LESSON 1

LIBRARY AS A SOCIAL INSTITUTION

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1.1 LEARNING OBJECTIVES

This unit provides an outline of the library from society's perspective.
On completion of this unit, the learners will be able to:

- Understand what is the actual meaning of library

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- Explain the meaning, purpose and importance of society
- Explain the various types of society
- Describe the objectives and functions of library as a social institutions
- Elaborate the functional role of library in society

1.2 INTRODUCTION

This Unit introduces you to some of the basic concepts of society, modern society and library. A basic level of understanding is given about library, its need and purpose, importance, types, functions. It also discusses the objectives and functions of library as a social institution. Further, the Unit explains how library as an institution serves the society focusing in particular on roles that libraries play in the cultural, educational and research institutions and in all such other institutions that are vital to the mankind.

1.3 Society: Meaning and Definition

Society: Meaning

Man is a social animal and society is the "web of social relationships". Being a social animal, man wants to communicate with his fellow-beings to build a social relationship.

Society can also be called Human society. A thoroughly informed understanding of all of the past intellectual achievements of mankind is essential for the survival of human society, as is maintaining a constant awareness of the expanding body of knowledge in the humanities, social sciences, sciences, and technology fields. The transition from the Stone Age to the age of technology has been a long one for human civilisation. Information is the foundation upon which the technical age in which we currently reside and the technological revolution that we are witnessing today are built. Thus, information is at the core of our current society. It would be appropriate to emphasise that information is produced today at an alarming rate that is unimaginable. Every discipline has a tremendous ocean of information. Every member in the society, regardless of whether they are a student, researcher, specialist, layperson, professional, industrialist, worker, child, or elderly person, needs information of some kind. In order to maximise benefits, the information deluge must therefore be managed, analysed, and channelled. This implies that the available information must be gathered and disseminated in order for the appropriate information to reach the appropriate user. And there is probably no better institution than a library for gathering, evaluating, storing, and disseminating accurate information to the in need user, as well as for identifying and locating the accurate user for accurate information. To suit its many demands, society has created and maintained a number of institutions. One such organisation that attends to its informational, cultural, recreational, and educational needs is the public library. The institutions that modern

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man has discovered to get around this complexity are libraries. For the sake of all humans, the man must therefore absorb and apply this oceanic wisdom. As a result, libraries are crucial for society's informational demands.

Society: Definition

According to Merriam-Webster Dictionary, Society is defined as **"**a community, nation, or broad grouping of people having common traditions, institutions, and collective activities and interests"("Definition of SOCIETY," n.d.)**.**

According to Cambridge Dictionary, a society is "a large group of people who live together in an organized way, making decisions about how to do things and sharing the work that needs to be done. All the people in a country, or in several similar countries, can be referred to as a society"("SOCIETY | Meaning in the Cambridge English Dictionary," n.d.)**.**

"Society is a structured composition of individuals in groups, communities, institutions and associations that exist together for their mutual benefits Libraries: Basics and Contexts 9 and for the benefit of humanity. Society may also be viewed as a process of reciprocal, social and complex relationships among all components of the society"(Rajan, 2017a).

1.3.1 Types of Society

There are various kinds of societies in the world. Here we are going to discuss about Human Societies.

Human societies are majorly defined in five categories as shown in below figure. Let's discuss each one by one.

1. **Hunting-Gathering Society:**
    a. Earliest form of human society
    b. Smallest size(family bands)
    c. Most time spend looking for food
    d. Very nomadic
    e. Very low developed division of labor
    f. Longest lasting society(99% of all societal time)-59 minutes and 51 seconds on the societal time clock
2. **Horticultural society**
    a. Villages(less than a hundred inhabitants to several hundred)
    b. Family clans and others

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c. Domestication of plants and animals
d. Semi-nomadic
e. Food production is a major social effort
f. Division of labor evolves especially by gender
g. Religious and military leader roles
h. 3.6 seconds on the societal time clock

3. **Agrarian society**

a. Developed large-scale agriculture
b. Large societies with large cities
c. Multiethnic society
d. Large division of labor
e. Farming technology roles (government, religion, business, etc.)
f. Peasants are the largest class (50 % or more of population)
g. 5.2 seconds on the societal time clock

4. **Industrial society**

a. Most developed form of human society
b. Nation-states
c. Mega populations (metropolis)
d. Advanced technology in many fields
e. Less than 10% of population is involved in food production
f. Very detailed division of labor (gender roles remain)
g. Enormous capacity to destroy other societies
h. Less than one second old on the societal time clock

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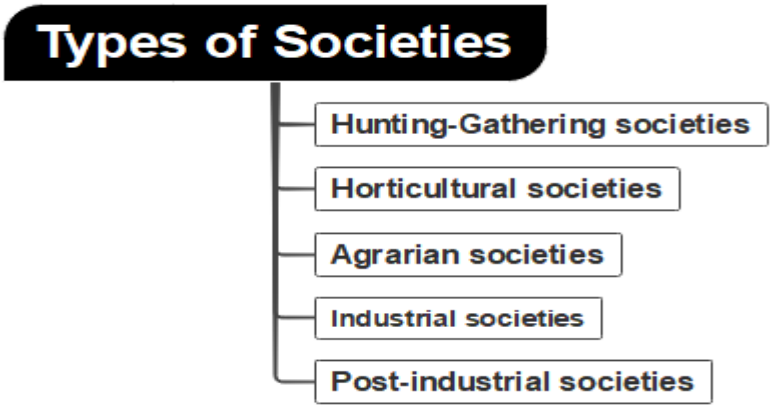

Fig.1.1: Types of Societies
(Source:("Welcome to the Dr. Nestor Rodriguez's Introduction to Sociology Webpage," n.d.)**)**

1.4 Modern Society: Meaning

The library can be seen of as a modern temple in the modern day where everybody, regardless of caste, creed, religion, or sex, can receive knowledge.

Today's civilization is becoming more integrated and self-aware as we enter a new era. It is known as Modern Society. The modern world is transitioning to an information society where knowledge and information are the primary agents of, and drivers of, change. Organizations and countries generally gravitate toward globalisation and more open working practises in contemporary culture. Barriers related to geography, time, and culture are no longer a problem. Across barriers, communication is possible between people. They have access to a huge pool of resources' talent, knowledge, and material. Variation from the prior standard is becoming something that should be intentionally planned in education. The modern society has many requirements, not the least of which is education, in addition to all these developments in the consumerization of products and services and changes taking place in the social and cultural sphere. Education fosters the development of informed, knowledgeable, and responsible people who can contribute to the advancement of the country. The objective is for society to be economically prosperous. Clearly, technical advancements brought about by research and the large volumes of information it makes available to us must support efforts geared toward this objective. Throughout its history, society has created a variety of institutions. Schools, colleges, and universities as well as research facilities, cultural organisations, institutions for the arts and entertainment, as well as commercial and industrial entities are only a few examples. In fact, among all the institutions established by society, libraries and their contemporary equivalents are effective

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at satisfying a range of needs of various modern society users(Satyanarayana, 2017). Modern civilised culture understands the value of public libraries. The public library system plays a significant role in the advancement of science and technology in society. It took place in American society, when public libraries were very important to people's social lives.

1.4.1 Evolution of Modern Society

A dynamic society is one that evolves over time. The course of humanity has been determined and changed by significant revolutions that have occurred in civilization throughout the previous few centuries. The agricultural, industrial, information and communication technology (ICT) and knowledge revolutions all had an impact on society, and each had unique characteristics.

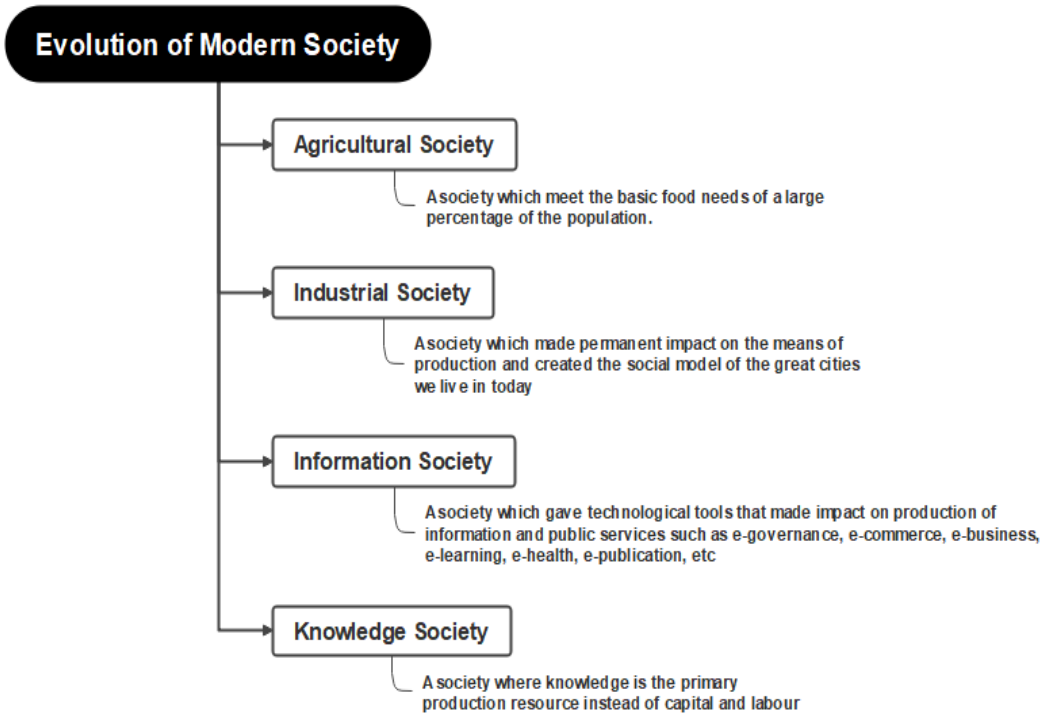

Fig.1.2: Evolution of Modern Society (Source: (Rajan, 2017a))

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IN-TEXT QUESTIONS

1. A Society is a group of people who___
   a) Jargons live together in an organized way
   b) Making decisions about how to do things
   c) Sharing the work that needs to be done
   d) All of these.
2. Modern Society comprise of___
   a) Agricultural Society b) Industrial Society
   c) Information Society d) All of these.

1.5 Library: Concept, Meaning and Definition

Library Concept

The word 'library', which in English refers to a collection of books gathered for study, research, reference and recreation, is derived from the Latin liber, "a book". But the word libraire in French does not have the same meaning, being used to denote a bookshop or, by extension, a publisher; the word used in many other countries to signify a collection of books(public or private), is derived from a Latinized Greek word, bibliotheca: hence bibliotheque in French, biblioteca in Italian and Spanish, Bibliothek in German, biblioteka in Russian. In Japanese, the word is toshoshitsu. The use of the word library to denote a building, room, set of rooms in which a collection of books is housed and organized in also common.

Library: Meaning

According to Encyclopedia Britannica "library is a collection of books used for reading or study, or the building or room in which such a collection is kept"("Library | Britannica," n.d.).

Reading materials were to be gathered, organised, and preserved by the library and made available on demand. A library was believed to be operating effectively if it could carry out these four tasks. However, a library cannot limit its operations to just these four domains in the current environment. The library of today opened its doors to a much wider audience in addition to leaving its four walls in order to reach more people than the library of yesterday.

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"As gateways to knowledge and culture, libraries play a fundamental role in society. The resources and services they offer create opportunities for learning, support literacy and education, and help shape the new ideas and perspectives that are central to a creative and innovative society. They also help ensure an authentic record of knowledge created and accumulated by past generations. In a world without libraries, it would be difficult to advance research and human knowledge or preserve the world's cumulative knowledge and heritage for future generations"("Guaranteeing Access to Knowledge," n.d.).

