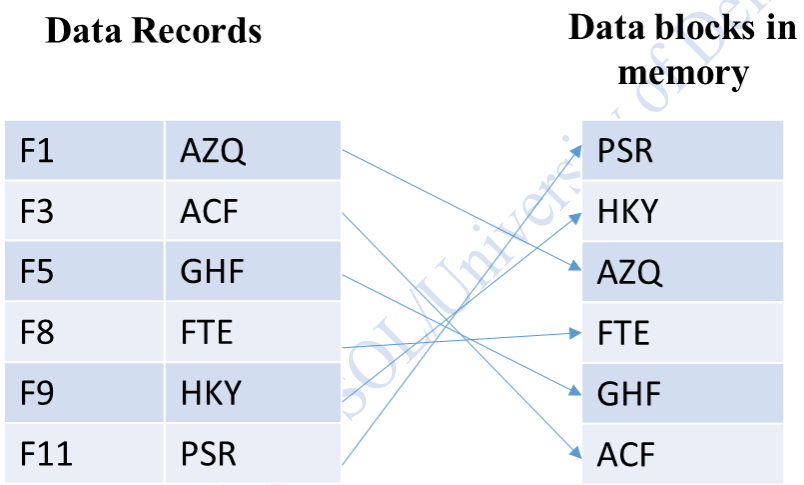
This is the simplest way of storing data where records are kept in a particular sequential sorted order. Sorted records make it easy for the operator to search a record in the file by applying algorithms like binary search. Nevertheless, there is a catch; all records cannot be of the same size; therefore, it is difficult to inculcate this organizational approach.

3.8.2 Random File Organization

The organization approach allows us to store the records randomly but provides direct access. For direct access records, keys are used to find the records associated with them. Example: Magnetic and optical disks follow this technique of organizing files. This has an advantage over the sequential organization as the records can be of different sizes.

3.8.3 Indexed-Sequential File Organization



An index is used to help the computer find specific records on the storage media, almost identical to the sequential method. For instance, records are sequentially stored on the tracks of a magnetic drum. Each record is given a unique index, which can be used to access it directly.

3.8.4 Serial File Organization

The term "heap file" also refers to serial file organization. This procedure adds records to the data blocks at the end of the file. The sorting of data is not necessary. This strategy is appropriate when a large volume of data must be loaded into an organization.

Data access takes longer than using a sorted file approach.

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IN-TEXT QUESTIONS

9. The data file contains _____.
10. _____ is the process of arranging your files into blocks and placing those blocks on a storage media.
11. What does sequential file organization entail?

a) Any record can be placed wherever there is a space for the record
b) Records are stored in sequential order according to a search key
c) A hash function is computed on some attribute, and that decides the block
d) None of the mentioned

3.9. MASTER AND TRANSACTIONAL FILES

Various file types are used to store data needed for processing, reference, or backup. The most prevalent categories of processing files are Master files, Transaction files, Reference files, Backup files, Report files, and Sort files.

3.9.1 Master File

As the name suggests, ' master' serves as an authoritative data source. It is the main file pertaining to relatively permanent records about specific items or entries. Output and input (parameter files) files are specified in the master file. Such files include information that is continuously updated by recent transactions. It can be further subdivided into static and dynamic master files. Examples include customer ledgers like a customer file will contain details of a customer such as a customer ID, name, and contact address.

3.9.2 Transaction File

A transaction file is used to hold data during transaction processing. The data relating to business events are recorded. The file is later used to update the master file and audit trails. For example, daily sales are recorded in a busy supermarket on a transaction file and later used to update the stock file. The management also uses the file to check on daily or periodic transactions.

Assume we have both a master data set and a transaction data set with the variables ID, DEPT, and SALARY. The data sets' contents are as follows:

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DATASET MASTER

ID	DEPT	SALARY
1	MARKETING	12,000
2	SALES	9,000
3	RECORDS	14,000
4		11,000

DATASET TRANS

ID	DEPT	SALARY
2		15,000
4	PEOPLE	

To update the records, apply the transaction data set to the master data set. The new master file obtained is:

DATASET NEWMASTER

ID	DEPT	SALARY
1	MARKETING	12,000
2	SALES	15,000
3	RECORDS	14,000
4	PEOPLE	11,000

Because these IDs 1 and 3 are absent from the TRANS data set, observations 1 and 3 in the original MASTER data set are unaffected. In observation 2, the MASTER data set's ($9,000) corresponding value for SALARY was replaced by the TRANS data set's value of $15,000.

However, the DEPT value in observation 2 of the TRANS data set did not take the place of the DEPT value in the MASTER data set since it was absent. The new observation will be included in the new master data set if the transaction data set contains a value of the BY variable (ID) that is absent from the master data set.

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3.9.3 Purpose of Master and Transaction files

The precise details of customers, suppliers, and employees, as well as records of recurrent occurrences relevant to each, are often found in company databases, which can hold exceptionally enormous volumes of information. These databases frequently consist of separate master and transaction files. The master file includes information that is unique to an individual or corporation, such as names, company contacts, addresses, email lists, and particular products or services. The transaction file includes facts about employee leave, disciplinary actions, career advancement reports, sales or buy transactions, calendar events, or employee details.

These blocks of transaction data include a key entry which is a piece of information common to both master and transaction files. This may be an account number, a contact name, an employee identification number, or financial details such as purchase orders or invoice numbers. The key entry is a unique identifier that the database uses to tie the transaction entries to their corresponding master file records. Any query or search for a particular master file transaction will then isolate either the entire group of entries for that record or any one specific entry, depending on how specific the key is.

Basically, transaction files are used to update master files; they are often linked together.

Maintaining separate master and transaction file records allows the master file to be kept at a manageable size and dedicated to entity-specific entries only. In applications in which users store transaction records off-site or on archive servers, separating them from the master file also makes archiving a lot easier. Keeping a dedicated transaction file also makes for easy and effective auditing. This file may also serve as a diagnostic or planning aid with many databases featuring extensive reporting functions based on its contents. This type of split file arrangement is often known as a referential file system because the master file "refers" to the transaction file for specific event details.

3.10. RELEVANCE OF DATABASE

Databases and database systems have become essential components of everyday life in modern society. Within the course of a day, most folks encounter several activities that involve some interaction with a database, when we visit the bank to make deposits or withdrawals, when we book a hotel or flight, when we use a computerized library catalog to look up a bibliographic item, or when we order a magazine subscription from a publisher, the likelihood that someone will access a database as part of our activities increases.

The above interactions are samples of what we may call traditional database applications, where most of the knowledge that is stored and accessed is either textual or numeric. Within the past few years, advances in technology are leading to exciting new applications of database systems. Multimedia-based databases can now store pictures, video clips, and sound

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content. Geographic information systems (GIS) based databases can store and analyze maps, weather data, and satellite images.

Data warehouses and online analytical processing (OLAP) systems are utilized in many companies to extract and analyze useful information from vast databases for decision-making. Real-time and active database technology is employed in controlling industrial and manufacturing processes. Database search techniques are being applied to the planet wide web to improve the search for information needed by users browsing the Internet. Some common examples are given below:

i. Reservation System

We all know how to book tickets in places like- movie theatres, train tickets, airline tickets, etc. While booking, we must supply our details so that a particular seat is reserved with us. So here also, these reservation systems are using the database and management system for achieving this. The info stores are like – customer name, train number, price, date, etc. Moreover, these details are required to spot the correct person during the trip.

ii. Telephone Companies

Without databases and management systems, telephone businesses cannot simply survive. We can also ask how these mobile operator businesses maintain track of the daily data limit, as well as the calls we make, given that every mobile phone includes a sim card for calling and internet access. For keeping our data, they are utilizing databases and database management systems. They save the data and produce cell bills based on our usage. DBMSs are used by more than just Internet service providers, mobile carriers, etc.

In conclusion, databases and database technology have a significant impact on how computers are being used more and more. In the majority of applications where computers are employed, it is reasonable to assume that databases play a crucial role.

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IN-TEXT QUESTIONS

12. OLAP stands for _____.
13. Which of the following helps people keep track of things?
    a) database
    b) table
    c) instance
    d) relationship

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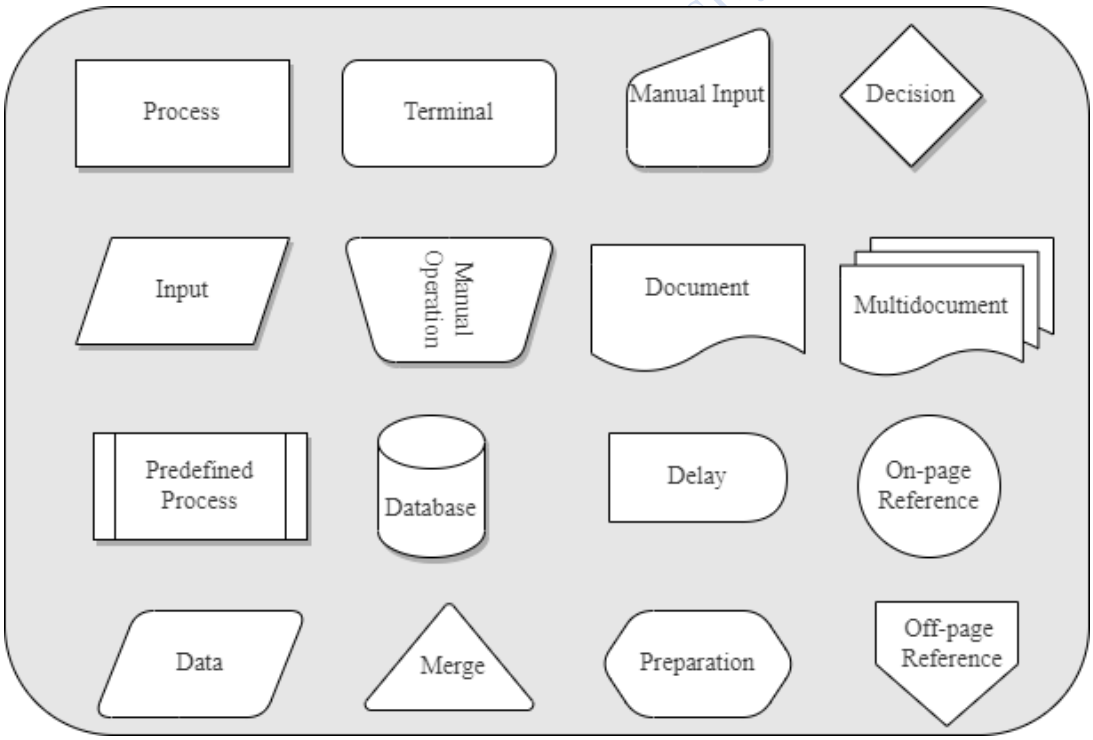
3.11. FLOW CHART

Diagrams and charts are always descriptive and captivating when it comes to solving a problem. One such interesting diagrammatic representation technique is flowcharting. The technique can be used to visualize a direction in which a process heads to produce a solution to the problem.

When it comes to programming, flowcharting is frequently used to depict how an algorithm operates. Along with providing direction, the technique also gives us insights into how the process is broken down into stages to land at the final solution.

One attractive aspect of flowcharting is that each step is independent of implementation at any stage and is only concerned about the input and output of a particular stage rather than the actual processing to be done. Additionally, this approach of flowcharting a problem categorizes types of tasks such as data, decision, process, etc.

To diagrammatically represent these categories, there are symbols that signify each category:



Now that we are aware of how flowcharting acts as a utility, we can dive deep into how the follow-up that it suggests

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i. Establish the task

Starting with the task that has to be completed, the first stage in using a problem-solving strategy is to establish and define it. Once the problem is defined, a possible solution can be thought of, followed by answering the questions such as "what is the step to be done prior to this?" or "what should be done next?" these types of questions give out the chronological structure of the way to be followed to pull off the result.

ii. Depict the Chart

Once all the questions are answered about heading in a problem-solving line, the illustration is done. Wherein the tasks are drawn as per their categories using the symbols mentioned above. The tasks are sequential in nature, as in, what happens next? All these tasks are connected with arrows according to the flow of the solution proposed.

iii. Check the Process

This step is all about re-checking what has been done in the previous two stages. Double checking the flow chart from start to end cuts the possibility of leaving out some tasks in the flow or can identify a wrong flow when it comes to decision-making or the sequence that it is expected to follow.

iv. Optimize the Chart

Solution approaches to some problems might get complex very often. Therefore, optimizing a chart can simplify the view and can provide a better and clear-cut picture. Redundant and unnecessary tasks can be removed, including performance-enhancing optimizations, until we get an efficient diagrammatic representation of the solution.

Performing all these steps can get overwhelming when the problems are complex and demanding when it comes to the number of tasks to be performed. There are several tools, such as draw.io, creately, and many others, that make this simple and offer free services to execute such flowcharting.

Given below is an example that shows how flowchart can be used in showing a simple summation process.

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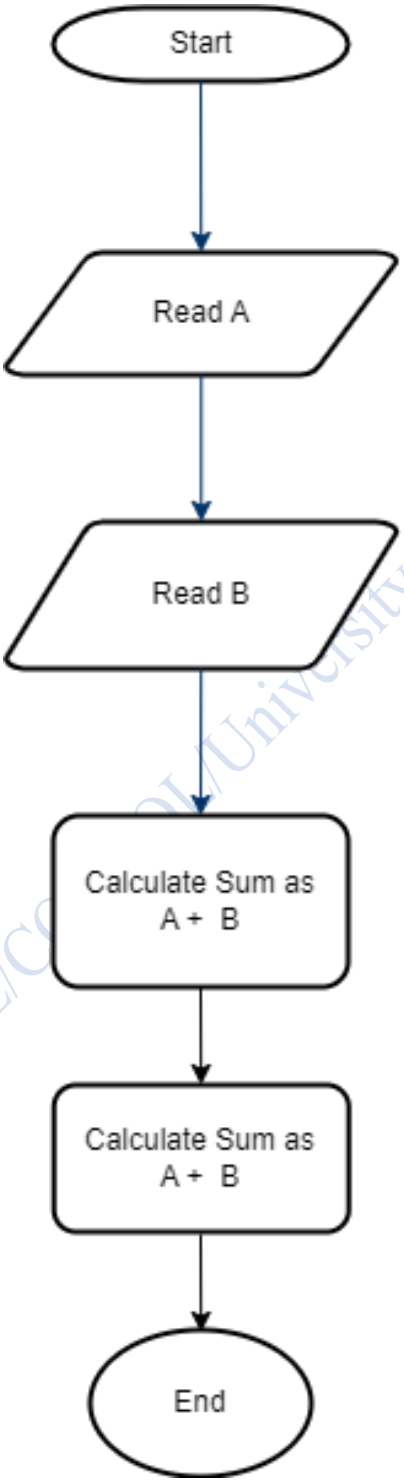

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IN-TEXT QUESTIONS

14. A box that can be used to symbolize two different situations.
    a) Rectangle
    b) Diamond
    c) Circle
    d) Parallelogram
15. Drawing a flowchart for an algorithm is referred to as…….

3.12. INPUT-PROCESS-OUTPUT ANALYSIS

A computer is an electronic device that accepts data, processes data, generates output, and stores data. Input-process-output (IPO) is another name for the idea of creating output information from input data.

The input-process-output concept of the computer can be interpreted as follows—

- **Input**

  The computer accepts data as input from the user with the help of an input device. The input data can be anything, including characters, words, text, sound, images, etc.

- **Process**

  The computer processes the input data. It performs some operations on the data by using the instructions or program given by the user of the data. The action could be arithmetic or logical processing, editing, modifying a document, etc. During processing, the data, instructions, and output are stored for some time in the computer's main memory.

- **Output**

  The outcome of data processing is known as the output. Text, sound, images, and other types of output are all possible. The output from the computer can be played, sent to a printer for printing, displayed on a monitor, etc.

- **Storage**

  Secondary storage devices like discs or tapes permanently retain the input data, instructions, and output. Anytime later, as needed, the stored data may be retrieved.

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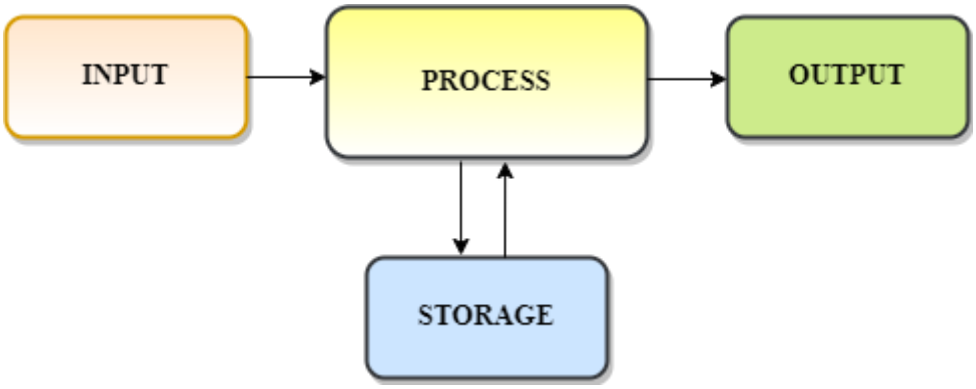

The Input-Process-Output Concept

3.13. REPORT GENERATION

Reports must be accurate, timely, and pertinent. To accomplish these three aims, report generation is required, and the effectiveness of the generation program directly affects our ability to accomplish the three targets. Then, either Excel or Python makes it challenging to generate reports. This section will walk us through everything we need to know about report generation, including its definition, features, and software list.

3.13.1 What is Report Generation?

The practice of employing a program to generate reports, mainly for business users, is known as report generation. We must develop a report definition that specifies the data to be retrieved, where to find it, and how to show it before we can generate a report.

For a very long time, Excel has been used to create reports. However, many individuals have criticized how difficult and painful it is to create reports using Excel, particularly when we need to do so frequently for regular reports like daily, weekly, and monthly reports.

3.13.2 Features of the report generator

Compared to Excel, the report generation software makes the process of creating reports more effortless and more professional, from data entry to data display. There is less need for us to write code, for instance, to extract data from databases as we would with a SQL database. With a few clicks, even non-technical individuals may get data.

YoY and MoM calculations are included in the software as well, saving the time it would take to enter them in Excel manually.

Every stage of the report generating process is more user-friendly with the report generator. Let us examine the attributes of the report generator in greater detail. Using FineReport as an example, we can see how we increased our productivity at work by 100%.

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- **Feature 1: Support extracting data from multiple data sources**

  Report generators allow users to aggregate and extract data from numerous data sources.

- **Feature 2: Works with real-time work**

  The daily, monthly, quarterly, and annual reports can be generated automatically and sent to the specified email address after the templates and frequency are set up.

- **Feature 3: Support reusing templates**

  Users can reuse completed report templates to create new reports. Numerous beautiful built-in templates cover a range of situations and businesses.

- **Feature 4: Support reports exporting and printing**

  Reports can be exported or printed to Excel, PDF, CSV, or pictures by users.

- **Feature 5: Support view reports on the web or on mobile applications**

  Users can access reports on mobile devices at any time and from any location, thanks to the current report generator.

3.13.3 Report Generation Process with Report Generators

There are two different report generation processes available when using the report generators. The full-automatic generation is one, and the semi-automatic generation is the other.

3.13.3.1.2 Full-Automatic Generation– Based on the template

Consider the most popular financial data, such as MoM and YoY Ranking, as an example. Financial statistics templates have been constructed inside report generators like FineReport, from indicators to formulas, from titles to formats. When using the fully automated generation, all one has to do is log in to their database and drag the appropriate cell.

3.13.3.1.3 Semi-Automatic Generation– Use Professional Functions to Generate Each Module Automatically

Semi-automatic report generation is more prevalent and better able to cater to the unique needs of customers than full-automatic report generation.

A whole report design process may typically be broken down into the following three steps:

1. Open designers, configure data sources, create new reports, and configure private data sources as part of connecting to databases.
2. Create new reports, define data sources, bind data columns, summarise, and format reports as part of the report design process.

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3. Report previewing, saving, and publishing are all included in the phrase "publish and browse reports."

The process of retrieving the data from the database, structuring it, and exporting it as reports is referred to as report production. It offers illuminating insights and reassuring references to decision-makers.

A skilled report generator can be a valuable ally in business at every stage of reporting. It is best to conduct a thorough study on each feature of report generation software before selecting the best option for business. A functionally unrestricted free version of FineReport is available for personal use.

3.13.4 Popular Report Generators (Report Generation Software)

There is a rising need for reporting tools that are entirely written in Java as the B/S structure is used more frequently. There are canvas-like generators and Excel-like generators from the standpoint of the interface. These two interface paradigms are sometimes combined by software.

The top three report generators in the company are as follows:

- Fine Report
- Crystal report
- SQL server reporting system

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IN-TEXT QUESTIONS

16. A report generator is utilized to
    a) print files on paper
    b) data entry
    c) update files
    d) All the above
17. When a query runs or the report is processed, reports use _____ to retrieve data for a report.
    a) Data connections
    b) Data source definition
    c) Connection string
    d) All of the mentioned

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3.14 PROGRAMMING CONCEPTS

Programming is the process of first solving a problem and then writing the code. One needs to figure it out to solve a problem by keeping fundamental programming concepts in mind.

This piece talks about two major programming approaches, i.e., procedural programming and object-oriented programming, as well as other supporting concepts to support these approaches, namely variable declaration, basic syntax, data types and structures, flow control, and debugging.

3.14.1 Procedural Programming

A programming style that uses a linear or top-down approach. It relies on procedures or subroutines to perform certain functions or tasks. Programs written using this approach comprise a sequential pattern of instructions to be executed to get the desired results.

The procedures can be seen as logic chunks that can be called anywhere in code. The catch here is that these logic chunks are sequential in nature. Therefore, it follows a structured programming method that uses block-based program control flow.

3.14.2 Object Oriented Programming

In contrast to procedural programming, this programming approach revolves around objects and methods rather than sequential procedures.

- Objects are the elementary component of OOP; they can be understood as real-world entities that have behavior and attributes associated with them. Example: A student is an object that has attributes such as name, class, roll no, age, and has the behavior of reading, writing, speaking, etc.
- Class is a blueprint of an object which declares variables, constant, and member functions and then concludes all these as a single data type and its methods.

The four pillars of OOP are:

i. **Abstraction -** Hiding unnecessary details.

ii. **Encapsulation** - Binding data and functions together.

iii. **Polymorphism** - Methods with the same name but different signatures.

iv. **Inheritance** - Acquire properties of an existing parent class.

Now that we have a brief overview of the above-mentioned programming approaches, we need to know about some concepts that support these approaches.

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1. Variable Declaration

These are containers for storing data values at a memory location. The declaration is usually made by certain keywords according to the language used.

2. Syntax

To write a code that a computer can understand, one needs to use some programming language; like any other language, programming languages also have words and rules that define them; these rules need to be followed by a programmer to write a code that can be understood by the computer.

3. Data Types and Structures

A data type is the category of the data value that is being handled. For example, data can be of numeric type: 1,2, etc. It can be of character type: 'a', 'b'...

Some of the fundamental primitive data types are:

- Numeric - Integer and Floating Point
- Character
- String
- Boolean

Data structures, on the other hand, are organized structures having a set of data values on which functions can be applied. These structures are used to optimally store a set of values and perform efficient operations on the data.

- Stack
- Queue
- Tree
- Heap
- Linked List
- Array

4. Flow Control

The flow of a program is a result of decision-making statements that decide what direction the program will go based on the derived scenario.

Three types of control flow:

- **Sequential** - It follows the linear execution of statements, i.e., one after the other
- **Selection** - A test condition selects what action to perform based on the result of the test as true or false.

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- **Iteration -** A statement or a block of code is run repeatedly till the test condition remains true, thus forming a loop.

5. Debugging

Locating errors and rectifying them is a bottom-line activity that makes the code written to produce the desired result. Various tools and techniques are used for locating errors to save time and effort.

IN-TEXT QUESTIONS

18. Which of the following OOPS ideas refer to giving the client access to only the information they need?

a) Encapsulation
b) Abstraction
c) Data hiding
d) Data binding

19. A computer programming language that states a series of well- structured steps and procedures within its programming is known as _____.
20. _____ data type is used to store the value 200.

3.15 USE OF DATA FILES IN PROGRAMMING

When a program is terminated, complete data is lost but to prevent this; data files are used. Since data files are stored in Random Access Memory (RAM) when the program is running, and it is stored in Read Only Memory (ROM) when the program is terminated. Data files are stored in non-volatile memory after the program is terminated, resulting in the preservation of data. As shown in the image below, a C program writes something in the file, and the data is stored on disk (ROM) in the form of an ASCII Text File or Binary File.

- **Handling the Huge Amount of Data**

  Whenever a program requires a large size of data, it can be very tedious and time taking to enter that data. However, if we pass that data into a data file, it will become very suitable for the programmer to use that data in the program. It is possible because of the accessibility of the contents of the data file using read commands in programming languages. The only condition is that the data should already be present in a data file, and from that data file, the programmer can easily use fragments of data.

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- **Data Transmission**

  Transferring data from one computer to another is a ubiquitous example of data transmission, but the data produced by a program cannot be transferred. It can only be transmitted by converting the data into a data file and then transferring the data file to another computer. The data transmitted by datafile will be unaltered while transferring, i.e., it will not be affected by the future changes made by the program unless the programmer explicitly changes the data.

- **App and Web Development**

  We all know that App Development uses XML for Designing the app, Whereas Web development uses HTML. Whenever we load a web page or an app screen, a data file is created in the background, storing the data about the design and how that design is implemented.

- **Hidden Datafiles**

  Sometimes a programmer requires to store some data which should be hidden from the user to prevent the user from corrupting or tampering with the data. This is accomplished by using closed datafiles format or proprietary format files. Here datafiles contain metadata (Data about Data) elements according to the preferences of a programmer.

3.16 MANAGEMENT OF DATA PROCESSING SYSTEMS IN ORGANIZATIONS

Data is not helpful in its original form to any organization. For organizations to improve their business strategy and gain a competitive edge, data processing plays an important role. Employees worldwide can understand and use data by turning it into a readable representation in graphs, charts, tables, and documents.

By data processing, we refer to the carrying out of operations on data, especially by a computer, to retrieve, transform, or classify information to generate usable information from raw data. An organization's team of data scientists and data engineers often performs it in a step-by-step manner. The raw data is then collected, sorted, processed, examined, and stored in a readable format.