Library: Definition

Dr. S. R. Ranganathan, father of library science in India describes the library as "a public institution or establishment charged with the care and collection of books and the duty of making them accessible to those who require the use of them".

According to ODLIS: Online Dictionary for Library and Information Science:

"Library" derives from the Latin word liber, which means "book." The equivalent word in Greek and the Romance languages is bibliotheca. a collection of books and/or other printed or digital information that has been organised and kept up for usage (reading, consultation, study, research, etc.). Staffed by librarians and other workers educated to provide services to satisfy user demands, institutional libraries are set up to allow access by a particular clientele. By extension, the space, structure, or establishment that contains a collection of this nature, typically but not necessarily created for that use"(*ODLIS L*, n.d.).

The Oxford Learner's Dictionary defines library as "a building in which collections of books, newspapers, etc. and sometimes films and recorded music are kept for people to read, study or borrow" ("Library Noun - Definition, Pictures, Pronunciation and Usage Notes | Oxford Advanced Learner's Dictionary at OxfordLearnersDictionaries.Com," n.d.).

The Glossary of Library & Information Science define Library as – "A library is a collection of sources of information and similar resources, made accessible to a defined community for reference or borrowing. It provides physical or digital access to material, and may be a physical building or room, or a virtual space, or both. A library's collection can include books, periodicals, newspapers, manuscripts, films, maps, prints, documents, microform, CDs, cassettes, videotapes, DVDs, Blu-ray Discs, e-books, audiobooks, databases, and other formats. Libraries range in size from a few shelves of books to several million items. In addition to providing materials, libraries also provide the services of librarians who are experts at finding and organizing information and at interpreting information needs. Libraries often provide quiet areas for studying, and they also often offer common areas to facilitate group study and collaboration. Libraries often provide public facilities for access to their electronic resources and the Internet. Modern libraries are

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increasingly being redefined as places to get unrestricted access to information in many formats and from many sources. They are extending services beyond the physical walls of a building, by providing material accessible by electronic means, and by providing the assistance of librarians in navigating and analyzing very large amounts of information with a variety of digital tools"("Glossary of Library & Information Science," n.d.).

1.5.1 Need and Purpose

1. Establishing a library serves as a means of making available to everyone the archives of human thoughts, ideas, and expressions.
2. Library is one of the greatest potentials in our social and intellectual life. The library acts usually as a centre for interest for many scholars which cut across groups and serve the people individually in new groupings.
3. The goal of the library is to market, advertise, and promote its resources and services.
4. Libraries command respect in our societies.
5. Library feature vitally in our economic welfare.
6. They are crucially related to our intellectual, artistic and creative activities.
7. They are the vehicles of socio-political change.
8. The library also plays a significant role in academic institutions.
9. Libraries are gateway to knowledge and information.

1.5.2 Importance of Library

1. **Library for Better Education:** Libraries are necessary in society for better formal and informal education delivery. A nation's development is greatly influenced by the education it offers its citizens, from early childhood through old age. It seems sense that a library plays a part in offering non-formal education and lifelong learning to everyone.(Sharma, 1987).
2. **Libraries for adequate information:** Today's society is information based society where every individual need information of one or other type. Library plays a very important role in making this possible by providing the adequate information for its users according to their need.
3. **Library for Better Citizen:** A democratic society needs such citizen as are exposed to the environment around them and are well acquainted with the cultural, social, political, and economic heritage and development of the country. The role and

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responsibility of a library to make better citizen is more important and vital than providing facts and figures.

1.5.3 Types of Libraries

1. **Academic Libraries**: An academic library is a library attached to an academic institution, i.e. an institution engaged in teaching and/or research and imparting formal education to students who aspire to complete a particular course under a prescribed syllabus. Schools, colleges, universities, and technological/engineering/medical institutions are some of such institutions(Khanna, 1987).

2. **Public Libraries**: A library which is open for everyone irrespective of age, sex, occupation, affiliation and social or economic status is a public library. "Ranganathan also defines a public library as "as institution maintained for and by the community primarily for the social purpose of providing easy opportunity for self education throughout life of every person of the community".

3. **Special Libraries**: A library is an organised collection of audiovisual materials maintained for the use of its clientele. Collection and clientele are therefore the two factors that may determine the nature of a particular type of library.

4. **National Libraries**: A National Library is one which acquire, store and organize the complete set of national printed output and serve as depository of these materials. It also acquire and conserve rare documents such as manuscripts.

5. **Government Libraries**: Since the turn of the 20th century, governments have been held more accountable for the welfare of the populace in a number of areas of national growth and development. The necessity for library assistance for diverse sorts of information to deal with the operations of numerous ministries and departments of government was once more established as a result of this. Naturally, compared to other types of libraries, government ministries and departments have organised their libraries to fit their specific functional needs.

6. **Other Types of Libraries** The active growth of scientific and technological literature has been a highly noticeable aspect of the development of libraries since the middle of the 20th century. The majority of the new knowledge developed as a result of research efforts was published in academic magazines. This changed the requirements for active researchers and those connected to them, who now need to hunt for an increasing number of articles and research papers appearing in magazines and other publications other than books. From libraries, new kinds of institutions were developed. Depending on their functions and services, these were called by various names, including documentation centres, document delivery centres, information

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centres, information analysis centres, knowledge centres, and so forth. Information brokers and other sorts of information business institutions, as well as commercial information services, began to emerge. However, we are not talking about these institutions in this Unit; we are only bringing them up here to let you know they exist.

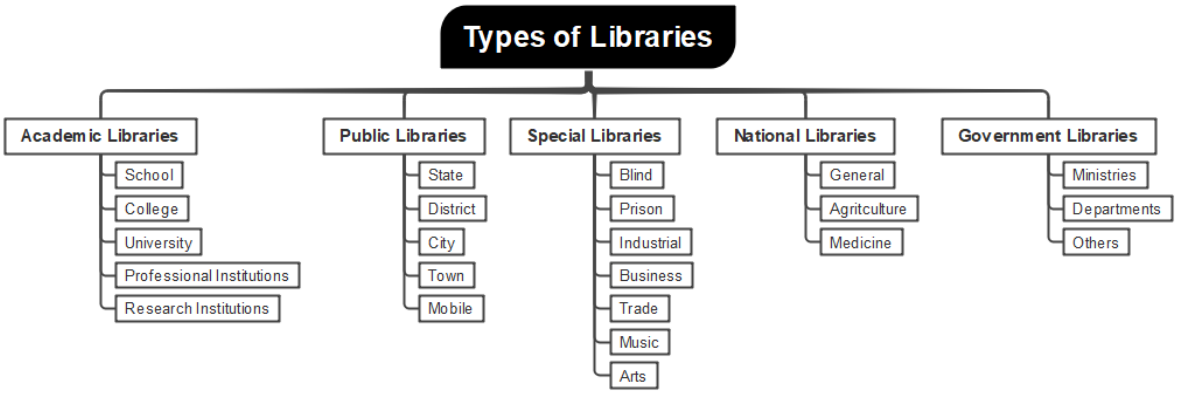

Fig.1.3: Types of Libraries (Source: (Rajan, 2017b)**)**

IN-TEXT QUESTIONS

3. The term Library is made of the word_____.
   a) Liber b) Libra
   c) Liberae d) Libre
4. Library is a collection of _____.
   a) Periodicals b) E-books
   c) Books d) All of These

1.6 Library as a "Social Institution"

The gateway to knowledge and information is the library. The evolution of libraries and society over time indicates a strong connection between both. The Library has been the primary repository for knowledge and concepts amassed by man in his battle to destroy the physical universe, leading to his moon landing and planned Mars walk, to relate to the society of his fellow beings efficiently, and to develop his mental and spiritual capabilities. The civilization has conserved its cultural heritage—essential to human education and intellectual exchange—through libraries (including, of course, museums). The facts, ideas,

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and innovations of man are intertwined with the processes of societal change, and each new concept or invention arises from previously acquired and maintained knowledge.

These days, we consider libraries to be "social institutions." It is a result of society's growth of culture. The preservation of the past is implied by the conventional purpose of culture, which is to help a people survive. Libraries not only preserve our culture, but also, as channels of communication, they are essential to its dissemination. Its designation as the "community's intellectual centre" and "the mind of society" indicate its role in influencing how the community lives. (Vyas, 1993)The library is a community centre that is managed by, for, and with the help of its patrons. The development of society has benefited greatly from the libraries. The man does not survive just on bread. He has a predisposition to naturally seek out the knowledge required for the growth of cultural and spiritual values. The man needs good amusement for his free time, and until he finds it, he engages in illegal behaviour since the devil loves an idle mind. Therefore, it should be our goal for each person to live a cultured and wealthy life with the aid of society. It is the collective duty of society's members to gain knowledge in order to realise their ideals. Libraries are necessary for society to provide better formal and informal education. A nation's development is greatly influenced by the education it offers its citizens, from early childhood through old age. It seems sense that a library plays a part in offering non-formal education and lifelong learning to everyone. People who live in a society should be aware of current events in nature, society, and themselves. The only places where information should be gathered, stored, processed, and made available to the public are libraries. Since no society can fully evolve into a modern society without a library, it is regarded to be a significant social institution. Public libraries serve as the social centre of a community, while other kinds of libraries also serve as the centre of an institution.

Every society throughout history that aspired to economic prosperity required modern knowledge. They could only learn about the most recent designs, methods, and technologies at the library, and it is because to these endeavours that society as a whole experiences economic prosperity. For example, if a man is not given the right guidance, he will focus his energy on harmful and destructive pursuits. The pursuit of spiritual, cultural, and aesthetic ideals is a natural propensity of the human brain. He aspires to become the best version of himself. He requires wholesome enjoyment during his downtime, which may be found in decent publications like biographies, novels, dramas, and poetry. The library should support society by giving people access to reading material and by enabling people to live rich, cultured lives.

Social institutions

Educational institutions like schools, colleges, universities, institutions for research and culture, music and art institutions, business institutions etc. are example of **Social institutions.** But these institutions do not cater to more than one or two needs of the society,

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whereas the public library caters to all the needs of the society. It provides information on all topics to the users.

For instance, the primary goal of school-age children is to learn, but this knowledge is constrained to what the teacher has taught and what is provided in the textbooks. In contrast, the library has a sufficient amount of material on hand on all topics, allowing users to gain knowledge while also developing their creativity. The library also helps people learn to distinguish between right and wrong, assisting users in making the best choice at the appropriate time. To suit its many demands, society has created and maintained a number of institutions. One such organisation that attends to its informational, cultural, recreational, and educational needs is the public library.

Below are some examples of various institutions that meet the requirements of society in terms of education, culture, recreation, and information:

Table 1.1: Social Institutions and its Activities (Source: (Chowdhary, 2007))

Activities	**Social Institutions**
Formal Education for different levels	**Schools(primary and secondary), colleges, universities, professional and vocational institutions, TV(distance education), etc.**
Cultural Activities	**Different literacy, music, dance, drama, fine arts, folk literature and arts, academics and cultural organizations, TV, radio, etc.**
Recreational and leisure time activities	**Theatres, cinemas, sports & games organizations, TV, radio, etc.**
Information Activities	**Different government and non-government institutions and organizations, newspaper, radio, TV, etc.**
Educational, Cultural, Recreational and societal Information activities	**Libraries and museums - public libraries**

1.6.1 Objectives of Library as a Social Institution

In his work "Library Manual", S.R. Ranganathan hails the library as a "Social Institution" and lays down for it the following objectives:

1. it should help the life-long self-education of one and all;
2. it should furnish up-to-date facts and information on all subjects to one and all;

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3. it should distribute, in an unbiased and balanced way, all shades of recorded view and thought to one and all, as a help in discharge of their political functions in respect of local, national, and inter-national affairs;
4. it should contribute to productivity-drive by informing top-managements of the latest trends in diverse enterprises, by ploughing back into the minds of researchers, designers, and technologists every piece of relevant new thought, promptly and pin-pointedly;
5. it should provide to one and all a harmless and elevating use of leisure;
6. it should preserve the literary remains of humanity for posterity, as vehicles of culture and as source materials for antiquarian research; and in general
7. it should work for continued social well-being, as the agency in charge of all socialized recorded thought.

Thus a library has educational, informational, political, economic, industrial, cultural, and antiquarian objectives.

1.6.2 Functions of Library as a Social Institution

1. **Providing Materials:** Being a social institution, the library's constant function is to provide and service materials for enlarging the mind and dispelling prejudice and ignorance. It implies the necessity of making access to the truth easy and rapid for anyone who seeks it. The library must be current as well as retrospective.
2. **Servicing the Materials:** Providing materials is only the first step. The second basic function that which differentiates a library from a mere collection of books and other materials, is service. The services performed by a modern library includes the organization of material to make it easily accessible through self-arrangement, classification, and cataloguing; lending of material so that it may be used at the time and place most suited to the public; and guidance to assist the users to find what he wishes, either in the materials immediately at hand or in whatever library may possess it.
3. **Prime Educational Functions:** Convinced of the fact that books and reading have a powerful influence on society, the public library under dynamic leadership can become an active, and effective education centre. In the words of Ranganathan, "libraries are social institutions charged with the duty of providing the means for the perpetual self-education of one and all", leading to material happiness, mental joy, spiritual delight and the spread of mass literacy. Library's chief function is to serve as the lifelong university for the individual, in which he may find freely, without money and without price, an opportunity for the continuous development of all his powers.
4. **Adult Education:** The idea of adult education lay embedded in the realization that education is a life-long process, and that universal education is the very life-blood of modern society. The adult education is an effort put forth by a mature person to improve himself by acquiring new skills, information, under, attitudes, or appreciations or the

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effort of an agency to present the opportunity and the encouragement to mature persons for improving themselves or their community. Library is the most appropriate agency of adult education in so far as it provides both the requisite reading material and environment for informal reading. Probably, it inspired Alvin Johnson to hail the public library as a People's University and assigned it a vital role in fighting illiteracy and helping people in their intellectual, cultural and material advancement.

5. **Community's Information Centre:** Public library "is an indispensable basis for a community intelligence service". It was prophesised that "a free community book exchange is destined to be transformed into an active intelligence centre… a genuine community university, bringing intelligence, systematically and persuasively to bear on all adult affairs". The author of this statement, William S. Learned, persuasively enunciated the concept of the public library as the community's intellectual power-house, a centre for reliable, useful and up-to-information. A.H. Bill, too, argues that the library is not a collection of books but a collection of information in various forms, which has to be gathered, organized and fully exploited to be more fully and promptly available to each user according to his needs. The public library also provides facilities for the study of arts, trades and professions which contribute to the occupation of the inhabitants.
6. **Recreation:** The term 'Recreation' in library discussions denote "such use of leisure time as will promote personal happiness and social well-being". In persuance of its recreational function, the chief role of the public library is to provide material for relaxation, entertainment, adventure and escape. Library also organizes cultural activities for the entertainment of the public. Recreational uses of library services shade imperceptibly into those of an educational nature and from increased leisure matched by greater educational opportunity comes a readership that requires access to information and to recorded knowledge on a greater scale than before.
7. **Strengthening Democracy:** The public library is a product of modern democracy and a practical demonstration of democracy's faith in universal education as a life-long process. By throwing open the mine of recorded knowledge for effective use, critical evaluation and exploration, library encourages individuality, variety and dissent within a climate of tolerance- the anit-thesis of authoritarianism. Through the diffusion of education, the library strives to enhance equality and social justice, to promote intellectual freedom and advancement of knowledge, to generate in the young generation a sense of purposefulness and maximum dedication, confidence in themselves and faith in democracy's future.

1.7 Role of Libraries in a Society

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1. **Role as a disseminator:** Accroding to Shera the library's role in society as a disseminator of information. He characterizes the present age as being largely concerned with the utilization of applied science in the design of society, and writes that we are, therefore, very much depended upon the successful communication of information. The dissemination of information is, thus, one of the most basic of social activities, and one of the most essential. The value of such a service is indisputable.

2. **Library as a Place**

    - Information commons – a library model for learning
    - Offering architecturally designed building as a place that inspires interest in every one for academic pursuits

3. **Continuing Education:** Library and education are sister services: Education bereft of library service sounds like staging Hamlet without the Prince of Denmark.

    Education implies discipline and cultivation of the intellect; "an intellect able to operate well in all fields". Of course, the importance of formal education imparted through a social, a college, or a university can hardly be over-exaggerated, yet education does not end with one's formal education. As Carroll V. Newsom has aptly remarked, "All education is really self-education" Learning cannot be passive, one who would develop the powers of his mind must seek deliberately 'to match his wits' with problems of his mind must seek deliberately. A person learn to think by learning. It is now being increasingly realized that self-education permeates the entire life of the individual from cradle to the grave. Informal education cultivates in individual the virtues of self-help, self-confidence, self-reliance, and initiative. And the most appropriate agency of continuing education for people of all ages is the public library. If the society has an obligation to feed, clothe and house the people comfortably, it has a similar moral obligation to educate them and to feed them with mental food through educational institutions and libraries, respectively. This twin obligation is the sine qua non of a modern society, which flourishes when it nourishes the belly, brawn and brain of its entire populace. Education and library are, therefore, two most important factors of social metamorphosis.

    In communities where there is no flow of appropriate reading materials and no stimulus to write, literacy, if it is to achieve its fullest role I society, is not passively to make books available when needed by a potential reader, but actively to stimulate the use of books.

4. **User Education Roles :**

    - Building good reading habits
    - Information literacy, computer literacy

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- Encouraging use of library collections and services

5. **Stimulation of Reading:** In stimulaton of reading habits among public, the public library plays a vital role. As a social agency, the most important function and a continuing activity of the libraries is the stimulation of reading and guidance of the reader in choosing his/her book in the form of planned reading programmes. Book talks and reviews, book lists and specialized bibliographies, displays and exhibits, browsing areas, open access, and teaching the use of specific library tools. The biggest contribution which libraries could make is to get people into libraries. Library must encourage reading at all levels and for different purposes: reading for education, reading for information, reading for seeking status, reading for emotional release, reading for self-realization-attaining Moksha or spiritual emancipation. With its network of branches, distribution points, book-mobiles and with its new responsibility towards children, new-literates, and other less favoured individuals as readers, the public library penetrates into country's remotest corners and reaches every reader.

6. **Roles in Higher Education**

- Supporting education, teaching research, and training in the society by providing access to knowledge resources, materials and by providing referrals (Traditional role)
- Dissemination and distribution of information/
- knowledge stored in such documents to stakeholders in education
- Serving as gateways to the collections of
- global libraries Supporting informal self-education and learning

7. **Research:** Research is the life-blood of modern society, as our economic standard of living, our culture, and our age of progress depend upon it. Research is an endeavour, to discover, develop, and verify knowledge. It is an intellectual act that begins with the asking of question and progresses through the cirtical examination of evidence that is both relevant and reliable. To the revelation of truth that is generalization and universal. Research, whether it endeavours to formulate new principles or theories and generalizations or concepts without concern for their application, requires an awareness of the state of existing knowledge and a free flow of information. It is at this point that library enters into the research process and helps in this advancement. The bed-rock of research is information. And it is the function of national, university, research and special libraries to disseminate information pin-pointed, exhaustively and expeditiously.

8. **Roles in Recreation :**

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- Supporting the educational, civic, and cultural activities of groups and organisations.

9. **Changing Dimensions :** Library is the only effective repository of our cultural heritage. The conservation of knowledge is basic and fundamental to the library. Library collections must be carefully built and conserved, but for the use and benefit of the community, present and future: not for their own sake, not for prestige, and not in any way for the satisfaction of librarians themselves.

    - Custody of archival materials should be secure, but not prohibitive
    - To be "a live depository of the cultural past that anticipates the future is not enough. The documents must be used to the largest possible extent and with least trouble
    - They must be used as tools for expanding the horizons of knowledge rather than guarded as treasure-troves.
    - Free library service for all is another changing dimension.. People belonging to the lower strata of society had not right to education; hence no right to books: library was created of, by the later half of the mid nineteenth century those who believed that education could save the world urgently needed to make the world safe for democreacy were in full cry. Library was considered the crowning glory of education
    - Cosistent ot its dynamic and changing role, the library plays a vital role in strengthening democracy.

10. **Social and Cultural Roles :**

    - Democratisation of information and knowledge in the society
    - Linking people to knowledge and information sources
    - Giving under-privileged sections of the society awareness about opportunities available in the society for their social and economic development
    - Community information resources
    - Community awareness about State programmes such as mass literacy
    - Organising cultural activities to promote social harmony such as book discussions, lectures on important topics
    - Supporting the civic and cultural activities of groups and organisations

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- Knowledge preservation for posterity
- Capturing and preserving traditional knowledge
- Serving as a gateway to local and national government

11. **Citadel of individualism :** Libraries, in Shera's view, are the stronghold of individualism. "To the library men come seeking trught, each in his own way and for his own ends. In the library the patron is not told what to think or when to think it, but in his search each must discover for himself the thoughts and opinions of others and try to understand them, to appreciate them for what they are, even though he may not share them". Needless to commend that library is a 'sanctuary' of independent thinking-the one securing hope of intellectual freedom as also a means of securing and safeguarding it. It is essential to encourage dissent which is so vital a factor for a healthy intellectual environment. The library, is, then, a forum for mutual understanding, for mutual cohesion, for mutual cooperation, and for mutual tolerance and peaceful co-existence- not as a homogenizing institution but as a unifying, living, and dynamically growing force(Khanna, 1987).

IN-TEXT QUESTIONS

5. Library is regarded as a
   a) Social Institution b) Private Institution
   c) Profit making institution d) None of these
6. Library plays an important role in _____ of individuals.
   a) Personality Development b) Old age
   c) Educational Development d) Physical Appearance

1.8 SUMMARY

Society is a web of social relationships. People who are part of a community sharing common interest build a society. Libraries are gateway to knowledge and information. Libraries and societies are interlinked to each other. Library provides accessibility and readability of its resources to each individual of society. The society needs library as much as the library needs the society. Today we are living in a modern society which is moving towards an information society where knowledge and information are two central instrument of change, force and direction of change.

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1.9 GLOSSARY

Library: In a library, books are kept, arranged, and shared among its patrons.

Society: People from several cultural groups, each with their own culture, residing in a particular area.

Modern Society: Societies that fall under the umbrella of the post-industrial, informational, and knowledge societies.

Information Society: Societies A society in which the primary activity is the generation, dissemination, and use of information.

Social Institution: Social institutions include places of education such as schools, colleges, universities, places of research and culture, places of music and art, places of business, etc.

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. (d) All of these. 2. (c) Information Society 3. (a) Liber	4. (d) All of these. 5. (a) Social Institution 6. (c) Educational Development

1.11 SELF-ASSESSMENT QUESTIONS

1. Library as a Social Institution. Elaborate.
2. Describe the role of Library in the society.

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LESSON 2

DEVELOPMENT OF LIBRARIES IN INDIA

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Library Historical Development in India
  1.3.1 Pre-Independence Period
  1.3.2 Post-Independence Period
1.4 Library Development in Modern India
  1.4.1 Plans
  1.4.2 Proposals
  1.4.3 Advisory Committee for Libraries
1.5 Library Development
  1.5.1 Library Science Training and Education
  1.5.2 Library Science Literature
  1.5.3 Role of Library Associations
  1.5.4 Library Legislation
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

After completing the lesson, you will be able to understand:

- The development of libraries during post-independence period
- The development of libraries during pre-independence period

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- The plan and proposals for development of libraries in modern India.