Thus, managing a data processing system involves both the system's hardware and software as well as some stages of data processing: -

- **Data Collection-**The first step of data processing is the collection of the data. Data is pulled from the available sources an organization has of its employees. The data sources available must be trustworthy and well-built.

- **Data Conversion-** Transforming data into a format that can be processed.

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- **Data Cleansing-** Often referred to as the pre-processing stage of data processing. It eliminates errors from data before processing. Raw data is cleaned up and structured for data processing.
- **Organizing-** Involves grouping the data into sets or groups, or categories
- **Data Input-** The organized and cleaned data is then entered into its destination and translated into a language the system can understand.
- **Analysis –** also known as processing. The data is processed for interpretation by which extracting and producing valuable data from the raw data is possible.
- **Reporting-** Presenting the information. It is the output of processing data usable to non-data scientists in the form of graphs, videos, images, tables, and many more.
- **Data Storage-** The final stage of data processing is storage. After all the data processing stages, the data must be stored so that it cannot be lost, so for future reference, the data is stored.

Management of system resources assigned to the various functions is necessary for managing the many parts of the data processing system. The process of coordinating all the functions to guarantee the system runs smoothly is also included in management. Control is an oversight role of management and ensures that the data processing system performs an anticipated and produces the desired result. Control also ensures that any system problems are identified and fixed.

For a company or organization, the task of data processing is crucial as it helps to understand information quickly. Data processing increases productivity and profits, better decisions, and more accurate and reliable data. Further cost reduction, ease in storage, distribution, and report making followed by better analysis and presentation are other advantages.

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IN-TEXT QUESTIONS

21. Which of the following terms best defines the kind of analysis that transforms massive volumes of data into one or more summaries?
    a) Analysis
    b) Conversion
    c) Aggregation
    d) Sorting
22. _____best describes how data is moved from an old system into a new one, such as a payroll system.

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3.17 SUMMARY

The chapter thus gives us an insight into how data is gathered, organized, and used to give informative outputs. As we say, data files can be organized in various ways by analyzing the usage category of the data. Apart from organization and storage, we also learned about databases and their relevance in real-world scenarios. Data is not just limited to information view; it is also used in programming to read, write and process information, thereby introducing us to the Input-Process-Output analysis that data goes through to provide meaningful solutions.

3.18 ANSWERS TO IN-TEXT QUESTIONS

1. Application software 2. True 3. System Analysis 4. Requirement analysis 5. Software Development Life Cycle 6. Collaboration testing 7. Does not work well for smaller projects 8. Linear model & Prototyping model 9. Records 10. File organization 11. Records are stored in sequential order according to a search key	12. Online analytical processing 13. Database 14. Diamond 15. Flowcharting 16. Print files on paper 17. Data connections 18. Abstraction 19. Procedural language 20. Integer 21. Aggregation 22. Conversion

3.19 SELF-ASSESSMENT QUESTIONS

1. Briefly explain the phases in the SDLC process.
2. State the advantages and disadvantages of the SDLC process.
3. Explain the Spiral model in SDLC. Write its advantages and disadvantages.
4. Discuss the levels in data design.
5. Compare and contrast the following file organizations.
    - Serial files

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- Indexed sequential file
- Sequential files

6. Explain the differences between the transaction file and the master file.
7. Describe the IPO cycle using a real-world example.

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LESSON 4

PC – SOFTWARE PACKAGES

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STRUCTURE

4.1 Learning Objectives
4.2 Introduction
4.3 Operating System – An Interface
4.4 Windows – An Operating System
4.5 Text Processing Software – An Introduction
4.6 Introduction to Spread Sheet
4.7 Spread Sheet - Applications
4.8 Data Base Functions in Spread Sheet
4.9 Graphics in Spread Sheet
4.10 Data Base Manager – An Introduction
4.11 Presentation Graphics - Introduction
4.12 Applications of Presentation
4.13 Applications of PC Package
4.14 Summary
4.15 Glossary
4.16 Self-Assessment Questions
4.17 References

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4.1 LEARNING OBJECTIVES

After completing the chapter, you will be able to learn about different PC common software. These software will help you to command your presentations, so this chapter is going to target the following objectives:

- Provide basic knowledge about the PC- package software.
- Get familiar with the term 'Operating System' and it's working.

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- Explain about WINDOWS as interface.
- Gets the essential information about the text processing software in brief.
- This chapter will help you to learn the spread sheet software with its applications.
- Will be able to work on the database and graphical representation of spread sheet.
- Target the Data base manager working and its connectivity with different software.
- Tell how to work with the presentation software and its applications.
- Usage of all PC – software packages.

4.2 INTRODUCTION

Economic conditions and computerization in every field of human life gave birth to different kinds of software. The availability of low-cost hardware and the expansion of software industry for small to large-scale enterprise have resulted into a wide variety of software packages. Due to this growth, the previous approach of custom software has changed. Off-the-shelf software has been more widely employed as the variety of software packages with the boom in the industry. Although market offers a large variety of software packages, still there are barriers in the selection of the proper PC package for a particular need of the enterprise. Due to the immense amount of information available on the internet, understanding of the PC package and decision process of choosing a package is difficult. Locating sources of information which describe software packages and ways of effective usage of software packages for specific requirement is important. The types of PC packages are described here and their compatibility the operating system. This chapter describes the different software applications and operating system (windows). It also tells about different usage and applications of the PC packages.

4.3 OPERATING SYSTEM – AN INTERFACE

Operating system is also called as "System Software', that acts as an Interface between the computer hardware and the user. Every system has at least one operating system to interact with the computer system and different application programs. Applications like Browser, MS Office, Games, Notepad etc., need to work with the help of operating system.

The basic purpose of an operating system is to provide working platform to execute different application programs in efficient manner and manages the allocation of computer hardware as well.

4.3.1 BENEFITS OF OPERATING SYSTEM

- User-Friendly Interface for the computer system

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- Source of computing provided by it for different programs
- Sharing Resources is possible only by the operating system
- Data Protection the other usage of operating system for system
- Multitasking is another important working of operating system
- Updated of software is possible through operating system
- System Error can be recognized with the help of OS

4.3.2 COMPONENTS OF OPERATING SYSTEM

- Management of processes.
- File Administration.
- Network Management.
- Main Memory Management.
- Management of Secondary Storage.
- Management of I/O Devices.
- Security Management.
- Command Interpreter System.

4.3.3 TYPES OF OPERATING SYSTEM

- Batch Operating System.
- Time-Sharing Operating System.
- Distributed Operating System.
- Embedded Operating System.
- Real-time Operating System.

4.3.4 EXAMPLES OF OPERATING SYSTEM

- Apple macOS,
- Microsoft Windows,
- Google's Android OS,
- Linux Operating System, and
- Apple iOS.

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Now we have very important problem of choosing the operating system. We already have multiple operating systems in the environment. Although it would be nice to stick on one, it is rarely possible anymore. It's very important to keep in mind that "choosing" operating systems directly is not a simple. In fact, it's a decision that is made almost indirectly based on some important factors and issues. Specifically, which applications are in use by the enterprises, which hardware (workstations, servers, handheld, and mobile devices) is required to support, and what the specific needs of users are often determine which operating system(s) will be use.

4.4 WINDOWS – AN OPERATING SYSTEM

Windows is a graphical operating system developed by Microsoft. It was released for both home computing and professional works. It is one of the most popular operating system in the world. It enables users to save data, watch videos, run applications, play games, and connect to the Internet. The first independent version of Microsoft Windows, version 1.0, released on November 20, 1985, achieved little popularity.

Now, Microsoft's offerings are dominating both, the server market (Windows Server 2003 and 2008) and the desktop market (Windows XP, Vista, and Windows 7). Windows has also step inroads in the smart phone with Windows Phone but has not been as successful as others. First Version was released in 1985 and there have been many versions of WINDOWS released since. Due to the popularity, most application vendors will first write their software to support Windows; many won't even consider writing their application on any other OS platforms. However, because of its prevalence, it is also the preferred platform for hackers and virus creators to go after.

4.4.1 Applications of WINDOWS

- Controls the backing store and peripherals such as scanners and printers.
- Deals with the transfer of programs in and out of memory.
- Organizes the use of memory between programs.
- Organizes processing time between programs and users.
- Maintains security and access rights of users.

4.4.2 Silent features of WINDOWS

- Speed is basic feature of windows for booting speedily.
- Compatibility of windows with other platforms and applications is widely appreciated.
- Lower Hardware Requirements are well compatible with windows.

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- Search and Organization is introduced with windows very well.
- Safety and Security of data and computer system is at higher level with windows.
- Interface and Desktop with windows are significant and displays customizable features.
- Taskbar/Start menu of windows provides many grouped items and tiles.

4.5 TEXT PROCESSING SOFTWARE – AN INTRODUCTION

Text processing is the process of analysing and sorting of textual data into valuable information. Text editing and word processing are two important features of automated information. To work with these two features, text editor and word processor are combined software. Text editor provides the ability to add, delete, update, remove etc. with text and word processor helps in formatting the text or document. It also works with colors, special symbols, shapes, graphics etc.; editing, printing, and saving.

After a long period, the typewriter has gone and rewarded with computer systems with text processing software i.e., word processors. Nowadays, word processing is the most common and popular application software. There are so many word processors available in the market and allow users to work through a document with its principle activities. Text processing has many steps or set of activities as described below:

4.5.1 Creation of document

The creation of document includes making of new file, entering text into it, inserting of different templates, shapes, symbols and different types of graphs etc.

4.5.2 Editing of document

The editing of document is act of making alterations in the content of the document. This act includes insert, delete, reviewing, find & replace, cut/copy /paste, spelling check, and much more.

4.5.3 Formatting of document

For the document, formatting means developing, updating and altering the appearance of a document. Formatting of document has been done manually, but word processing software provides different tools and techniques.

4.5.4 Output of document

Word processing software provides various types of output such as printing option, projecting the document with the help of projector; document can be scan with the

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scanner, creating of web document and in last but not least is the saving of document is necessary first.

4.6 AN INTRODUCTION TO SPREAD SHEET

The spread-sheet was created in 1978, for the financial purpose in the form of tables. The spread-sheet allows users to enter data and formulas into rows and columns arranged as a grid on a display screen. The electronic spread-sheet is most popular for the enterprises and business organizations. Spread-sheets are commonly used for maintaining student grade cards, tracking investments, creating and tracking budgets, calculating loan payments, estimating project costs, and creating other types of financial reports and much more. This is an application which is used to manipulate the data especially arithmetic data. Spread-sheets are more collaborative than other tools of this kink. It's easy to manipulate, analyse and organise the data. It can be integrated with certain other tools. Spread-sheets are quick and easy to add into a workflow.

Besides performing basic arithmetic and mathematical functions, spread-sheets also provides built-in functions. Spread-sheet also provide conditional expressions, functions to convert between text and numbers, and functions that operate on strings of text. Nowadays, spread-sheet software have multiple interacting sheets and can display data either as text and numerals or in graphical form. It also provides powerful data optimization and management solutions that can be integrated throughout accounting, marketing, and development teams, just to name a few.

4.6.1 Features of Spread-sheet

- Data Management
- Rows & Columns
- Formulas & Functions
- Data filtering & visualization
- Cell definition
- Custom formatting

4.6.2 Advantages of Spread-Sheet

Spread-sheet is quite popular among the organisations all over the world due to:

- Spread-sheets are free for usage
- Spread-sheets require less training and skills
- Spread-sheets are customizable

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- Calculations are streamlined
- Provides multiple user interaction
- Can integrate several sheets as well as files
- Compatible with different types of formats
- Collaborative with different sources of data

4.6.3 Dis-Advantages of Spread-Sheet

Apart from advantages spread-sheet also holding the disadvantages as :

- Lack of security of data
- Countless templates create confusion in the spread-sheet
- Spread-sheet integration with certain tools create mess.
- Time consuming
- Unfit for remote working
- Consolidation among workbook is difficult

4.6.4 Uses of Spreadsheet

As spread sheets are most popular all over the world, and apart from many disadvantages everyone is using. So, its important and basic uses are as follows:

- Financial working in organisations
- Accounting purpose in the offices
- Use for analysis
- Use for presentation of data with various tools
- Generating reports and charts
- Assisting with data exports
- Statistical analysis

4.6.5 Best Examples of Spreadsheet

- MS-Excel
- Google-sheets
- Libre-Office Calc

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- Air-table
- Smart sheet
- Zoho-sheet

4.7 SPREAD SHEET - APPLICATIONS

There are a number of features and applications that are available in Excel to make your task easier. It has total nine menus to work with excel. We start from the initial point of creation.

4.7.1 Main Working Steps of Spread-Sheet

- **Create worksheet**: Choose File → New from the menu bar, The New Workbook task pane opens on the right side of the screen. Choose Blank Workbook under the New category heading. A blank workbook opens in the Excel window. The New Workbook task pane is closed
- **Saving worksheet**: Choose File → Save As from the menu bar. The **Save As** dialog box appears. Click the Save. In: drop-down menu and locate where the file will be saved. Type a name for your file in the File Name: box. Click the Save button.
- **Closing worksheet**: Choose File →Close from the menu bar. The workbook in the Excel window is closed.
- **Editing worksheet**: editing of excel sheet includes many features as deleting any entry, replacing, copying, moving of data, etc.
- **Printing of Worksheet**

4.7.2 Formulas & Functions in Spread-sheet

Spread-sheet is consisting of many types of formulas & functions (set of pre-written formulas), and it is very difficult to discuss all formulas and their working in single chapter. So, this lesson will consider few of them.