1.2 INTRODUCTION

This unit serves the purpose of providing you an overview of efforts made towards development of libraries in India pre-independence and post-independence. India is known for its tradition of scholarship and learning and for its cultural heritage. In ancient and medieval periods, there existed famous libraries around learning centres and places of religious worship. The rulers of the land in the medieval period had taken a deep interest in setting up libraries. During the sixteenth century, the work of Christian missionaries and introduction of printing resulted in the establishment of some libraries. However, the library movement in India may be regarded to have had a proper beginning only after the advent of British rule in the modern period. When English was introduced into the country and the British began to set up some modest educational facilities in the later half of the 19th century, libraries in the modern sense began to spring up in some places, notably the provincial capitals. It was only after the country attained Independence and the Five Year Plans began to be implemented that library development got attention. The successive Five Year Plans, which add up to nine, now, have ushered in library facilities on a large scale in the country(2017).

1.3 LIBRARY HISTORICAL DEVELOPMENT IN INDIA

The greatest failure in library development in India is our inability to develop a national library system. Such a system has a national library at its apex, supported by a central library in each state and special national libraries for disciplines like agriculture, medicine, atomic energy etc(Kumar, 1986).

At another level, sub-systems like academic library system, the government library system and the public library system provide the national library system the necessary sustenance.

A quick review of developments since independence is necessary to place library development in proper perspective. The late Maulana Abul Kalam Azad (Union Education Minister) is his address to the UNESCo seminar on the Development of Public Libraries in Asia on October 6, 1955 observed:

1.3.1 Pre-Independence Period:

1. **Pre-Vedic Age (5000 B.C. to 2500 B.C.):** Pre-Vedic period was the period of Indus Valley Civilization. The Harappa and Mohenjodaro excavations indicate the culture

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and civilization that developed and prospered during the period. It shows that the cities were well developed and planned, and people were cultured and civilized. According to R.K. Mukherjee and Hunter, the people of the Indus Valley Civilization had developed their own languages and script. The script had more than 400 words. The people could read and write. Most of the **Bhojpatras** are now extinct yet it provides as impression that such Bhojpatras could have been kept only in the libraries which were looked after by the Purohits(Vyas, 1993).

2. **Vedic Age (2500 B.C. to 500 B.C.):** This period belongs to the Aryans who came to India in 3000 B.C. They spoke Sanskrit and used **Brahmi Script**. The civilization developed during the period was rural oriented. The educational system was spread all over the country in the Gurukulas where people used to go to learn history, grammar, military science, astrology, music, medicine and religious scriptures. The Gurukulas had the libraries where books were kept for students to read and write. It was in this period that the great Vedas were composed. The 'Rishis' had learnt writing ability. Of course the Western scholars do not agree with the view that India had developed writing ability in the Vedic period. According to Gauri Shankar Hira Chand Ojha, the people had learnt writing during the period the man would show his feelings through drawings and other diagrammatic pictures. The only language developed during that time was the drawings drawn on a piece of paper or stone. These were the books. They collected the stones at one place and inscribed their feelings. Such places were called Libraries. Later **Bhojpatras** and **Tarpatras** were used for the writing. There are evidences that the rulers used to give maintenance grant for the libraries. They would go to the people and encourage them to read and write.

3. **Buddha Period (500 B.C. – 1200 A.D.):** Buddhism and Jainism had spread all over the Indian subcontinent in 6th century B.C. Buddhism received a state support i.e. it was a state religion. The Sanghas and the Mathas were established. These had a responsibility to collect book material and make number of copies. The people from the Far East came to India in the search of knowledge. The travelers recounted that the libraries did exist in the Nalanda University. The main centres of learning were Takshila, Nalanda, Odantipur, Vallabhi and Vikramshila, and these centres had big libraries. The travelers from the Far East i.e. China and Japan had carried with them religious books, and scriptures for proseletysing purpose. Excavations found in Turkistan desert revealed that the books were found in the sand, and these are still preserved. The Nalanda University was first destroyed by the Huns and later by Bakhtyar Khiljee in 1200 A.D. Bakhtyar Khiljee also destroyed the library of Vikramsila. Raja Bhoj had in his library 3000 manuscripts written on **Bhojpatras**. The library was controlled by the great poet Banabhatt.

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The Sangha is a slect band of monks and nuns who were giving training to spread Buddhism. Buddhism is divided into two sections: 1) Hinayana: Its literature is in Pali and mixed Sanskrit and 2) Mahayana: Its literature is in mixed and pure Sanskrit both.

Jainism also flourished in the same age. Lord Mahavira was the contemporary of Lord Buddha. He was the twenty fourth Tirthankara. The Kalpasutra of Bhadrabahu gives the life history of each Tirthankara. In Jainism writing manuscripts and their preservation was the main plank of the religious duty. It is said that many books and cannons finalized in the first council were lost. Second council proceedings were maintained which took the present shaping of Jainism. In the Jain Mandirs, there were separate rooms for keeping books which are called 'Upashrayas'. These 'Upashrayas' are found in Pune, Ahmedabad, Surat and Cambay. Some of the rare documents are still preserved in these places. In the South, it was the Sangam age which was flourishing. In this age there was a development of the library culture among people.

It is well known that the Hindu temples and the Buddhist monasteries made vigorous contribution to the intellectual life of the land between the year 400 A.D. and 1200 A.D. From 500 A.D. the monasteries began to play a conspicuous part, whereas the Hindu temples became active only from the 10th century. It is possible that educational activities might have commenced much earlier in the Hindu temples, but we are not yet in possession of conclusive evidence on the point. In the Medieval times (900 A.D. – 1400 A.D.) the Hindu temples continued to serve as seats of higher learning through the well known temple colleges which were very active in the Deccan. In later times, the Hindu Mathas also functioned on similar lines. The libraries containing **Palm-leaf** manuscripts existed as complements to these institutions.

Some of the important libraries of the Buddhist period were the following:

1. **Nalanda University Library**: The establishment of ancient Nalanda as an undisputed seat of learning was a historical consequence of its context. Ancient Magadha was characterized by an intellectual ferment unlike any known to humanity. The ability to meld multiple discourses and embrace knowledge in its entirety is what made Nalanda uniquely attractive for all seekers of knowledge. Historical sources indicate that the University had a long and illustrious life which lasted almost continually for 800 years from the fifth to the twelfth century CE. It was a completely residential university believed to have 2,000 teachers and 10,000 students. The Nalanda ruins reveal through their architectural components the holistic nature of knowledge that was sought and imparted at this University. It suggests a seamless co-existence between nature and man, and between living and learning.

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The profound knowledge of Nalanda's teachers attracted scholars from places as distant as China, Korea, Japan, Tibet, Mongolia, Turkey, Sri Lanka, and South East Asia. These scholars have left records about the ambience, architecture, and learning at this unique university. The most detailed accounts have come from Chinese scholars and the best known of these is Xuan Zang who carried back many hundred scriptures which were later translated into Chinese.

Thus, when the former President of India, the Hon'ble Dr. A.P.J. Abdul Kalam mooted the idea of reviving the ancient Nalanda University while addressing the Bihar State Legislative Assembly in March 2006, the first step towards realizing the dream of reinventing the old Nalanda had been taken. Almost simultaneously, the Singapore government presented the "Nalanda Proposal" to the Government of India suggesting the re-establishment of ancient Nalanda to make it as the focal point of Asia once again. In the same spirit, the State Government of Bihar was quick to adopt the visionary idea and consulted with the Government of India on the way ahead. At the same time, it began its search for a suitable location for the new Nalanda University. A stretch of 450 acres of land at the base of the picturesque Rajgir Hills was identified and acquired to house its campus. A high degree of cooperation between the State of Bihar and the Government of India, thus, marked the establishment of Nalanda University in its new avatara right from the outset.

As the hallmarks of the ancient Nalanda were its diversity, a knowledge ecosystem thriving on shared creation of new knowledge and an international outlook, these remain as the essence of the new Nalanda University as well. Thus, leaders of sixteen member states of the East Asia Summit (EAS) endorsed the proposal to re- establish Nalanda, when they met in the Philippines in January 2007. The chief inspiration was the historical Nalanda, of course. Yet, the proposal was as at once futuristic, for the ideals and standards of the ancient seat of learning have proven to be universal in their relevance as well as utility. We may even consider those to be the feasible solutions to a shared and sustainable future for all, not just Asia. This also tells us why the regional initiative for the revival of Nalanda University was unanimously and enthusiastically welcomed the world over. The idea garnered greater support subsequently. At the fourth EA Summit held in October 2009, at Hua Hin, Thailand, more members affirmed the merit of establishing the Nalanda University and encouraged the idea of regional networking and collaboration between the University and existing centers of excellence in East Asia. Finally, the project took off, when the Nalanda University Act 2010 was passed in both the Houses of the Indian Parliament. In September 2014, the University opened its doors for the first batch of students, a historic development after a gap nearly eight hundred years!("History and Revival," n.d.).

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Nalanda Univeristy Library: Nalanda University envisions its Library to be the central fulcrum of its master plan, both in terms of its design and bearing. The Library aims to become an apex resource center with the state-of-the-art resource (print and digital) and services. It will be a constant companion in the academic journey of the entire community of the University and contribute to the quest for creating new bodies of knowledge. The University library is committed to excellence in services and supporting intellectual inquiry, research and lifelong learning needs of the University community. Its vision is to provide seamless access to information through innovative services that drive intellectual exchange and foster interdisciplinary cross-campus research. It is also committed to building an intellectual center ensuring access to quality resources in a variety of easily accessible formats for the overall growth of students and teachers. Nalanda University Library is fully automated by KOHA integrated library management software("Overview," n.d.).

2. **Vallabhi University Library**: From I-tsing, we also learn that Vallabhi (modern Kathiawar) was as famous a centre of learning in the 7th century A.D. as Nalanda. A Vihara situated at some distance from the city perhaps was a seat of higher learning with a library attached to it, A grant from king Guhasena-I, dated 559 A.D., makes provision for the purchase of books for this library.

3. **Takshila University Library:** Takshila, in the northern India was acknowledged to be the most important seat of learning in the ancient valley of Sind. It was at that time the capital of the important province of Gandhara, situated about 20 miles west of Rawalpindi. It was an ancient centre of higher education specializing in Vedic literature. Students came to Takshila from far off centres such as Mithila, Ujjain, Rajgriha and Benares to congregate there. Though no authentic record is found about its library there is no doubt that this famous centre of learning had an adequate library of its own with considerable collection of the manuscripts relating to the subjects pursued therein. This university had continued to flourish down to the end of the Kushana rule (280 A.D.). Important feature of the library was to collect as many manuscripts as possible. The kings and the emperors and the learned scholars donated many

4. **Library under Cholas:** It is interesting to recall that the great Chola King, Raja Raja (985 A.D. – 1013 A.D.), when apprised of the fact that only a few stanzas of the famous Devaram hymns sung by Saints Jnanasmbandar (7th Century), Appar of Tiruvukkarasu (7th century) and Sundarar (8th century) were extinct out of the many thousands, he set out on a vigorous quest, and with the help of St. Nambiandar-Nambi recovered them in a room behind the sanctum of the famous Nataraja temple at Chidambaram. The retrieved pieces were compiled at the

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behest of the King by St. Nambiandar-Nambi himself into eleven Tirumurais (sacred books) and preserved for the posterity.

5. **Amaravati and Nagarjunakonda:** In South-India there was the Buddhist centre of culture at Amaravati and Nagarjuna Vidyapith on the banks of the river Krishna. It flourished in seventh century A.D. and was associated with Nagarjuna, one of the famous ancient Indian scholar. Nagarjuna was well known chemical scientist. Chinese scholars visited this place in search of knowledge. They had paid eloquent tribute to this university and its library. The University was a five storied building. The libray being housed at the top floor.

4. **Muslim Period (1200 A.D. – 1700 A.D.):** After the fall of Buddhism there was a rise of Muslims in India. The education was given in Arabic in this period. Agra, Delhi, Bidar, Golconda, Malwa, Allahabad, Sialkot, Rampur, Patna, Lucknow, Lahore and Bijapur became the centres of learning. Religious literature forms the main collection in these libraries. During the Muslim period the growth and development of the libraries received considerable encouragement. Fortunately, paper came to be used as writing material in the 12th century and this gave a great fillip to book production in this period, and the consequent enrichment of libraries. These rulers themselves were the great lovers of books and some of them even owned private collections. Babar's daughter, Gul-Badan Begum was one such. It is well knowm that Humayun tumbled from the balcony of his library and tumbled out of life. Akbar had zealously built a great library and had a large number of Sanskrit and other books translated into Persian to equip it. His favourite pastime was to have books he loved and read to him. Aurangazeb added to the Imperial Library many Muslim theological works. This library, built up by the interest of many sovereigns through a long period of time, was carried away to Persia by Nadir Shah when he sacked Delhi in 1739 A.D. The loss naturally resulted in a great set back to educational progress in the country.

   Mohammad Gawan, Ministry of Mohammad Shah (1463- 1482 A.D.) of the Bahamani Dynasty of the Deccan, built a Bidar a college which is said to have possessed a library of thousands of volumes.

   Mughal emperors had loved books and they were well known for this. First Mughal emperor Babar was a lover of books. His autobiography 'Babarnama' was found to be the best biographical piece of work written in Persian. His son emperor Humanyun was a scholar. He not only collected books in Arabic and Persian, but also in Sanskrit and other Indian languages and maintained his own library. His library, known as Delhi's Imperial Library was burnet by Nadir Shah. His great love for the books had left a deep imprint on his illustrious son Akbar. Humanyun appointed Lal Beg as the librarian of the Imperial Library. He was so fond of the books that even during expedition he carried a select library with him. While fleeing as a fugitive, Count

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Noer says, he took with him his librarian and a few of his favourite books. Akbar composed poetry which was full of wisdom. 'Ain-e-Akbari' and 'Akbarmama' were the books written by him. Akbar had his own library of 25,000 documents. His library could be divided into two parts: 1) Science and 2) History. He created a separated department of library to look after not only the State Library but also the public libraries located in the capital. Nazim, who was responsible for the libraries, was high administrative capability was his deputy. Although the Imperial Library was exclusively meant for the emperor, he allowed others to use its collection. Emperor Akbar took much delight in building up a collection of valuable books. Though he was not that scholarly and literary as his predecessors, yet he was a great listener who was always keen to learn new things. He was the most consummate reader. All the books were manuscripts in the library. A regular reader used to read before him a book.

Faizi the great Persian scholar was appointed by Akbar as the Librarian of the Imperial Library. When Faizi died his personal collection of 4600 books were shifted to the Imperial Library. These were numbered, catalogued and broadly classified by subject. One of the ministers of Akbar's court Abdul Rahim Khana also had his own library.

During the time of Jahangir any, unclaimed property was utilized of the development of the libraries. The idea behind establishing their libraries was to gain popularity. Dara Shikoh, son of Shah Jehan was a great shoclar. He translated the saced Gita and the Upanishads into Persian. In the Mughal period, the Adilshah Pustakalaya of Bijapur and Tanjore Pustakalaya at Thanjavur were main libraries. The state gave the development grant to the libraries. This was also the period of new movement in which many great saints of all faith were born like Sankara, Ramanuja, the Madhav, Vallabhacharya who shaped the destiny of our culture by preaching their own philosophy. This was a momentous creative period.

1. **Library of Tipu:** After the fall of Srirangapattnam in 1799 A.D. and the death of Tipu Sultan, his property was sold by public auction for the benefit of the captors, but his valuable library was ordered to be preserved entirely with the exception of a few manuscripts which were sent to the Asiatic Society of Bengal and the Universities of Oxford and Cambridge. Marquis Wellesley ordered that the library should be transferred to Fort William in Calcutta I 1804 A.D. It was attached to the college founded for the benefit of the junior civil servants of the East India Company to acquaint them with the sciences of 'the Asiatic Languages'.

   The library comprised nearly 2,000 volumes of Arabic, Persian and Hindustani manuscripts in various branches of the Muslim literature. Many of these were beautifully written and highly ornamented, but a good portion were in bad condition,

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and several books with the first and last page missing. It is surmised that these volumes were part of the plunder brought by Hyder Ali n his various expeditions.

All of them were subsequently rebound at Serigapatnam on the orders of Tipu. The topics were either theology or Sufism which interested the Sultan most. It is said that the Sultan himself was very ambitious of being an author. However, no work of his composition was discovered in the library. There were in all 45 books on different subjects which were either composed or translated from other languages under his immediate patronage and direction.

5. **Sandhi Age (1700 A.D. – 1813 A.D.):** From the fall of Mughal empire till the rise of British empire is known as Sandhi period. This was a period in which not many libraries developed. Banaras Sanskrit College, in Banaras and Fort William College in Calcutta were founded in this period. In 1812 A.D. the Madras Literary Society Library was the most important library of the country. There was another library in the Madras which is called the Madras Government Oriental Manuscript Library. It had a fantastic collection of manuscripts of the South Indian languages.

The following important libraries were established during this period:

1. **Saraswathi Mahal Library, Tanjore:** The Thanjavur Maharaja Serfoji's Sarasvati Mahal Library is one among a few medieval libraries existing in the world. It is an unparalleled repository of culture and an inexhaustible treasure house of knowledge built up by successive dynasties of Nayaks and the Marathas of Thanjavur. It contains very rare and valuable collections of manuscripts, books, maps and paintings on all aspects of Art, Culture and Literature. The Encyclopaedia Britannica in its survey of the Libraries of the world mentions this as "the most remarkable Library in India"(“Sarasvathi Mahal Welcomes You,” n.d.).

Maharaja Serfoji's Sarasvati Mahal Library

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Fig. 1.1: Maharaja Serfoji's Sarasvati Mahal Library

(Source: ("Saraswathi Mahal Library," 2022))

2. **Madras Literary Society:** It is one of the most oldest libraries of India having had a continuous record of library service for one and a half century. It was established on 27th March, 1818. The Society is an auxiliary of the Royal Asiatic Society, London. It has more than 1,00,000 books, new and old on all subjects, and fulfills excellent literary purpose. The Society brought out a valuable journal Madras Journal of Literature and Science which ran for a period of about 60 years, from 1833-34 to 1894. It is now a ceased publication. The library receives the grant from the state government and sustains itself from the subscriptions received from the members and subscribers. It maintains the excellent home delivery system for the benefit of the city residents. The books are delivered at their door-step once a week without any additional charge.

Fig. 1.2: Madras Literary Society, Chennai

(Source: ("Madras Literary Society,Chennai | CEPT - Portfolio," n.d.))

6. **British Period (1743 A.D. – 1947 A.D.):** In 1813, the East India Company declared in its proclamation that the Company will spend Rs. 100,000 every year on education of the country. The grant was for education and revival of Indian literature. The Christian missionaries had a great say on the higher education in this period. In 1854 the company issued its Ghosana Patra (Education Policy Statement which is called Wood's Dispatch). This dispatch was the result of the British Parliament's concern

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about the slow progress of education. Education departments were opened in all the states. Three universities at Bombay, Calcutta and Madras were opened in 1857. On the other hand, Lord Macaulay's recommendation about the English as a medium for higher education was accepted. Britishers who settled in Calcutta, Bombay and Madras opened their subscription libraries.

In 1835 the people of Calcutta established a public library which later became the Imperial Library in 1893. St. John's College at Agra, Madras Christian College at Madras, Wilson College at Bombay and Presidency College at Calcutta were opened. The British Government gave a lot of financial support for building libraries, colleges, laboratories etc.

On 18th February, 1901 the Britishers had established India Office Library at India House, London to collect the material on Indian literature, history and culture. Some 2000 documents from Tipu Sultan's Library were transferred to the Library.

In 1891, the Khuda Bux Library was established at Patna. India's fourth university was opened at Allahabad in 1887. During the last decade of nineteenth century the people had started realizing the importance of higher education. British government saw to it that all academic institutions have a good library. Allahabad University Library had 1lakh and 20 thousand books in 1947. During the period between 1916 to 1947, 17 new universities were established.

Two libraries of the importance established were the following:

1. **Hindi Sahitya Sammelan Library**
2. **Kashi Nagari Pracharini Sabha Library**

The functions of these two libraries was to collect material of books published in Hindi, Hindi Sahitya Sammelan Library has more than 50,000 documents in their collection and 500 mauscripts. Kashi Nagari Pracharini Sabha Library has the fine literary collection for researchers.

Some of the important libraries established during the British Period were as follows:

1. **Trivandrum Public Library (1847)**
2. **Connemara Public Library (1830)**
3. **Allahabad Public Library (1864)**
4. **Punjab Public Library, Lahore (1884)**
5. **Bharat Itihas Samshodhak Mandal, Pune (1910)**
6. **Ameerudualla Public Library, Lucknow (1910)**

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7. **Central Public Library, Baroda (1910)**
8. **Gujarat Vidyapith, Ahmedabad (1920)**

Important development was the Delivery of Books Act which was implemented in 1869 A.D. Through this act, it was made compulsory to send one copy of each book published to the Imperial Library, thus making the library a National Library. There were widespread changes in education. Emphasis was laid on opening the libraries whenever new educational centres were opened. Manuscripts and other valuable documents were given importance, and these were procured through the nation wide effort. Such manuscripts were put in the public libraries or academic libraries to have preservation control over them.

Till 1909 A.D., there existed the following types of libraries in India.

1. **Libraries of British Administration**
2. **Libraries of Provincial Government**
3. **Libraries of Educational Institutions**
4. **Libraries of Research Institutions, and**
5. **Public Libraries**

Maharaja Sayaji Rao Gaikwad started public library movement on planned basis in Baroda in 1910. He toured USA and UK and saw for himself the functioning of the public libraries. This visit made an indeliable impression on his mind that without the public library movement he will not be able to make his people literate. Hence he issued a proclamation in the state for the promotion of the public libraries. He also invited well known American librarian W.A. Borden from the US who happens to be the friend of Melvil Dewey. Borden was teaching library science at the Columbia University. He was made the Director of public libraries. Moti Bhai Amin, a school teacher was asked to take care of rural library service. Borden and Amin both made efforts in convincing the people about the importance of public libraries. They also opened Gujarati and Marathi publishing centres. Borden also started a training centre and a central library at Baroda. Maharaja Gaikwad himself donated 20,000 books to the library. There was a separate wing for women and children within the library building. Till 1947 there were 1,500 libraries, 4 district libraries, 72 taluka libraries and separate city libraries in the State. Even 192 libraries had their own library building. It was a remarkable achievement in the public library movement in the country.

1. **Imperial Library, Calcutta:** The Calcutta Public Library began its journey on 21st March 1836. The Library was established for reference and lending, open to all, irrespective of class, colour & nationalities, on the self-financing principle. The Calcutta Public Library was subsequently merged with the Imperial Library and combining the collection of a number of secretariat libraries, the Imperial Library was opened to the public in January in 1903. After Independence of India, the National

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Library came into being in place of Imperial Library by the "Imperial Library (Change of Name) Act" in 1948. It was accorded a special status of an institution of national importance in the Article 62 in the 7th Schedule of the Union list of the Constitution of India and Maulana Abul Kalam Azad, the then Union Minister of Education opened the Library to Public on 1st February 1953("National Library of India | Ministry of Culture, Government of India," n.d.).