- Mathematical formulas
- Statistical formulas
- Engineering formulas
- Financial formulas
- Lookup & Reference:
- Logical formulas
- Date & Time formulas

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4.8 DATABASE FUNCTIONS IN SPREAD SHEET

Database functions in spread-sheet are very much popular in the world. Database Function is a routine function, which accepts parameters and performs an action and returns the value. Depending on the Function, the return value can be either a single value or a result set. The Excel Database Functions are designed to help you to work within a database (i.e. a large number of organized data records), stored in Excel.

The database functions are for basic calculations, such as sum, average, count, etc., as well as for criteria arguments, that allows performing the calculation for a specified subset of the records in the database. Other records in the database are ignored.

4.8.1 Types of functions in Spreadsheet

- **SUM:** SUM function adds set of numbers and returns the sum of these values. The syntax of the function is: SUM (number1, [number2], ...)
- **PRODUCT**- PRODUCT function returns the product of a set of numerical values. The syntax of the function is: PRODUCT (number1, [number2], ...
- **POWER**- Power function calculates a given number, raised to a supplied power. The syntax of the function is: POWER (number, power)
- **SQRT**- Sqrt function calculates the positive square root of a number. The syntax of the function is: SQRT (number)
- **ABS**- ABS function returns the absolute value of a number. The syntax of the function is: ABS (number)
- **MOD**- MOD function returns the remainder of a division between two Numbers. The format of the Syntax is: MOD (number, divisor)
- **ROUND**- Round function rounds a number up or down, to a specified number of decimal places. In other word, this function removes decimals rounding up the last decimal if the next one is 5 or over. The syntax of function is: ROUND (number)
- **LOWER FUNCTION** - LOWER function converts all alphabets in the string to lowercase. If there are characters in the string that are not letters, they are unaffected by this function. Syntax- LOWER (Text)
- **LEN FUNCTION**- LEN function returns the length of text string. Syntax-LEN (text)

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- **CONCATENATE FUNCTION**- CONCATENATE function joins together a series of text strings or other values, into one combined text string. Syntax- Concatenate (text1, [text2], …)
- **TODAY Function**- TODAY function returns the current date from the computers system clock. Syntax- =TODAY ()
- **NOW Function**- NOW function returns the current date and time. The NOW function is only updated when the spreadsheet is calculated. Syntax - =NOW ()
- **DATE Function**- DATE function returns the sequential serial number for the date and formats the result as a date. The DATE function is most useful when the year, month and day arguments are formulas. Syntax- =DATE (year, month, day)
- **MAX Function**- MAX function returns the largest value from a set of numeric values. Syntax- =MAX (number1, [number2] ...)
- **MIN Function**- MIN function returns the smallest value from a set of numeric values. Syntax- =MIN (number1, [number2] ...)
- **AVERAGE Function**- AVERAGE function returns the average (arithmetic mean) of the numbers provided. Syntax- = AVERAGE (number1, [number2] ...)
- **COUNT Function**- Count function returns the count of numeric values in a set of cells or values. This count includes both numbers and dates. Syntax- =COUNT (value1, [value2] ...)
- **COUNTIF Function**- The COUNTIF function counts the number of values in a range that meet specific criteria. Syntax- =COUNTIF (range, criteria)

4.9 GRAPHICS IN SPREAD SHEET

Graphical representation of data is an effective visual and impressive tool to represent information quickly and easily. Graphs and charts are commonly used by print and electronic media for the clarity. Sometimes, data can be better understood when presented by a graph than by a table because the graph can reveal a trend or comparison. Spread-sheet is presenting the data with the help of Graphs and charts, to create visualizations of data sets. By highlighting a set of data within spread-sheet and feeding it into the charting tool, users can create various types of charts in which the data is displayed in a graphical way.

4.9.1 Advantages of Graphical Representation

- Through graphs, the data is more presentable and easier to understand as well as draw certain inferences or analysis.

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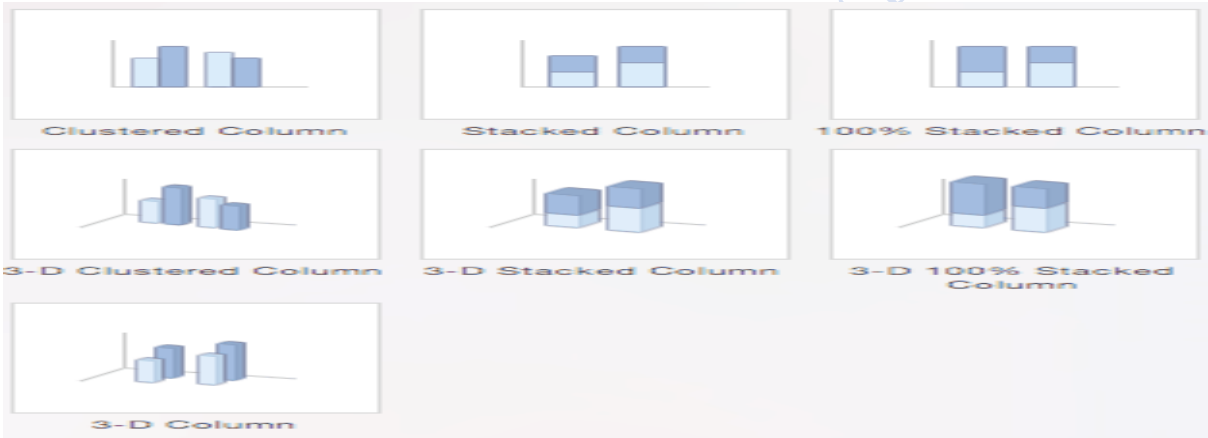
- Graphical representation summarizes a very large data in a very crisp and systematic manner.
- It makes comparison easy of data.
- Visual presentation targets the audience.
- Helps in estimating the key values at a glance.

4.9.2 Types of Graphs and Charts in Spread-Sheet

There are many types of Graphs and Charts available in Spread-Sheet. These are as:

- Column Charts: A column charts uses vertical bars or columns to display values over different categories. They are excellent at showing variations in value over time. It represents different types of column charts.



- Bar charts: Bar charts are similar to a column charts, except they use horizontal instead of vertical bars. Like the column chart, the bar chart shows variations in value over time. These charts are again of different patterns.

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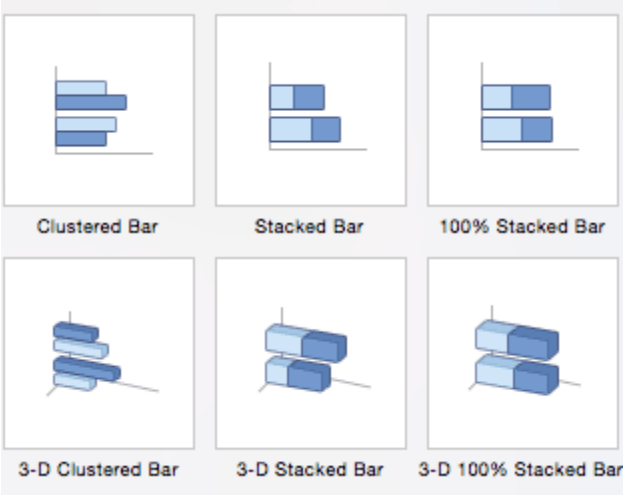
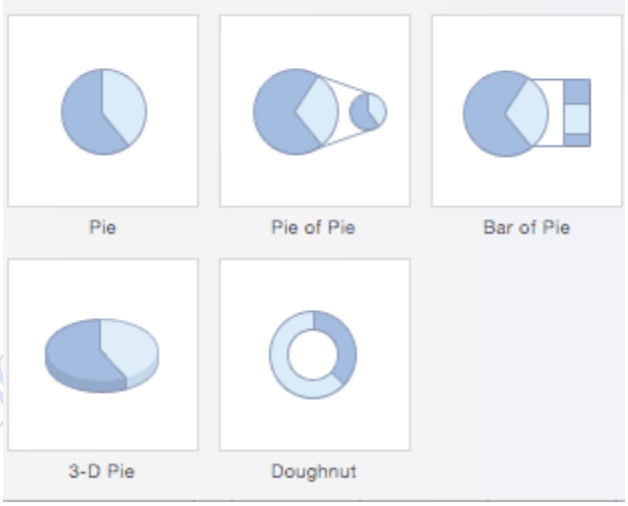


- Pie charts: A pie chart present the contribution of each value to the total. Pie charts are an effective way to present information when you want to represent different parts of the whole, or the percentages of a total.



- Line charts: A line chart shows trends and variations in data over time. A line chart displays a series of points that are connected over time. Often used to plot continuous data and are useful for identifying trends.

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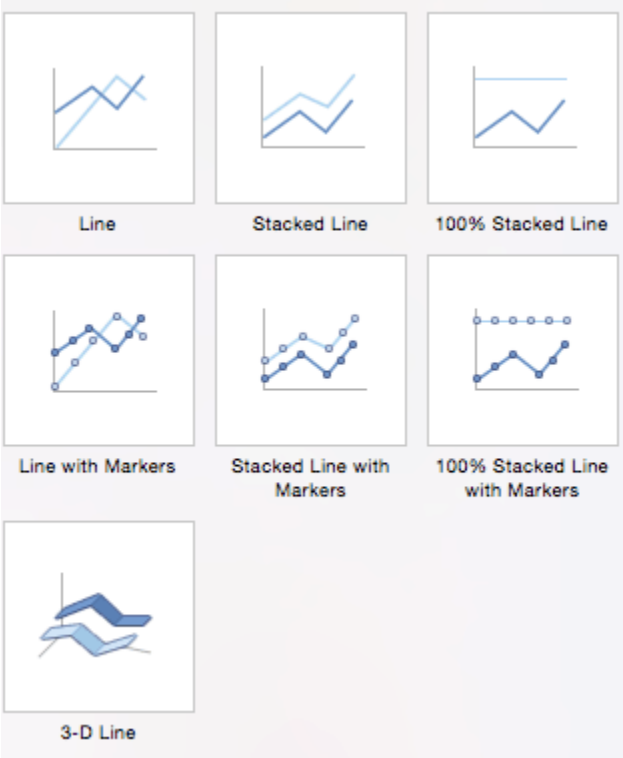

4.9.4 Steps for creating Graphs and Charts in Spread-Sheet

- Select chart type
- Select the data & create chart
- Add chart element as axis, chart title, data labels, legend, trend lines etc.
- Adjust quick layout
- Change colors
- Change style
- Switch Row / Column
- Then save the chart

4.10 DATA BASE MANAGER – AN INTRODUCTION

In Data, 'Data' refers to "information in digital form that can be managed to organise the system. And Database is a collection of related data. The purpose of this type of software is to organise and manage data. The advantage is that changes in data can be made and stored then displayed. MS-Access, d-base, Foxpro, Paradox and Oracle are some of the examples of database manager. Database manager are software systems used to store, retrieve, and run queries on data. They serves as an interface between an end-user and a database, allowing

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users to create, read, update, and delete data in the database. It also supervises the daily activities of the data i.e., any update or manipulations. These systems help in association of understanding the tools and technology that are available to make the database and related technology even more effective. They also provide basic database management functionalities including creation and maintenance of databases.

4.10.1 Characteristics of Database Manager Systems

There are some characteristics of database manager system, which allows smooth working:

- Manage remote as well as local databases
- Discover databases on web servers
- Provide the ability to connect to the database available in the network
- Provide administrative functionalities
- Display information from databases catalogs.
- Allow database administrators to new patches for databases and updating databases.

4.10.2 Basic Functionalities of Database Manager Systems

Database manager systems enables users and provide quick solutions to the organisation by its functionalities, which are as:

- Sharing of data
- Faster Accessibility with multiple users
- Compatibility across platforms
- Maintain Integrity while sharing
- Manipulation of data ensures consistency
- Provides security with different levels of abstraction
- Following the data models
- Connected on the basis of distribution system

4.10.3 Basic Responsibilities & Uses of Database Manager Systems

Some of the main responsibilities of Database manager are as follows:

- Creation of efficient and consistent database.
- Determination of data storage structure.
- Facilitates data searches.
- Maintain integrity among assets
- Manipulations are required
- Simplifies consultation process

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- Control undesired movements in the data.

4.10.4 Examples of Database Manager Systems

- SQL server
- Oracle
- My SQL
- TeamDesk
- TablePlus
- Azure
- IBM Informix
- MS Access

4.10.4 Basic uses of Database Manager Systems

- **On Demand online video streaming**
- Personnel cloud storage
- Social Gaming
- Telecommunication
- Knowledge management
- RDBMS

4.11 PRESENTATION GRAPHICS - INTRODUCTION

Presentation Graphics is a way of presentation, which can be used for formal or informal presentation and in any form (text, audio, video, animation or else). In other words, presentation is a structured delivery of information or a way of presenting skills or showing or expressing skills. For the attractive or effective task, presentation is used. Through presentation user can express views, feeling, opinion, etc. Presentation is generally used in business, conference, education system, seminars etc. Presentation can be reproduced on transparency, paper or on-screen. Teachers, professors, politicians and sales representatives make presentations to present their concepts. Some notable presentation software packages are available as Harvard Graphics and Lotus Freelance. PowerPoint is a presentation software package included in Microsoft Office suite. It is used to create professional quality presentations.