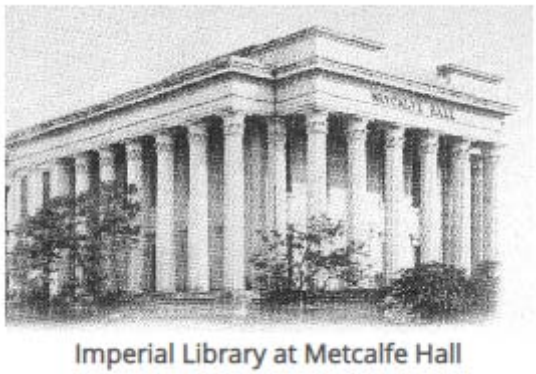

Fig. 1.3: Imperial Library at Metcalfe Hall

Source: ("National Library of India | Ministry of Culture, Government of India," n.d.)

2. **Madras Oriental Manuscripts Library:** The library which is housed in the new University buildings on the Marina in Chepauk, ranks next in importance to the Saraswathi Mahal Library at Tanjore. Valuable manuscripts in Tamil, Telugu, Malayalam, Kananda, Marathi, Sanskrit, Arabic, Persian and Urdu are treasured here. There are in all 72,40 Tamil, 4,693 Telugu, 513 Malayalam, 2,316 Kannada and 31,692 Sanskrit Palm-leaf manuscripts in this rich treasure house. A part of the invaluable collection of Sir Colin Mackenzie popularly known as the Mackenzie's Collection constitutes the nucleus and foundation collection of this library besides the Leyden Collection of manuscripts discovered in the India Office Library by C.P. Brown, a member of the Indian Civil Service in 1837.

   These were preserved in the Madras College Library and transferred later to the custody of the Director of Public Instruction who had them all locked up in a godown under the care of an attender. The Rev. Foulkes of the Vepary Diocese drew the attention of the government on 14th August, 1867 to the fact that these manuscripts were getting decayed for want of proper care. However on 6th February, 1869 the Government constituted a committee to look after them. Mr. Pickford, a professor of Sanskrit at the Presidency College, Madras was appointed by the Government on 15th March, 1869 as honorary librarian to take charge of them. The collections were shifted to the Presidency College. In the year 1895 they were moved into the Fort St.

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George and again during the following year to the Madras museum. It was finally transferred to the present building from the government museum in 1939.

In 1873, the government created the post of a part-time curator and made it full-time in 1942. From 1869 to 1948 ten curators had been incharge of this library. In 1948 the then curator Shri T. Chandasekharan had administered it ably. Under his care many valuable manuscripts have been published. There is a good descriptive catalogue of the collection running into several volumes.

3. **Connemara Public Library, Madras:** Connemara Public Library at Egmore in Chennai, Tamil Nadu, India, is one of the four National Depository Libraries which receives a copy of all books, newspapers and periodicals published in India. Established in 1890, the library is a repository of centuries-old publications, wherein lie some of the most respected works and collections in the country. It also serves as a depository library for the UN("Connemara Public Library | INDIAN CULTURE," n.d.).

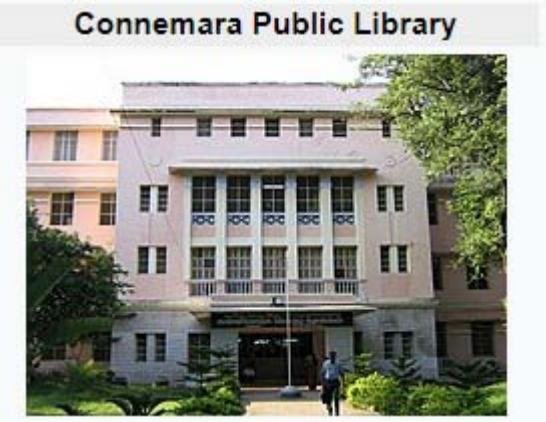

Fig.1.4

(Source:("Connemara Public Library," 2022))

1.3.2 Post-Independence Period:

Since India's independence, there have been numerous planning and programming efforts made in the area of library development. There is no doubt that the nation has been able to establish a substantial infrastructure for library and information services on the basis of plans and programmes launched at various levels, even though their results may be of varying degrees of achievement. To fully comprehend how the nation's libraries are organised, you need be well-versed on its library rules, planning procedures, and programming initiatives.

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Systematic library development started in India only after 1947. The establishment and development of the National Library at Calcutta, public library legislation in a few states leading to the creation of public library systems, a growth in the number of university and college libraries, and the rapid development of special libraries and information centres in science and technology, medicine, agriculture, social sciences and the humanities are some of the landmarks achieved during the last five decades. Impressive as these seem to be, they are, inadequate to meet the increasing demand for knowledge and information required for our socio-economic development, higher and technical education, higher industrial productivity, and scientific and technological research, development and progress. All these point to the need for integrated planning and programming of activities and tasks on the basis of a national library and information policy. Dealing with policy initiatives, a summary of the recommendations of the national policy on the library and information system, formulated by the Department of Culture, is given in this Unit. This policy document spells out an integrated approach to the development of all types of libraries and information systems. As a sequel to this effort, a national commission on libraries has been proposed. National policies in other sectors, such as education, science and technology, and information (communication) also have a bearing on library development in the country. Several ad hoc committees appointed by appropriate bodies in the country have made recommendations with reference to the development of public, academic, medical and agricultural libraries. The Five Year Plans have given considerable attention to library and information system development, particularly the Seventh Five Year Plan. Sectoral plans in science and technology, education, health and family welfare, environment, biotechnology, etc., have also dealt with library and information systems in their respective areas. Notwithstanding this impressive record of progress and development, the present situation of library and information system development appears to be uneven, piecemeal and uncoordinated. The application of computer and communication technologies for creating a network of library and information systems is sure to provide the necessary coordination and integration. The National Policy on Library and Information System, expected to be in force soon, will hopefully result in an integrated development of the library and information system in appropriate quality and quantity(2017).

The following library developments took place immediately after 1947:

1) **Making Imperial Library of Calcutta as India's National Library.**
2) **Enactment of Library Acts in Tamilnadu, Andra Pradesh, Karnataka and Maharashtra**
3) **More universities and colleges were opened along with scientific and social science research libraries.**

When we got our freedom, we were divided also. Our wheat-rice and jute growing areas went to Pakistan. The country could not withhold the pressure of growing population. Hence

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it had to import food grains to feed the millions. At the same time the National Government could not have left economic problems on the whims and fancies of individual. They believed in proper economic planning by making Five Year Plans. Since socio-economic needs were more pressing, the government gave more attention towards agriculture, power generation, industrialization, defence, and therefore education got the back seat.

In 1951 with the help of UNESCO the Government of India opened Delhi Public Library. Today is the India's largest public library system.

IN-TEXT QUESTIONS

1. Nalanda University Library is not the library of Buddhist Period. True / False
2. Takshila University Library is the one of the library of Buddhist Period. True / False
3. From the fall of Mughal empire till the rise of British empire is known as_____.
4. Connemara Public Library is situated in _____.
5. Saraswathi Mahal Library is situated in _____.

1.4 LIBRARY DEVELOPMENT IN MODERN INDIA

The development of library in modern India can be traced in respect of University Libraries, Public Libraries and Special Libraries.

1.4.1 Plans:

1. **University Education Commissoin**: The first great milestone on the road was the appointment of the University Education Commission, in Dec., 1948, consisting of reputed educationalists from India, the United States and the United Kingdom under the Chairmanship of S.Radhakrishnan. No doubt, the commission paid a glowing tribute to the library by hailing it as the "heart of all the university's work". Yet, the modern librarian is constrained to record that the commission set up as a first step to suggest ways and means of raising up the cultural standards of the country and headed by a man of letters, did not suggest any concrete measure to cleanse the Augean Stable and restore to library and his controller the place they deserve.
2. **Radhakrishnan Commission:**The Radhakrishnan Commission, however, made a recommendation revolutionary in spirit. This concerned the setting up of an autonomous body to foster the development of university educaton in the country. This unique recommendation blossomed in 1953, when the University Grants

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Commissoin ws set up. It was, however, in 1956 that it was infused with statutory life.

3. **The University Grants Commissioin:** The UGC under the guidance of its chairman, C.D. Deshmukh injected new blood into the hitherto paralysed limbs of the university libraries. To him: "the students are the body of the university, the administration is, of course, the head, teachers are the soul and the library the heart". In pursuance of this full-blooded faith in the role of the library, he appointed a library committee headed by S.R. Ranganathan in 1957 to advise the U.G.C on various problems connected with the provision of grants to libraries for the purposes of book purchase, development of reading habits and help to students in the use of libraries.
4. **The Kothari Commission:** The Kothari Commission touched the heart of librarianship when it stated that with ever-increasing enrolment in universities and colleges, the demand for library service has been mounting. Unlike in the past, the library staff have now to cater to be diverse needs of undergraduates and research scholars. Because of "torrential rain of micro-documents" and with the emergence of research in our universities, the commission rightly felt the need for conservation of research potential throught documentation work and service.

1.4.2 Proposals:

1. **Sufficient Finance:** Finance is the life-blood of every organization but more so of a spending institution like a library. The universities should ear-mark at least 6.5 to 10 percent of their total budget or Rs. 40 per capita on the basis of students registered in the university and Rs. 300 per teacher as the annual grant to the libraries. These figures may be revised periodically.
2. **Rich and Balanced Collection:** The object of the library planning is not to build a collection of books unrelated to class work, laboratory research and conference room. The object should rather be to relate book selection, organization of the books, conditions of access and all library activities to the daily needs and activities of the academic community, both professors and students.
3. **Service to Students and Faculty:** Libraries have often been referred to as the hearts of universities from where flows the invigorating blood of knowledge to nourish and sustain life in all the teaching departments of the university. Unfortunately, our libraries are the weakest at the service point. The Radhakrishanan Commission (1948-49) recommends that lectures and tutorials must be supplemented by work in the library.
4. **Library Staff:** True that as an integral part of research, the library is a temple that emits all knowledge, but the revelation will only be achieved through the help of both men and women who operate libraries and who forming the link between the man and the intellectual thought-content of the documents at once create the public image of

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the library as a nerve-centre of the university and the very nucleus of the idea of education.

5. **Librarian as Manager:** The librarian as a manager of the industry of knowledge must have the ability to energise, direct and sustain the behavior of his staff at work. In simple words, to make the library organization effective and efficient, the librarian as manager must motivate his staff to participate in the task of operating the library at teaching and research level by applying the techniques of management to their organizations.

1.4.3 Advisory Committee for Libraries:

The Ministry of Education,on the recommendation of a Seminar on the 'Role of Libraries in Social Education' set up an Advisory Committee for libraries with the following terms of reference:

- To enquite into present reading needs of the people, how they are met;
- To enquire into the reading tastes of various sections of the people;
- To recommend the future library structure in India;
- To recommend the forms of co-operation between the library and social educational set-up;
- To go into the question of training of librarians and the condition of their service;
- To make recommendations on the administrative and financial measures necessary to support the future set-up in India.

The Report recommended that library service should be free to every citizen of India. Secondly, the library pattern in the country should consist of National Library, State Central Libraries, District Libraries, Block Libraries, Panchayat Libraries. Thirdly, it was deemed desirable to have an independent Directorate of Social Education and Libraries in every State. Fourthly, it strongly recommened the levy of library cess@ 6 paisa per rupee on property and house tax. Finally. It was recommended that the State and Central Governments should supplement the amount collected by levying cess.

1.5 LIBRARY DEVELOPMENT

1.5.1 Library Science Training and Education

It was found necessary to give training to the librarians to organize library collection. Hence universities opened Certificate Course, Bachelor's Course and Master's Course in library and information science in various universities. Later, certificate course was shifted to the library associations of the states. Today there are more than 50 universities giving library

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science teaching. Delhi, Bombay, Chandigarh, Varanasi, Rajasthan, Osmania, Madras, Poona, Waltair, Calcutta and Sagar have not started Ph.D. Programmes. So far more than 10,000 professionals have M.Lib.Sc. degrees and about 30,000 have taken B.Lib.Sc. degrees. But this is distressing to note that despite such a library science manpower available in the country, there is hardly and appreciable improvement in library services as well as maintenance of the libraries. The libraries are still backward with no proper library service given to the readers. It shows that the library science teaching is not effective. Another factor which is equally important as well as disturbing is mushroom growth of library schools without caring whether they are really needed. It requires reforms. Insdoc and DRTC are responsible for training information science and documentation manpower for the country. They run 14 months documentation course with submission of a full length dissertation.

1.5.2 Library Science Literature

S.R. Ranganathan was first to write books on library science followed by C.G. Vishwanathan, Bimal Kumar Dutta, A.K. Mukherjee, J.S. Sharma, A. Neelammeghan, R.S. Parkhi, R.L. Mittal, S. Bashiruddin, P.N. Kaula, S. Parthasarthi, B.S. Kesavan, N.N. Gidwani, Girja Kumar, A.P. Srivastava, P.B. Mangla, R.G. Prasher, A.A.N. Raju, Krishan Kumar, P.S.G Kumar and M.P. Satija. Till Ranganthan was alive he used to contribute first article in every issue of library science journal. The following important journals are published in India:

- Indian Libraries (1946-)
- Iaslic Bulletin (1956-)
- Herald of Library Science (1958-)
- Library Herald (1958-)
- Annals of Library Science and Documentation (1964-)
- Library Science Slant to Documentation (1964-)
- ILA Bulletin (1965-)
- CLIS Observer
- Journal of Library and Information Science (1974-)
- Indian Journal of Information, Library & Society (1988-)
- Granthalaya Vigyan

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1.5.3 Role of Library Associations

Library Advisory Committee was set up in 1955 A.D. by the Government of India under the chairmanship of K.P. Sinha. It recommended the states to have library associations. The library associations can play significant role to educate the people and giving them a sense of culture and develop brotherhood among professionals. The library associations should hold seminars, workshops, lectures, exhibitions, study circles etc. It should also take up the help of mass media. Some library associations are responsible for teaching C.Lib.Sc. and Diploma in Library Science.

Major aims of the library associations were the following:

- Implement library acts in all the states.
- To make service oriented profession
- To spread literacy movement, and
- To train library and information science manpower.

Today, almost all the states have the library associations. National library associations are Indian Library Association, Indian Association of Special Libraries and Information Centres, Indian Association of Teachers of Library Science and Government of India Library Association. Prominent among state library associations are the associations where the library acts have been enacted.

1.5.4 Library Legislation

It is a national obligation of any government to provide the library service free to all citizens. If the library acts are passed, all the states will perform the following functions:

- Collect financial resources for maintenance of libraries.
- Make library department as a statutory body to play an effective role.

Without getting legal assent the public library systems are inefficient. The library acts shall help us in controlling and managing library resources in most systematic and planned manner. The library acts force the state governments to be responsible towards the development of public libraries. The library acts shall ensure the free library service to all, administrative efficiency, library planning, provision of proper financial resources, standard library service and the continuity.

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IN-TEXT QUESTIONS

6. Library Advisory Committee was set under the chairmanship of _____.
7. Example of Library Science Journal _____.
8. The appointment of the University Education Commission, in Dec., 1948, under the Chairmanship of S.Radhakrishnan. True / False
9. Library service should not be free to every citizen of India. True/False
10. Following tools can S.R. Ranganathan was first to write books on library science. True/False

1.6 SUMMARY

This lesson is an introduction to the study of organised and planned efforts at library development in India. While tracing the growth of the library movement in the country, we find that the parameters for library development have been very wide and the magnitude too vast. Planning and programming endeavours are essential to aim at a systematic and assured development. A national library policy is also necessary to have a commitment to provide library service to all the people. The Five Year Plans have given a great deal of attention to library development and informatics and the Ninth Plan has made appropriate provision. If implemented rigorously, library development will get assured success

1.7 GLOSSARY

Library: Library is a place set apart to contain books, periodicals, and other material for reading, viewing, listening, study, or reference, as a room, set of rooms, or building where books may be read or borrowed.

Plan: A formulated method of doing something and refers to any method of thinking out acts and purposes beforehand. Plan, project, design and scheme are often synonymously used.

Proposal: A proposal is a plan or an idea, often a format or written one, which is suggested for people to think about and decide upon.

Library Legislation: Library legislation is legislation that helps establish and maintain public libraries.

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1.8 ANSWERS TO IN-TEXT QUESTIONS

1. False	6. K. P. Sinha
2. True	7. Library Herald
3. Sandhi Period	8. True
4. Madras	9. False
5. Tanjore	10. True

1.9 SELF-ASSESSMENT QUESTIONS

1. Explain the development of libraries during post-independence period.
2. Discuss the development of Libraries during pre-independence period.
3. State three landmarks indicating the progress of libraries in India in the post – Independence period.

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LESSON 3

ROLE OF LIBRARY AND INFORMATION CENTRES IN MODERN SOCIETY

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Modern Society: Meaning
1.3.1 Need and Purpose of Modern Society
1.4 Social Insitutions of the Society.
1.5 Library as a Social Intelligence Centre
1.6 Young People and the Library
1.7 Library and Continuing Education
1.8 Library and Scholarship
1.9 People's University
1.10 Library New Tools and Modes
1.11 Library and the Changing Society
1.12 Summary
1.13 Glossary
1.14 Answers to In-text Questions
1.15 Self-Assessment Questions
1.16 References
1.17 Suggested Readings

1.1 LEARNING OBJECTIVES

This Unit gives an overview of the role of the library and information centres in modern society.

After reading this Unit, you will be able to:

- discuss the meaning of modern society;
- explain the role of libraries to meet the different requirements of persons in society;

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- become aware of various social institutions of the society and libraries role in those institutions; and
- discuss the role of library from different areas of society like education, scholarship etc.

1.2 INTRODUCTION

(Khanna, 1987)Library and society are inter-linked and inter-dependent. Society without libraries has no significance, and libraries without society has no origin. Today, we look upon library as a social agency. The library has been created by actual necessities in modern civilization. It is a product of society for its cultural advancement. The traditional function of a culture is to enable a group to survive, and this principle implies the conservation of the past. Not only do the libraries conserve our culture, but as agencies of communication they play an important role in its dissemination.

To serve as a vechile of social progress, the library plays a vital role to

1) Assemble, organize, preserve, socialize, and serve all expressed thought embodied as manuscripts, books, periodicals, their constituent documents, however minute, and every other similar document produced as a means for communication; and by this means to
2) Help in the transmission of knowledge of the earlier generations to the later ones; and by this means to
3) Help in cumulation and further building up of knowledge from generation to generation; and in a similar way to
4) Help in the contemporary development of knowledge, by the unintended and purposeless repetition of effort and the consequent wastage in the research potential of humanity; and further to
5) Conserve the research time of humanity by the separation of literature search from positive search

One may examine the role of library in modern society in its endeavour to work for social progress.

1.3 Modern Socetiy: Meaning

The library can be seen of as a modern temple in the modern day where everybody, regardless of caste, creed, religion, or sex, can receive knowledge.

Modern Society: Meaning

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Today's civilization is becoming more integrated and self-aware as we enter a new era. It is known as Modern Society. The modern world is transitioning to an information society where knowledge and information are the primary agents of, and drivers of, change. Organizations and countries generally gravitate toward globalisation and more open working practises in contemporary culture. Barriers related to geography, time, and culture are no longer a problem. Across barriers, communication is possible between people. They have access to a huge pool of resources' talent, knowledge, and material. Variation from the prior standard is becoming something that should be intentionally planned in education. The modern society has many requirements, not the least of which is education, in addition to all these developments in the consumerization of products and services and changes taking place in the social and cultural sphere. Education fosters the development of informed, knowledgeable, and responsible people who can contribute to the advancement of the country. The objective is for society to be economically prosperous. Clearly, technical advancements brought about by research and the large volumes of information it makes available to us must support efforts geared toward this objective. Throughout its history, society has created a variety of institutions. Schools, colleges, and universities as well as research facilities, cultural organisations, institutions for the arts and entertainment, as well as commercial and industrial entities are only a few examples. In fact, among all the institutions established by society, libraries and their contemporary equivalents are effective at satisfying a range of needs of various modern society users(Satyanarayana, 2017). Modern civilised culture understands the value of public libraries. The public library system plays a significant role in the advancement of science and technology in society. It took place in American society, when public libraries were very important to people's social lives.

1.3.1 Need and Purpose of Modern Society:

As members of the modern society, we are all aware of its varied needs. Education is perhaps the most important among them, for it helps to mould a well informed, knowledgeable and responsible citizen who alone will be able to contribute to progress and advancement. Then there is the goal of the economic well being of society. Activities towards this end have to be sustained by technological developments brought about by research and the enormous amount of information it makes available to us. But `man does not live "by bread alone". There are deeper and finer instincts in the human being such as the spiritual and ideological instincts, cultural and aesthetic instincts and others which refine life and elevate it to a higher plane. A person also needs recreation during his/her leisure time, and unless there are facilities for constructive and competitive activities, his/her attention is likely to be diverted to negative and destructive avenues. The aim should be the development of a society that is able to lead a cultured, prosperous life, laying emphasis on certain basic values in life and adhering to them. It is the collective responsibility of members of society to

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make suitable arrangements for this purpose(*Unit-1 Role of Libraries and Information Centres in Modern Society*, 2017).

IN-TEXT QUESTIONS

1. Library and society are inter-linked and inter-dependent. True / False
2. The objective is for society to be economically prosperous. True / False
3. Public libraries not important to people's social lives. True/False

1.4 Social Institution of the Society

Social institutions

Educational institutions like schools, colleges, universities, institutions for research and culture, music and art institutions, business institutions etc. are example of **Social institutions.** But these institutions do not cater to more than one or two needs of the society, whereas the public library caters to all the needs of the society. It provides information on all topics to the users.

For instance, the primary goal of school-age children is to learn, but this knowledge is constrained to what the teacher has taught and what is provided in the textbooks. In contrast, the library has a sufficient amount of material on hand on all topics, allowing users to gain knowledge while also developing their creativity. The library also helps people learn to distinguish between right and wrong, assisting users in making the best choice at the appropriate time. To suit its many demands, society has created and maintained a number of institutions. One such organisation that attends to its informational, cultural, recreational, and educational needs is the public library.

Below are some examples of various institutions that meet the requirements of society in terms of education, culture, recreation, and information:

Table 1.1: Examples of Various Social Institutions and their activities.

(Source: (Chowdhary, 2007))

Activities	**Social Institutions**
Formal Education for different levels	Schools(primary and secondary), colleges, universities, professional and vocational institutions, TV(distance education),

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	etc.
Cultural Activities	Different literacy, music, dance, drama, fine arts, folk literature and arts, academics and cultural organizations, TV, radio, etc.
Recreational and leisure time activities	Theatres, cinemas, sports & games organizations, TV, radio, etc.
Information Activities	Different government and non-government institutions and organizations, newspaper, radio, TV, etc.
Educational, Cultural, Recreational and societal Information activities	Libraries and museums - public libraries

1.5 Library as a Social Intelligence Centre

(Vyas, 1993)Melvil Dewey defined the functions of the public library as an institution not so much for the storage and preservation of its knowledge as for the dissemination. This statement was made almost a century ago by Dewey. If this was true at that time., it is more so now as the library meets more people and promotes new methods of imparting its largesse of knowledge. Those libraries which are devoted exclusively for storage and preservation earlier now feel that devoted exclusively for storage and preservation earlier now feel that the users deserve opportunity to have a look at the collection and library service provided. The public libraries are neither educational institutions like schools, colleges, universities nor a social agency though it has a social aspect. This depends upon how we view the functioning of the public libraries. According to Ernestine Rose, the library is essentially concerned with intelligence, its nourishment and growth of the society. If the public libraries are not given the importance as a catalytic social agency then the intelligence of the society is its at stake. The nature has its own laws to govern that the stupid will perish, keeping in view the biological principle 'survival of the fittest' the nature will not suffer for fools gladly. Hence if the public library is not a social centre for social intelligence for which a library is not primarily responsible then what it is for. Though the librarians indulge in finding out their reading interest was considered useless job, yet it is the right job for the librarians.