PowerPoint can be used to work on slides, organize presentation contents with outlines and generate speaker notes and audience hand-outs, helps to structure the ideas and information that may be convey to the audience. It lets to create the contents of presentation by typing/inserting text, pictures, sounds and animations. With it, anyone can add visual images,

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supporting documents and audio-video recordings to enhance the presentation. PowerPoint makes the creation of any presentation simple by providing built-in professional designs called Auto-Layouts and templates. Different versions of a presentation can also be created for different audiences and contents can be built in either a text-based outline view or a design-based slide view.

4.11.1 ELEMENTS OF PRESENTATION

- **Slides**: Slides are the pages of the presentation. It can also be said that each page of a presentation is known as slide, which includes any text, graphics, titles, shapes, designs etc. PowerPoint provide various views to view the slides, Normal view, Slide Sorter view and Slide Show view respectively these three buttons are available on button left of the PowerPoint window.
- **Notes Page**: While giving presentation, it may need to refer to notes to elaborate on a slide's material, or to remind, to mention some detail. For this purpose, can create a notes for slides used in the presentation this note is available below the slides. Anyone can type any notes, remark or any help message.
- **Hand-outs**: Hand-out is a printed form of any presentation, which can print all the slides used in the presentation is small sizes on a single page. This can print 1, 2, 3, 4, 6 or 9 slides on a page. This can distribute these hand-outs among the viewer during presentation.

4.11.2 TYPES OF PRESENTATION

- **Blank Presentation**: With the help of blank presentation, design of the slide can be as per our requirement it gives us some predefined layouts of slides which can be used to create a blank presentation. To design the slide by using blank presentation option, select new option from the file menu and then select blank presentation option from the task pane. After selecting blank presentation it gives a default slide. If doesn't want to work with the default slide then select any slide layout. After the completion of one slide to create a new slide click on new slide button from the standard toolbar
- **Design Templates**: - Design templates provide some predesigned formats of presentation, can select any one of them and create the presentation. It can also be said that design formats are directly used to create the presentation.
- **Auto content wizard**: The Auto-Content wizard is a presentation, which act as a guide composed of several screens that helps to create a professional presentation quickly and easily. It basically works through series of questions and helps to choose options to create a good presentation with the suggested content. The auto-content wizards give some instruction to the user by following instructions, a new presentation can be created by selecting the category, style, and view of presentation. To use the auto-content wizard, anyone can go through step by step.

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4.11.3 TYPES OF VIEWS OF PRESENTATION

- **Normal view**: Normal view is by default view of the presentation, it contains three panes as the outline pane, the slide pane, and the notes pane. These panes allow to work on all aspects of presentation in one place. And can adjust the size of different panes by dragging the pane borders.
- **Slide Sorter view**: In slide sorter view, are able to see all the slides in a presentation on screen at the same time, displayed in miniature. This makes it easy to add, delete, and move slides, add timings, and select animated transitions for moving from slide to slide. It also previews animations on multiple slides by selecting the slides which want to preview and then clicking Animation Preview on the Slide Show menu.
- **Slide Show view**: Slide show view presents the slides in full screen mode including all its effects, this view can also decides the time to view the slides. One by one next slide automatically appear after the time frame. Otherwise, can use either mouse click or page down key to view the next slide.

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4.12 APPLICATIONS OF PRESENTATION

Presentation software is software used to show information, normally in the form of a slide show and present that slideshow to an audience. Presentation software is the medium of communication for a group of people, much simpler than any other delivery methods. The software helps educators to bring their lessons to life also used to enhance language learning with all four language skills: Reading, Writing, Speaking and Listening. It also helps to create innovative ideas when students come up with creative and interesting slides to illustrate their talk. The use of presentation aids makes more interesting talk, and such aids helps to develop students' confidence.

The software comes with tools and templates to add information in the form of text, images, audio, video, and graphs. It's major functions includes: an editor pane that allows text to be inserted and formatted, a method for inserting and manipulating graphic images and a slide-show system to display the content.

4.12.1 TYPES OF PRESENTATION

- **Informative Presentation:** An informative presentation is educational, concise, and to the point. The main goal of an informative presentation is to share information.
- **Instructional Presentation: A**n instructional presentation is to give specific directions or orders. This presentation will probably be a bit longer, because it has to cover whole topic thoroughly. In an instructional presentation, listeners should come away with new knowledge or a new skill.
- **Persuasive Presentation: A** persuasive presentation is to convince listeners for accepting the proposal. A convincing persuasive presentation offers a solution to a controversy, dispute, or problem. To succeed with a persuasive presentation, presentation should have sufficient logic, evidence, and emotion to sway the audience to your viewpoint.
- **Arousing Presentation: A**n arousing presentation is to make people think about a certain problem or situation. To arouse the audience's emotions and intellect so that they will be receptive to the point of view. Vivid language used is in an arousing presentation– project sincerity and enthusiasm.
- **Decision-Making Presentation:** A decision-making presentation presents ideas, suggestions, and arguments strongly enough to persuade an audience to carry out requests. In a decision-making presentation, tell the audience what to do and how to do it.

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- **Motivational Presentation:** Motivational presentations in the business world may not be as dramatic or life changing as a TEDTalk, but they still aim to generate interest or gain an audience's approval.
- **Progress Reporting Presentation:** This type of presentation shares status updates, progress towards deadlines, collected data so far, any obstacles popping up, and tasks that need to be added or adjusted. Presentations usually include an agenda, talking points, deliverable updates, discussion topics, and time for questions at the end. This presentation keeps everyone organized and focused, ensuring that everyone is still on the same page and working towards the same end goal.
- **Demonstrative Presentation:** This presentation demonstrates the process if it involves something in which the audience will later participate using the prescribed method.

4.12.2 BENEFITS OF PRESENTATION SOFTWARE

- **Visual:** Visualizing information helps readers for explaining.
- **Versatile**: It incorporates photos, illustrations, sketches, and even videos posted online.
- **Interactive**: This software can embed links and jump around the document itself or out to the Internet.

4.12.3 Types of Presentation software

Presentation can broadly be classified into different categories as:

- MS-Power Point
- Google Presentation slides
- Canva
- Keynote
- Vizme etc.

4.12.2 PROS & CONS OF PRESENTATION SOFTWARE

Every software technology has many advantages and disadvantages, presentation is very useful but consists of many pros & cons.

Pros	Cons
1. **Visualization of information.**	1. **De**signs of slides diverts from the information.
2. **Versatility in the presentation of**	2. Information, sometimes in readable

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information.	form only.
3. Interactive way of presentation.	3. It offers limited tools for entertainment interaction.
4. The presentation provides customization for slides.	4. The customization is not possible for entertainment
5. It has compatibility across the platforms.	5. Sometimes distraction created across the platforms.

4.13 APPLICATIONS OF PC PACKAGES

PC package is a suite of applications designed to help with productivity and completing common tasks. These are tools used commonly because of accessibility, ease-of-use, interactivity, and adaptability across operating systems. Efficiency is so important for enterprises, can be provided by the PC packages. These PC packages are being able to create, collaborate and communicate seamlessly for the organisations. And having easy access to productivity tools that enable people to work easily from anywhere, which makes organisations agile in their sector. A general-purpose application package is **a type of software that can perform many different related tasks** and enhance the productivity of organisation.

4.13.1 Characteristics of PC Packages

There are many characteristics of Packages, which fascinates the people and enterprises, are:

- Applications-centric
- Specialised Programs associated with documentation
- Standardize and streamline according to the task
- Customized silent deployment
- Assistant implementation

4.13.2 Categories of PC Packages

- Database Packages (e.g. MS Access, Lotus Approach, Paradox)
- Graphics Packages (e.g. Paint, PaintBrush, Serif Draw, Corel Draw)
- Computer Aided Design Packages (e.g. 2D-Design, AutoCAD, TurboCAD)

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- Presentation Graphic Packages ((e.g., PowerPoint, Lotus Freelance)
- Desktop Publishing Packages (e.g., MS Publisher, PageMaker, PagePlus)
- Communication Software (e.g., Internet Explorer, Netscape Communicator))
- Spreadsheet Packages (e.g., MS Excel, Lotus 123)
- Text Processing Packages (e.g., MS Word, WordPerfect)
- Web page editor (e.g., MS FrontPage, Macromedia Dreamweaver)
- Integrated Packages (e.g., MS-Office, Office 365, Open Office)
- Specialist Packages (e.g., Tally, Maxima, SPSS)
- Antivirus Packages (e.g., Quick Heal, Nortan, McFee)
- Build or Tailor-made Packages (in-house developed software)

4.13.3 Benefits of PC Packages

There are many advantages to PC Packages:

- Provide standard environment and ensure stability in working.
- Standards reduce the risks of working and also reduce the support cost correspondingly.
- Packaging is required for the better organisation of tasks, so compatibility is easier.
- Packaging format helps in less business disruptions.
- Application management is smooth.
- Packaging makes effective running of applications
- Reduce the security risks.
- Customization makes easier working and smooth.
- Accessible from anywhere.
- Communication friendly.
- Centralised collaboration within the organizations.
- Online support and training available.

4.13.4 Disadvantages of PC Packages

Any of the system or PC package cannot be without pitfalls and hazards. So some of them are described here:

- **Functional Requirements**: Statement that all the functional requirements of the user can result in selection of an optimal package is a difficult, it is a multi-step procedure. Only after the user requirements have been stated and matched to achieve the best fit

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to a package can success be insured. Insuring that a package meets the specific requirements of an organization is critical to say.

- **Flexibility:** Technical Environment, laws, policies and procedures constantly change and a software package must be adaptable to these changes, which is very difficult to say. The flexibility which, if anticipated, can readily be built into a custom developed system, and should take updates time to time that must be insured in a product.
- **Vendor reliability**: It is very important while selecting a package to insure that the vendor is well established and committed to the product for any kind of updates. This problem is not as relevant to in-house custom developments since an in-house development staff is readily available for support but this is not possible every time and for the long time.
- **Conversion:** A problem can occur with installation of package, is underestimation of the magnitude of adjustment to the conversion or transition to a new package. Using perspective in the selection and acquisition.
- **User Acceptance**: A common encountered obstacle along with the successful installation is user acceptance and adaptation to the new package. Although the package selected may appear to management as a best fit, lower-level staff may be required to significantly alter their routines. Usually, when a software package is purchased, the users are required to arrange current operational procedures so they are compatible with the software.

4.14 SUMMARY

PC Package, basically a synchronisation of interrelated units of the software for the business enterprises for achieving their objectives and fulfil targets. So, Integration of similar type of Software is necessary and important goal to manage processes and systems for better performances. Technology plays important role for the synchronisation of units with less errors and within budget. The availability of low-cost hardware and the expansion of software industry for small to large-scale enterprise have resulted into a wide variety of software packages. There are so many software packages available in the market. But, Applications like Browser, MS Office, Games, Notepad etc., need to work with the help of operating system. So market is also providing many types of operating systems. The basic purpose of an operating system is to provide working platform to execute different application programs in efficient manner and manages the allocation of computer hardware as well.

WINDOWS is one of the most popular operating system in the world. It enables users to save data, watch videos, run applications, play games, and connect to the Internet. Different types of PC packages are available in the environment to interact with the operating system (WINDOWS). Such as Text Processing Software, Spread-Sheet system, Presentation Graphic

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software, Database Manager Systems. All these general-purpose application package is **a type of software that can perform many different related tasks** and enhance the productivity of organisation. These software packages are holding many characteristics, which fascinates the people and enterprises. They are divided into different types of categories as Database package, Graphic Presentation package, CAD, DTP, Office suite, communication software package, antivirus and tailor-made packages. All these PC packages comprises of many benefits but are also holding some disadvantages.

After whole discussion, we can conclude that PC packages are required for smooth working with PC and necessary also.

4.15 GLOSSARY

OS: Operating system is also called as "System Software', that acts as an Interface between the computer hardware and the user.

WINDOWS: Windows is a graphical operating system developed by Microsoft. It was released for both home computing and professional works.

Word Processor: A software that combines, Text editor which provides the ability to add, delete, update, remove etc. with text and word processor helps in formatting the text or document.

Spread-Sheet: The spread-sheet a software that allow to enter data and formulas into rows and columns arranged as a grid on a display screen.

Database Manager Systems: They serves as an interface between an end-user and a database, allowing users to create, read, update, and delete data in the database. It also supervises the daily activities of the data i.e., any update or manipulations.

Presentation Graphics: Presentation Graphics is a way of presentation, which can be used for formal or informal presentation and in any form (text, audio, video, animation or else). In other words, presentation is a structured delivery of information or a way of presenting skills or showing or expressing skills.

4.16 SELF-ASSESSMENT QUESTIONS

1. What is a PC package?
2. What are the major differences between an application software and a package?
3. Describe text processing with example.
4. How Database Manager systems are different from databases.
5. Explain about presentation graphics systems and their functionalities.
6. Summarize all the PC packages with examples.

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7. Discuss the important workings of spread-sheet.
8. Describe operating system as an Interface.
9. Write short notes on different versions of WINDOWS.
10. Discuss different graphic tools of spreadsheet.

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LESSON 5

MANAGEMENT SYSTEM INTEGRATION AND NETWORKING

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STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 Management System Integration
5.4 Application Portfolio Development
5.5 Internet
5.6 Extranet
5.7 Intranet
5.8 Applications of Internet
5.9 Internet Technology in Organisations
5.10 Data Communications
5.11 Networking
5.12 Internet Service Providers
5.13 Application Service Providers
5.14 Summary
5.15 Glossary
5.16 Self-Assessment Questions
5.17 References

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5.1 LEARNING OBJECTIVES

The objectives of the lesson will indicate the Intended Learning Outcomes. So, after completing this lesson, you will be able to:

- Explain different terms as internet, extranet, intranet, networking, data communications networking and Management system integration etc.
- Explain application portfolio development.
- About Internet Technology & Networking.
- Elements of Internet & its applications.
- Usage of Internet Technology for Business Organizations

5.2 INTRODUCTION

Management system is the way of organising and managing interrelated units of the organisation to achieve their goal or objectives. Nowadays, management system integration is basic part of the businesses, in which it combines all aspects of the system, processes, and standards into smart system for better responses. From the point of view of performance, organisations are also into practice to implement application portfolios which helps in effective maintenance.

Analysing, assessing and synchronization of business roadmaps with technology needs some medium. So, Internet is the basic communication medium of organisations. The content of this lesson provides the knowledge of Internet, which accompanied with Extranet, Intranet. Business organisation are integrating their management systems with the help of data warehouses, and providing their own application portfolios with Internet, Extranet and Intranet. This is the way; Internet Technology is widely acceptable in business organisations.

This lesson is divided into many subparts in a systematic manner. First part of lesson describes integration of management system by business organisations with their own application portfolios. Second part of the lesson providing the knowledge of Internet and its usage, with the explanation of intranet and extranet. How the data is communicating in organisation needs the knowledge of Data communication and networking, which is next part of the lesson. Lastly, this lesson describes about the service and application providers of the internet, and conclude the lesson.

5.3 MANAGEMENT SYSTEM INTEGRATION

The advancement in technology leads to global growth and change into prospective of human life, so the concept of industrial development and business production has changed. Due to these changes, the process of economic growth and competition of markets have led

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organisations to extend their business segment and more differentiated to stand in the market. Thus, business organisations have developed with management systems with an extensive position in the market in which they operate.

There is a variety of management systems standards, which covers various functional areas of the organisation. With separate and incompatible management systems, organisations can incur insignificant costs, more errors and failures, redundancy, inconsistency etc. These issues have very negative impact on stakeholders, employees and consumers. So, to avoid such kind of prospects, the organisations should have integrated strategy for the management system. It's time to provide a holistic system of integration, and organisations can manage their operations with integrated management system.

The management system integration allows organisations to share work force, information, infrastructural and financial resources. That is an effective management model, promotes innovations.

5.3.1 BENEFITS OF MANAGEMENT SYSTEM INTEGRATION

Improvement in the relationship of stakeholders

- Improvement in procedures of organisations
- Change in behaviour at environment & safety levels
- Definition of responsibilities become sharper
- Reduction in documentation
- Reduction in indirect cost
- Better work culture
- Improvement in employee's communication
- Increase in speed of processes
- Globalisation of vision

5.3.2 CRITICAL SUCCESS FACTORS

Critical success factors are those agents or vital areas, which must take into consideration by the organisation for successful management system integration, such as:

- Involvement of top management
- Financial and human resource
- Training of personnel's
- Pre-defined objectives
- Persistence of operations
- Set deadlines
- Employee's involvement and motivation

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- Experienced consultants

Nowadays, Management System Integration is strategic decision to promote sustainability and competitiveness. For a successful integration level, organisations should follow some set of factors described. And it makes possible to identify a set of benefits for the organisation. Despite that some difficulties also have been pointed out, so should be aware of them.

5.4 APPLICATION PORTFOLIO DEVELOPMENT

As Information Technology is the most important tool, most of the business organisations are working with that only, has no option. Day by day, number of applications is increasing according to the needs and become substantial assets for the organisations. Consequently, management of these applications becoming less efficient and sustaining at high costs.

According to the business strategies and goals, allocation of aligned IT applications should be business centric and supportive and reflect the impact in the portfolio to the business. So, for the financial benefit of applications, ***Application Portfolio Development*** is required. The Application Portfolio Development is nevertheless a complicated issue to regain the control of the software automation for the business, which ensures about the added value and reliability of the application.

Application portfolio refers to a collection of software applications and software – based services for the business organisation to attain its goals. The managing of application portfolio is its management. Basically, it's a framework for the software application to illustrate the business benefits of every application integration. Most important benefits of application portfolio development are:

- Eliminate the risks of business & protect it.
- By integration of different applications, lower the costs of IT applications.
- Helps to think strategically for the betterment of business.
- Plan for tomorrow & support future business strategies.

5.4.1 Application Portfolio Development steps

Basically, it is a discipline for the governance of software applications through their entire life cycle in support of maximizing business value delivered. Following are the steps:

- Identification of best applications work for the business.
- Create content part of the applications and estimating their operations cost.
- Allocation of applications first, then categorize according to the business strategies.

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- Selecting applications with their features and operation for decision making for implementation.
- Lastly, integration of application with credible sources then evaluation of portfolio to maximise business value.

5.4.2 Silent features of Application Portfolio Development

Application Portfolio Development is carried out in a balanced fashion, by prioritizing the objectives of business and IT concerns to succeed. The silent features of it are as:

- Governance Focus: The focus is only on decision making for higher business value.
- Development of Application Portfolio: The Life Cycle of application portfolio is important to lower down the costs and risks.
- Categories of Applications: For acquiring governance approach, it is necessary to focus on category of applications
- Business Value: The most important objective is to govern the application portfolio driven by changing business needs for maximum business value.

5.5 INTERNET

The Internet is globally connected computer networks for communication and sharing information. It consists of millions of public, private networks with the global as well as local scope. Networks are linked with a broad array of electronic devices consisting of wireless or wired connectivity. As above said, it is for communication and information sharing, so internet have large volume of information resources and services linked and the infrastructure.

5.5.1 History of Internet

The internet is not evolved instantly but is the result of long progressive growth and research.

In 1969, under the American defence department, ARPANET was introduced for communication and exchange of information. With this, use of internet gradually increased in universities, scientists, researchers, and private and commercial organisations for sharing information. In 1990s, the working of ARPANET, and other public, private networks start increasing for exchanging information and messages.

The term “Internet” actually was coined in 1995 by the FNC (Federal Networking Council, USA). Therefore, Internet is a world wide web of computer networks’. It is connected with millions of computing devices that carry and transfer large amount of information from one

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device to the other. Desktop computers, mainframes, GPS units, cell phones, car alarms, video game consoles and many other devices are connected.

5.5.1 How Internet Functions?

Internet is collection of many public and private networks connected to each other. To avoid any discrepancy and disturbance, networks are governed by certain rules. They are following some common standards, but the functioning of internet is not controlled by any one of them. It is governed and managed by a group of voluntary organisations under the Internet Society. For smooth working of network, they decide some set of rules called as "Protocols", for communication. Other than societies, some networks have their own rules, which they follow internally only within their network, not on global Internet.

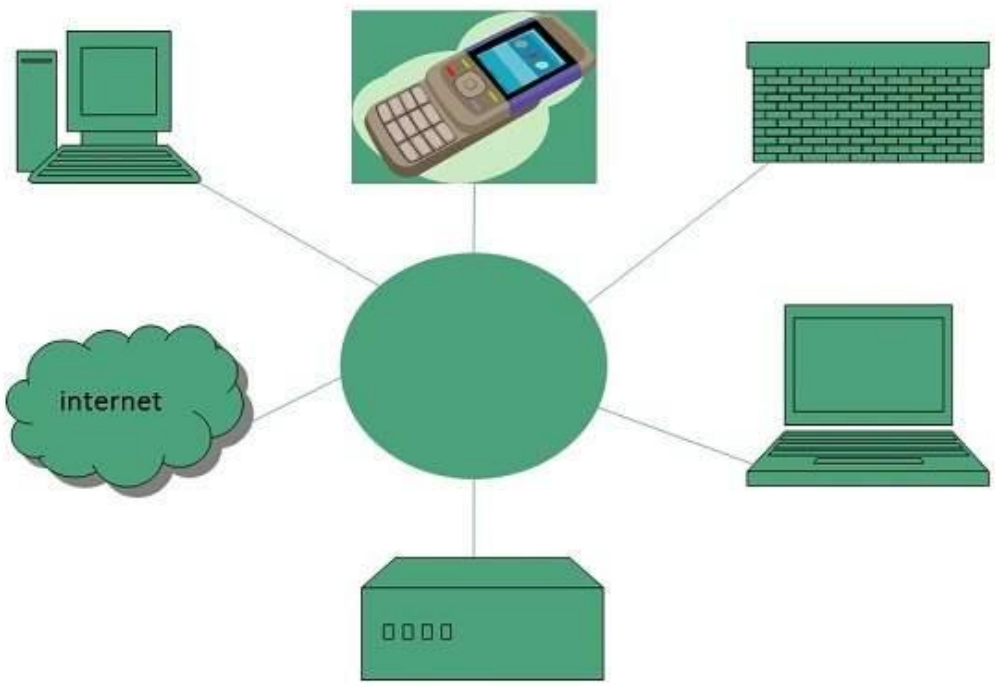

Fig1: Diagram of Internet

5.5.2 Uses of Internet

Nowadays, Internet has been the most powerful and useful technology. It works with us, from personal to professional life for the development. Internet helps us to achieve our goals in different ways as, educational purpose, business point of view, research subjects, doctors encyclopaedia, adding information for the home, filtering information for countries. Therefore, it is helping out for everyone, in all age, categories all over the world.

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Internet is working with the help of web browsers and websites, and then connected through URL within the Domain. There are many web browsers available to serve the user across the world. All working is based on many web-based application software in every field of life for each purpose.

5.5.3 Limitations of Internet

Despite of usage and global availability, Internet has many limitations, listed below as:

- Virus threat
- Decrease in face-to-face communication
- Loss/theft of personal information
- Addiction of Internet
- Dangerous for children
- Spamming

5.6 EXTRANET

Extranet is nothing, but in simple terms 'extension of intranet' only, i.e., a private network of linked many cooperating organisation outside the walls of same organisation. Extranet is providing services with the help of existing intranet interactive infrastructure. So, Extranet is more economical for proprietary network by using same standard servers, clients and web applications as well as browser. Due to the sharing of resources enterprises have strong communication connectivity and typically coupled relationship with common interests.

The usage of Extranet is among various types of businesses such as banking, airlines, railways, hospital chain, mart chain and corporate offices with branches etc. But, extranet is using the Internet protocol and public telecommunication for sharing of information with its any kind of branches. For the security and privacy of extranet, there is a requirement of firewall server management, which providing authentication, use of virtual network, usage of encrypted message, for tunnelling the public network. Because companies are more aware about their communication limits with authorised access. So, Extranets serve an extremely important role, as they allow for private communication, collaboration, knowledge sharing, document sharing, and data transfer between organizations.

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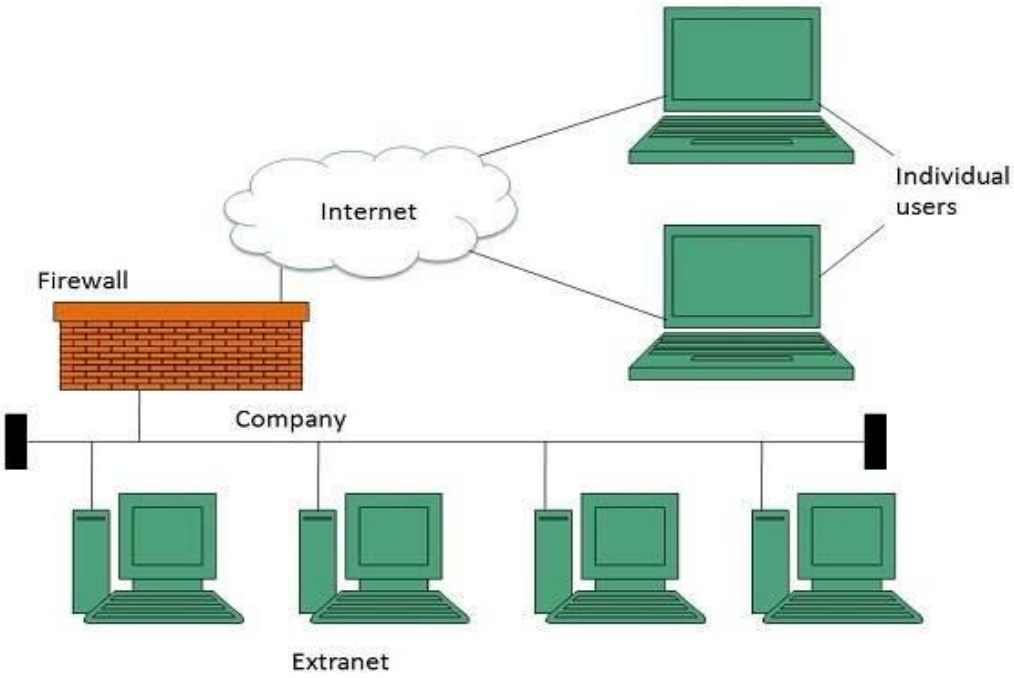

Fig3: Diagram of Extranet

5.7.1 Features of Extranet

- Extranet uses the TCP/IP protocol to link intranets at different locations
- Extranet is providing security and privacy with the help of tunnelling i.e. VPN
- Access to extranet is limited by agreements of collaborating parties
- Extranet is open and flexible for supply chain management
- Extranets are also having facility of replication of database for the safer side.

5.7.2 Advantages of Extranet

Apart from various limitations, extranet have various advantages as:

- Ubiquity of access
- Standards are open for all platforms
- Investment of less time and money
- Technical support and economical
- Act as information factory among the organisations

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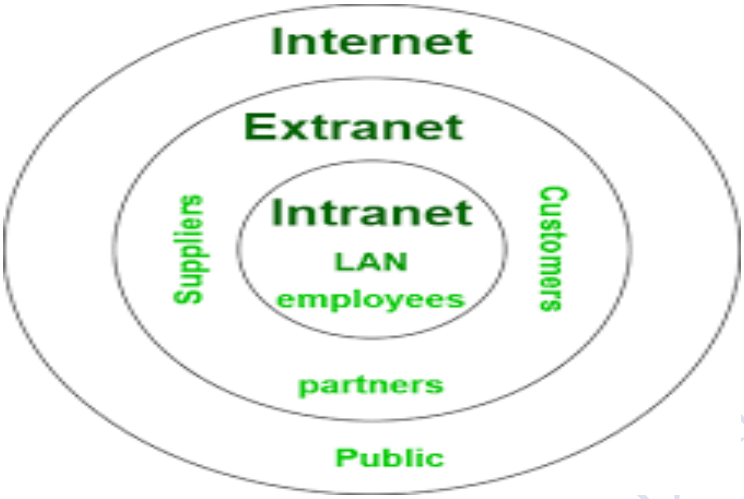

Fig4: Difference of Internet, Intranet, Extranet

5.7 INTRANET

Intranet can be described as "Internal Internet", i.e., private network, within the organisation, university, library, enterprise, company, office etc. It is connected with many interlinked local connections with the help of the wide area network in web.

The main motive or purpose of the Intranet is to share and exchange of information within the organisation among internal computing resources. It facilitates the working in groups and for telecommunication. So, it is the web-based architecture for managing internal information with the help of internet tools, protocols, and technology. The working of Intranet is accessible through public internet as well as local connectivity with the use of filters and routing algorithms. This intranet is bound to permission to access resources internally for the purpose of security of the network within the organisation.

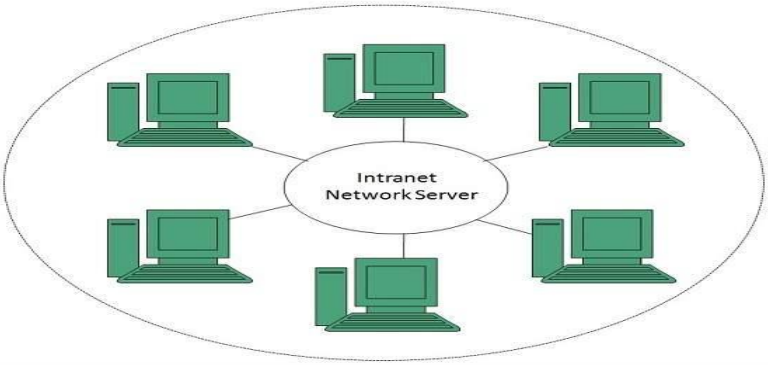

Fig2: Diagram of Intranet

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5.6.1 Features of Intranet

- Intranet is corporate network secured with firewalls
- Intranet links various clients, servers, many databases, different application programs (ERP).
- Accessible to authorised people/employees with limited access.
- Connectivity is open and flexible with defined infrastructure.
- Intranet is developed with protocol (TCP/IP) as internet but operates as private network.

5.6.2 Advantages of Intranet

Intranets are quite popular among the organisations all over the world due to:

- The interface of intranet is comfortable for multimedia formats.
- The single interface of intranet is enough for several proprietary systems such as database, libraries, bibliographic information, and different management systems.
- The setup of intranets is very inexpensive for the usage of in-house proprietary packages.
- They provide easy accessibility across the networking platforms

5.8 APPLICATIONS OF INTERNET

Today's world is of internet, which fascinates the world. It is used to explore the fascinating and ever-changing world. In this network, more than billions of people are connected. The internet has mainly three applications, which can expand further as:

- Communication
- Buying and selling, services (e-commerce, e-services)
- Searching for information

5.8.1 Communication

Growth of mankind began with the advent of communication. We share information, when we are communicating. Sharing of information can be done locally or remotely. Between individuals, generally face to face communication is considered as local communication, whereas communication which takes place over distance comes under remote communication. There are several ways to communicate over the internet. Some of them are as following:

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- E-mail
- Instant Messaging
- Social Networking
- Forum
- Video Conferencing
- Audio Conferencing
- Chatting
- News group

5.8.1 Buying / Selling, services (e-Commerce, e-services)

In this, the vendor and customer conduct a transaction sitting at different geographical locations, connected through the Internet. There is a wide range of services provided by the Internet also. These are listed as:

- E-commerce
- M-commerce
- E-services
- Net Banking
- E-learning
- E-gaming
- Communities

5.8.2 Searching for Information

A number of programs called search engines are available to search for the information on any topic. Some famous search engines are provided by:

- www.google.com,
- wikipedia.com,
- webopedia.com,
- MSN.com,
- Yahoo.com, etc.

5.9 INTERNET TECHNOLOGY IN ORGANISATIONS

Advancement in communication and information technology has further strengthened the role of the internet in business. The internet is widely used in organization for marketing and promotion of products and services. The internet is used to deliver customer support, share information and provide training to employees.

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The internet used in different applications to meet the requirement of different people at different places in different time. Business organisations are widely using the Internet, for the management of business; they connect and correlate information among organisations'. The main tasks are as:

- Resource sharing
- Information sharing
- Connecting people
- E-commerce
- E-services

The role of the Internet in business communication is varied and has come to be of great importance. It can be used to increase effective communication both internally and externally. Use of the Internet can make it easier to connect with others quickly and more often, in addition to exchanging a wide array of media types. It can be used to communicate purchase information to vendors and by customers to ask questions. The factors that make the role of the Internet in business communication important can also cause conflict, depending on the way the medium is used.

5.10 DATA COMMUNICATION

In Data Communications, 'Data' refers to "information in digital form that can be processed", and 'Communication' means exchanging of information or data from one entity to another entity in a meaningful way. 'Data Communication' is the process of exchanging or transferring of data/ information in two computing devices or more points. It can be explained as the transmission, reception, and processing of digital information. For the effective communication of data, it has some characteristics as:

- Data delivery (data should be delivered to the correct destination)
- Accuracy (delivered data should be accurate)
- Timeliness (delivery of data should be without delay)
- Jitter (network splits the data for easy communication that creates variation in arrival of data packets)

5.9.1 Components of Data Communications

There are some necessary components of data communications, which allows smooth communication as:

- Data / Message
- Sender (source)
- Receiver (destination)

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- Transmission Medium
- Protocol

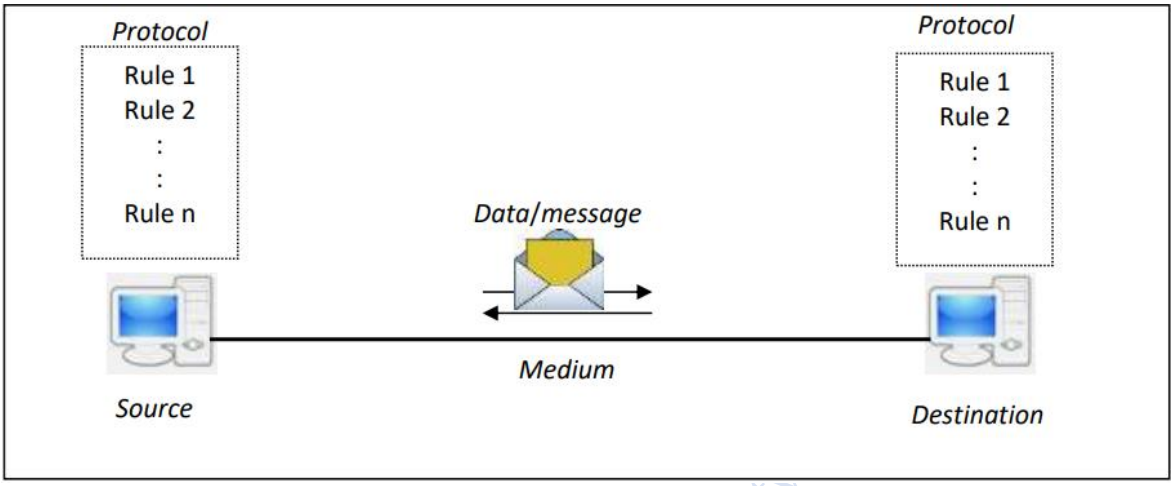

Fig5: Components of Data Communication

5.11 NETWORKING

Networking is the exchange of information or data at a common platform or ground. This can be done for professional interest, social interest or personal. Networking is possible with communication devices interconnected, which is used to transmit with protocols. For the networking computers and more other devices, machines are connecting people for transferring the data / information.

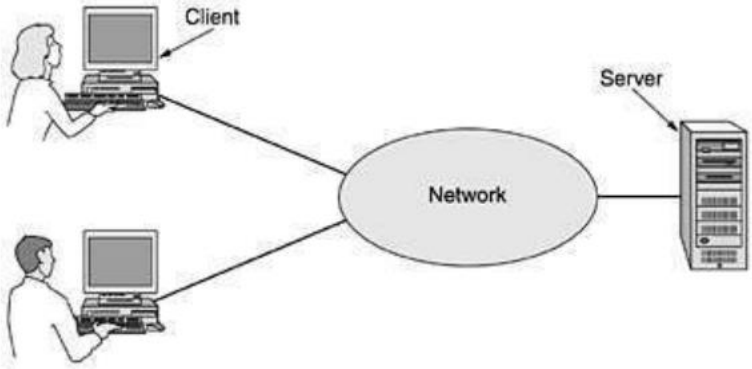

Fig6: Diagram of Networking

According to the working and geographical structure computers are networked as:

- LAN (Local Area Network)

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- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

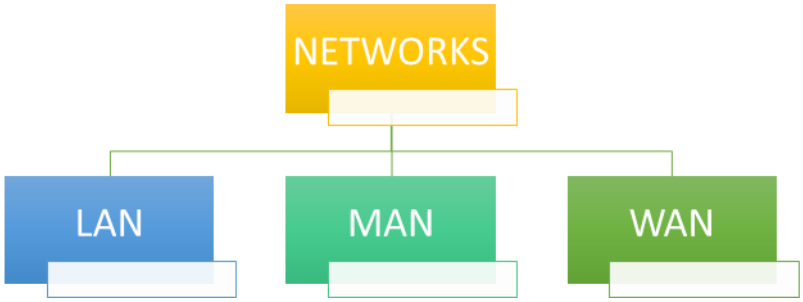

Fig 7: Types of Networks

5.11.1 LAN (Local Area Network)

LAN is a network, designed to operate small physical areas such as an office, enterprise, factory, home or a group of buildings. It is very easy to design and troubleshoot as well as in exchanging & sharing of information, resources. They all are connected to a single cable in different types of structures. Here, structure means physical structure of connection is called Topology. LAN can be connected in any of the topology as Bus, Tree, Star, and Ring. Usually, LAN connections are privately owned network.

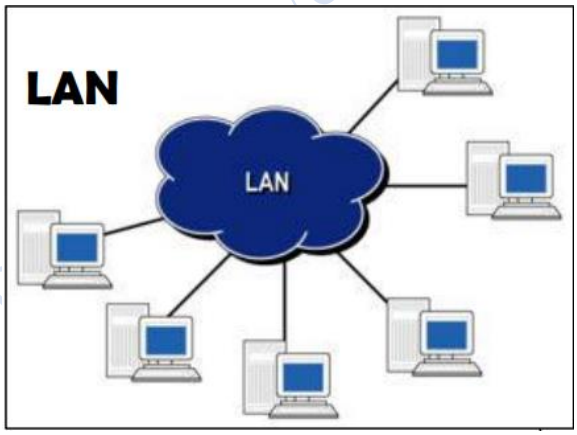

Fig 8: LAN network connection

LAN network connects different computers, mobiles, tablets, printer, and scanner etc., placed at limited distance. The geographical area of LAN network is very limited; range from a single room, a floor, an office, a lab, a school, college or within campus etc. The connectivity of LAN can be done by different means such as cables, fibre optics, Ethernet cables or Wi-Fi.

This type of connectivity is comparatively secure; users can access other computers or resources in the network from the local server distributed. Due to short distance coverage,

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LAN connections provide the high-speed data transfer rates with very low cost, and usually varies from 10 Mbps to 1000 Mbps.

Over the different advantages, there are many disadvantages also discussed as. Where a lot of terminals are there in the network, then processing speed will be slow. Secondly, if there is any virus in one computer then it will proceed further within whole network. Next, if dedicated server fails, then work stored or shared will not be able to access or use.

5.11.2 MAN (Metropolitan Area Network)

MAN is an extended form of LAN network, covers a larger geographical area as a city, a town etc. It is not very easy to design like LAN network, as it covers larger area so troubleshooting is little time taking. MAN network also can be connected to any type of topology as ring, star. These types of connections can be privately owned or public.

MAN network connects different LAN connections in it or with different devices or type of connections at longer distance or in larger network. This type of connectivity can be done through cable, fibre optics, and co-axial cables, PSTN or Wi-Fi. The speed of data transfer is moderate and ranges from 100 Mbps to 1000 Mbps but it considerably less as compared to LAN. It is used to provide link to the shared connection to other networks using WAN. This network typically covers area between 5 Km to 50 Km, although it can be less than that.

A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations. Examples of MAN: Telephone company network that provides a high-speed DSL to customers and cable TV network, also used in government agencies and University campuses.

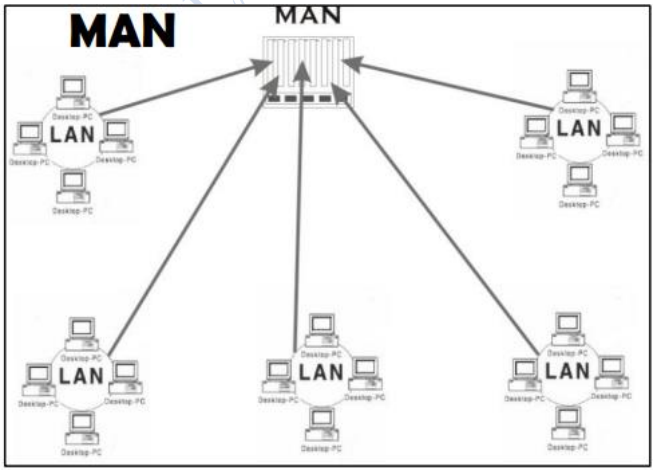

Fig 9: MAN network connection

MAN network also holds some disadvantages as it is hard to design and maintain. It is fewer faults tolerant and costlier also for implementing. MAN connection shows much congestion while connecting and working.

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5.11.3 WAN (Wide Area Network)

WAN (Wide area network) is the largest spread network that covers a large geographical are comprising a region, a country, a continent or even the world. So, it spans over very large-distances and can connect widely separated computer or clients or networks very easily. A WAN can include various LAN and MAN networks or can be connected separately with different types of technologies. It can transfer or transmit any type of data as image, audio, video or any information over the long distances.

The mode of transmission and communication in WAN can either be wired or wireless. Telephone lines used for wired communications and satellite links for wireless connections ranges beyond 100 Kms for connecting huge mass of people. It also facilitates the sharing of regional resource. The communication links provided by the WAN are public carriers like telephone networks, network providers, cable systems, fiber optics, satellites etc…

Large business enterprises, educational institutions and government organizations connect their different branches / offices at different locations across the world through WAN. The Internet is WAN that connects billions of computers, smartphones and millions of LANs from different continents across the whole world.

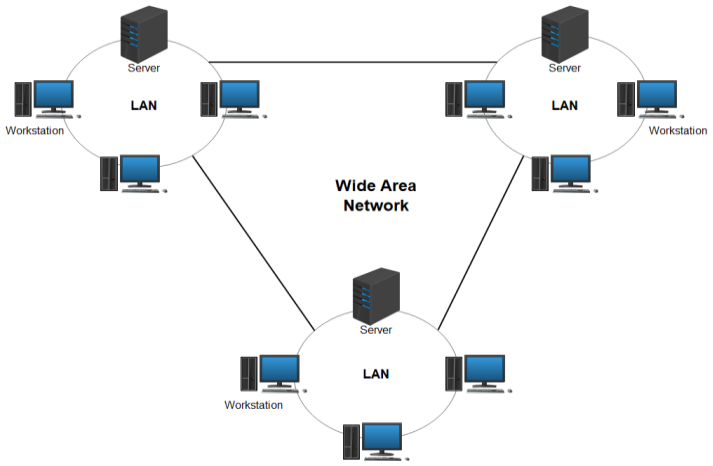

Fig 9: WAN network connection

The speed of transferring data is typically low and high propagation delay means speed of communication is low and having higher error rate. WAN network is very complex to design, used in different types of physical structures. It is networked in topologies as star, ring, tree, mesh, bus, or hybrid structure. It is using different types of protocols according to need, speed, span and geographical area such as ISDN, SONET, SDLC, SMDS, HDLC etc…

WAN is using both types of network ownership either private or public. Its types of network are also based on functionality of the network as peer to peer network or client server

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network. WAN supports transmission media of both types as guided media or unguided media.

Despite of many advantages, disadvantages are more. Firstly, it faces security problems in the network, secondly, higher setup cost, server down and disconnection issues are major. Examples, railway reservation system, satellite systems, stock brokerage, banking, e-commerce, m-commerce etc…

Difference between LAN, MAN AND WAN:

S.NO.	LAN	MAN	WAN
1.	LAN is defined as a computer network that links the local areas like schools, universities, organizations, etc.	MAN is defined as a computer network that links the metropolitan areas.	WAN is defined as the telecommunications network that covers a large geographical area.
2.	The full form of the LAN is Local Area Network	The full form of MAN is Metropolitan Area Network.	The full form of WAN is a Wide Area Network
3.	LAN is a wired network, i.e., all the computers and printers are connected through wires	The connections in MAN are connected through modem or cables/ wires.	The network of WAN is connected through broadband services, 3G or 4G internet services, etc.
4.	The ownership of LAN is private.	The ownership of MAN might be public or private.	The ownership of WAN might be private or public.
5.	The internet speed of LAN is very high, i.e., 1000 Mbps.	The sped of MAN is moderate, i.e., 44-155 Mbps.	The speed of WAN is relatively less than MAN and LAN, i.e., 150 Mbps
6.	The maintenance cost of LAN is easy.	The maintenance cost of MAN is difficult	The maintenance cost of WAN is difficult.

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5.12 INTERNET SERVICE PROVIDERS

Internet service providers are for providing internet connection services to individual systems and organisation. In other words, ISP is an intermediary, which connects internet by specialised lines and access to the internet. It is possible through authenticated user ID and

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password by using modem or other connecting devices. In addition to that they also provide software packages, working platforms and virtual accounts, many other services. ISPs are providing connections in the form of broadband or non-broadband. ISP may be of any type as, cable, fibre, DSL (Digital Subscriber Line), and satellite internet. Main functions of ISP are:

- Provide a link
- Hosting

5.12.1 Provide a Link:

To establish communication between you and ISP, a simple protocol is used PPP (Point to Point Protocol). PPP is a protocol making possible for two remote computers to communicate without having an IP address. So, internet connectivity between you and the service provider is established by the PPP protocol which is characterized by:

- a telephone call
- initialization of communication
- verification of the user name (login or user-id)
- verification of the password

5.12.2 Hosting:

After establishing communication connection between two remote computers, ISP lends you an IP address for being connected to internet is called 'Hosting'. However, this IP address is not fixed for connecting every time, because ISP has thousands of addresses. Whenever you will connect to the internet with your user id and password, whichever address will be free, you will connect with that. Therefore, connection is a proxy connection, it's your ISP who sends all the requests you make.

5.12.3 Types of ISP

ISP can broadly be classified into six categories as:

- Access Providers
- Mailbox Providers
- Hosting ISPs
- Virtual ISPs
- Free ISPs

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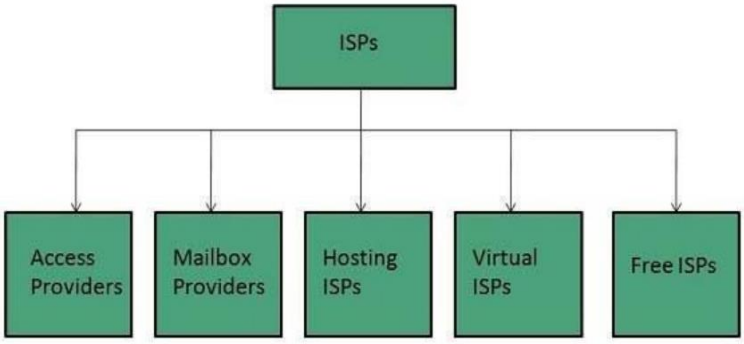

Fig 10: ISPs

5.13 APPLICATION SERVICE PROVIDERS

With the growth of Information Technology & Internet, the term outsourcing came for the expansion of networked infrastructure. Outsourcing led to the emergence of a new model for providing these services, is named as 'Application Service Provider' (ASP). Examples of such applications SAP and FileMaker.

ASP is a third-party application provider, which provides access to different applications, platforms etc. to multiple customers over the network. The service of an application service provider comprises the lease of usage time of software applications they own. It facilitates and manages application software, system hardware and other services on behalf of customers. The main functions of ASP are:

- Outsourcing
- Internet computing
- Packaged enterprise applications

5.12.1 Characteristics of ASP

There are many characteristics of ASP, which fascinates the customers, are:

- Applications-centric
- Centrally managed
- Point to multi-point service model
- Sells application access
- Delivers services based on contract

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5.14 SUMMARY

Management system, basically a synchronisation of interrelated units of the business enterprises for achieving their objectives and fulfil targets. So, Integration of Management System is necessary and important goal to manage their processes and systems for better performances. These organisations develop roadmaps for management with the help of technology. Technology play important role for the synchronisation of units with less errors and within budget.

To set goals and incur more profits, organisations are automating their management systems with the help of application supportive technology. The control of the software automation is fulfilled by Application Portfolio Development. All IT applications under application portfolio are business centric, which ensure the value addition & reliability of the application portfolio to attain their goals. These applications are enhancing the development of enterprises.

Analysing, assessing and synchronization of business roadmaps with technology needs some medium. So, Internet is the basic communication medium of organisations. The internet used in different applications to meet the requirement of different people at different places in different time. Business organisations are widely using the Internet, for the management of business; they connect and correlate information among organisations'. The main purpose of internet for the organisations can be listed as Resource sharing, Information sharing, connecting people, E-commerce, E-services etc.

To facilitate the organisations, technology has other options also in the form of Intranet & Extranet. The ***Intranet*** is to share and exchange of information within the organisation among internal computing resources. It facilitates the working in groups and for telecommunication. So, it is the web-based architecture for managing internal information with the help of internet tools, protocols, and technology. The working of Intranet is accessible through public internet as well as local connectivity. Extranet is nothing, but in simple terms 'extension of intranet' only, i.e. a private network of linked many cooperating organisation outside the walls of same organisation. ***Extranet*** is providing services with the help of existing intranet interactive infrastructure. So, Extranet is more economical for proprietary network by using same standard servers, clients and web applications as well as browser.

5.15 GLOSSARY

IT: Information Technology

ARPANET: Under the American defence department, ARPANET was introduced for communication and exchange of information.

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GPS: Global Positioning System is a satellite-based radio-navigation system owned by US govt. and operated by US space force.

URL: URL stands for uniform resource locator. It is nothing more than the address of a given unique resource on the web.

PROTOCOL: Organisations under the Internet Society, decide some set of rules called as "**Protocols**", for communication on Internet, for smooth working. Other than societies, some networks have their own rules, which they follow internally only within their network, not on global Internet.

INTRANET: Intranet is 'Internal Internet' of the organisation. The main motive or purpose of the Intranet is to share and exchange of information within the organisation among internal computing resources.

ERP: ERP stands for Enterprise Resource Planning. It is the integrated management system of main processes, procedure of the organisation in real time and meditated by software technology.

TCP / IP: It stands for transmission control protocol / internet protocol. It is the set of communication protocols used in the internet and similar computer networks.

VPN: VPN stands for virtual private network. It is extension of private network across the public network and enables users to share information in a shielded environment.

E-COMMERCE: E-commerce is the activity of electronically buying or selling of products on online services or over the Internet.

M-COMMERCE: It is Mobile Commerce. According to the Mobile Commerce Forum, "the delivery of electronic commerce capabilities directly into the consumer's hand, anywhere, via wireless technology." So that is possible only through the mobiles.

LAN: LAN stands for local area network. It is a computer network that interconnects computer clients within a limited geographic range, some of the examples are school, university, laboratory, office building etc…

MAN: MAN is metropolitan area network, a larger network than LAN. It connects systems within the metropolitan area, have covered area of city, town, multiple buildings, etc…

ISP: ISP stands for internet service providers. An internet service provider is an organisation of providing internet services. ISP can be organised in various frameworks, such as commercial, community-owned, non-profit organisation.

ASP: ASP stands for application service providers. ASP offers access to applications and related services over the internet. It provides different software and platforms for work also.

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5.16 SELF-ASSESSMENT QUESTIONS

1. What is a protocol?
2. What are the major differences between a LAN and a WAN?
3. What IT organization design variables are affected by networks?
4. Pick a specific company, and describe how it might make use of the Internet.
5. What is an Intranet? What is its role in an organization?
6. What is the purpose of a LAN?
7. What is the importance Management System Integration?
8. Explain the need of Application Portfolio Development?
9. Differentiate between Intranet and Extranet?
10. How business enterprises are dependent on Internet Technology?
11. Explain the role of ASP & ISP IN Internet Technology?
12. Explain the use of the Internet in our daily lives.

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