There are many challenges for the librarians in order to help the adults pursuing knowledge. Now it is obvious that the library is one of the greatest potentials in our social and intellectual life. The librarians should see that prompt library service is provided to the people without any waste of time, and also see that which are the people who are insistent on getting good

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service from the library. The students in colleges deserve a better library service from the librarian. This is because many of them might have never visited the library at school level. The contribution of the libraries in the field of continuing education and adult education cannot be denied. The library acts usually as a centre for interest for many scholars which cut across groups and serve the people individually in new groupings.

The library development and its services have resulted from the various contacts and through quiet evolution. It is not an abrupt development. The libraries are not satisfied with mere simple issue and return of books, they are conscious about the real life needs of individual scholars. The librarians know the role and potentialities of the libraries as a social institutions which is free, which is open to all, irrespective of race, religion or political bias and which offers without bias and coercion-the treasures of knowledge and the tools of education to its users. The libraries being democratic institutions have a solemn obligation towards the society to provide current information according to users needs. The library is near to everyone andits appeals are universally inviting to both old and young alike. It teaches without arrogance the knowledgeable as well as ignorant.

1.6 Young Peolple and the Library

(Vyas, 1993)It was found necessary in order to see that future generation of children learn to behave, manner and etiquette, the library for the children should be opened so that the future development of the society is safe. On the other hand, the school libraries too should be given equal importance where the library activities include story telling, showing slides, films and educational illustrated reference books which include encyclopedia, dictionaries and picture books. The children librarian will have to work wit the children in its overall programme of the children's education and personality. There should be special furniture and rooms meant for the children. Low talbes and chairs could be useful, and a special corner where the children can read reference books and books issued for home reading. The library visits could be arranged in school time as a part of school schedule. The children's collection includes books which reflect the various phases of child-life and development. The children's room plan exhibits and celebrates special days with story and reading. It has been experiences in the U.S. that the books for the children shelved along with adult collection is not liked by the children. Hence the children section in a big public library should be separate where the children would like to see the familiar faces of same age groups and the books specially meant for them. The librarian will have to make careful selection for both the groups - children and adults.

A close examination between the adult groups and the children is to prepare the young children to easily mix with adults without any waste of time and pain. The librarian will have to see that the children get such books to see that there is smooth transition between younger

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and older adults. This may be accomplished with the aid and co-operation of the young people.

It is essential to know the special needs of the children who are entering adult life. The people are concerned about adolescence crime and the rise of the youth movement. These have played an important part in leading many agencies to develop programmes specially suited to the requirements of the youth. Hence the children's libraries must equip themselves to see that the children get correct information of the issues involved which affects the whole society. Efforts should be made to appoint staff who are qualified to work with the children. It is necessary that we do more study and research to think about the future programmes to meet the needs which include specialized service to the young people on enlarged scale.

1.7 Library and Continuing Education

(Vyas, 1993)The man's mind does not stand still at a given age. Earlier it was believed that the human beings lose the power to learn in inverse ratio to their age. The child's mind is plastic and that of an adult is fixed and incapable of changing. It has been proved that learning power diminishes with growing age, but this loss is very gradual. The adults between 25 and 35 years of age learn more faster than the children. However, peak of leanring occurs between 20 to 25. E.L. Thorndike discoverned that adults do not cease learning. In the U.S Dr. Alvin Johnson in his book The Public Library- People's University has said that the library is not necessariliy an educational institution. He said that pure librarianship-in brief, is collecting, preserving and dispensing of printed material on demand-it is not educational in character. The philosophy and objective behind adult education is informal rather than academic in character. Likewise the use of the public libraries is informal and voluntary. The libraries are wholly devoted to the ideals of voluntary use. Informal method of teaching is employed in most of their educational activities. One of the most important functions of the public libraries is to provide a platform for discussion group and forum. Hence the library room could be used besides the library resources of books, reading lists and advisory services offered by the library.

Someone will question what responsibilities the libraries have for public education, and what are the characteristics which justify the libraries in assuming that responsibility. Dr. S. Radhakrishnan, former President of India says that "librarians have always been teachers in the past". Those who were more than mere customdians of books have helped to educate those who use the stores of learning in the libraries. The librarians hold the tools of educations i.e., books and are responsible for them to the people. In the past when the libraries were burnt we still think such an action as a crime to the posterity. Today if this happens it is a sure sign of intellectual degeneracy.

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Another important characteristics of the public libraries is their freedom and catholicity of use by users. Whosoever want to use them, and many have used them have educated themselves by the use of public library. How could this be possible? The following are functions of the librarians:

1) To make materials available to those who need them.
2) To counsel and advise the reader, and
3) To stir and arouse intellectual curiosity and desire to learn.

The public library should have a department of adult education with counseling and reader guidance and a regularly established programme of activities, including lecture courses, discussion groups, exhibits and concerts. The public library should create readers advisory services. The reader's advisor's job is to work with individuals and groups in their reading or study in building educational or reading programmes and in compiling and annotating lists of reading material. It is quite obvious that he should have sound acquaintance with literature on variety of subjects as well as knowledge of bibliographical sources.

In the U.S. the public libraries, the need of appointing reader's advisor was felt long back. The reader's advisor shall do the work in cooperation with the young as well as adult readers in satifying their library needs. He has to understand their psychology before he provides service. Perhaps the reader of the library may not think of him as a man who is key to the library resources. Thus it is not the fault of readers to know what is the role of the readers adviser.

1.8 Library and Scholarship

(Vyas, 1993)The librarians in the past never thought that the libraries shall have to have some attribute of knowledge in order to provide service to the readers. They were interested in opening the gate of the library to the people and raise the public intellectual standard to see that standardized library service is provided to the public. Earlier the librarians were not ready to help the poor and less literate. The library clienteles were drawn from the educated and priviledged class. It has to be understood that in the democratic phase the mediocrity of the library service does not creep in.

The public library has the following two responsibilities:

1) It is responsible for its traditions of scholarship and for those treasures of mind which has produced and entrusted to the library for safe keeping.
2) It is also responsible of the accessibility of those treasures to as many people as possible.

The libraries have an important job to do in the intellectual progress and continuing englightenment which alone can lead to widespread use of intellectual heritage. In the democratic society scholarship and popular education are steps in the same process. Webster

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defines the democracy as “government by the people and the government in which supreme power is retained by the people”.

Other definitions are not helpful in describing what is democracy and what its real meanings are except that a library is a public institution which as to support the public without any distinction to caste, creed, religion, race etc. The libraries are responsible to those who are well educated as well as those who unfortunately could not get formal education. Hence it has to serve both.

The librarians are now in position to help in providing the library service to satisfy the intellectual hunger of our people. It helps literate and those seeking mind who need intellectual food for which they crave. The libraries are now prepared to play the role to set intellectual standards, to contribute to the development of thought and to act as an intelligent aid institution in the procedures of research. In fact the libraries are giving such aid which is not known to the public. It needs publicity that what the libraries can offer to the public in satisfying their intellectual hunger. Every library can make its doors-the open doors of opportunity to the highest thought and deepest need of its community. The librarian may not be dependent on his own knowledge alone, but if he neds any help he can ask for co-operation and advice of best brains of his neighbourhood. He may also get help from the other neighbourhood libraries or the school libraries. Such requests need not give a sense of shame or inferiority, but show rather a good sense of values disseminating knowledge. At the same time no library, large or small can afford to neglect the interest of all the people of the community. The libraries can develop local area collection, so that the people know about their local region they belong. What is really moderate knowledge, willingness to learn, vision and determination. Such qualities are usually available in the librarian, but how he uses them is the question. Scholarship seems to be a big word with deeper meaning, but it is the only libraries which can provide exact and current knowledge to the society and provide facilities and effective techniques in the development of scholarly attribute. These conditions are available and within the powers of libraries to provide scholarly nees, motivate readers and create hospitable atmosphere for scholarly research. Ernestine Rose says that “if the librarians cannot do so, let them close their doors and leave the purveying of reading matter to the corner of a drug store”. However happily the libraries are in the position to provide the job meant for satisfying intellectual hunger.

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1.9 People’s University

(Vyas, 1993)The public Libraries have been turned as the people’s universities as these social institutions have potentialities of universities, and can face challenges presented by modern

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age. It is need of the hour that a top class library service is required for the literate, informed and maturely developed citizens.

It is not easy to gain education as its proess is not simple. The two points are involved here:

1) Acquisition of the background of knowledge, and
2) Traning and exercise in learning to think

The people hold the world's destiny and unless they think clearly and soberly which a sense of values, we shall have a world of prejudices, ignorance and shallow thinking. The library is certainly an educational agency with a considerable potency. The librarian's attitude is equally important in giving informal education to the people. The librarians should know the people, their psychology, knowledge of individual community, their background, desires, needs and should motivate them. The librarian can give effective library service only when he knows his community well for which he should keep in constant touch with it. For this work some big libraries would like to appoint field librarian to do field work to have first hand information. There should be coordination between a reader advisor and a field librarian to organise library services in effective manner-one being responsible for contacts, and the other for compiling and acquiring resources.

It should be noted that the use of public library is purely voluntary. Its door is open to all the groups of the society without any distinction of race, colour and religion. This is essential when the public library is regarded as an open university or the peopl's university whose main aim is to act as an educational agency for all the people. The public library being termed as People's University must be truly a democratic institution serving all. It should serve all i.e., educated as well as ignorant group of the society.

1.10 Library New Tools and Modes

(Vyas, 1993)Every public library if it wants to remain as a living organism must know and employ changing methods and new machinery of action. Now the knowledge is not found only in books or printed matter in any other form, there are many other formats where the information or the knowledge is stored. Knowledge today is being presented by many channels other than the printed matter. Through radio and television-sets the knowledge can reach their billions whereas printed words reach at the most a few millions. We can now store the whole collection of medium size libraries consisting of 50,000 volumes in 5`x 5`x 3` size cabinet. One microfiche which is largely reduced form can accommodate 1000 printed pages. What we require is the microfiche reader. This is a new technology which helps to save the unnecessarily physical growth of libraries every few years. We can store at least 100 years of past collection of important newspaper on microfilms in a compact 6`x 6`x 6` cabinet. Also important crumbling ephermeral material can be preserved on a few inches

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of microfilm which is designed to withstand almost anyting except fire. The sources of tomorrow's research lie in the newssheets of today. Yet how many research librarians can shelve and preserve thousands of newspapers which in a few months will crumble at a touch. The microfilm does not merely illustrate many a new methods of preserving information, but also a simple way of transmitting it. A reader may go trhough the information by simply unrolling the film on the reader. Today microfilm readers are expensive and perhaps the public libraries may not afford to buy them, but in the future the situation may not be bad. In fact the same situation will be there with the print presses.

But, we should not forget that there is a limit to physical expansion of libraries. It is not possible that every 10 years there is an another extension of a library. Hence space saving is possible only when we acquire the reading material on microforms.

Reading material on slides, gramophone records, tapes and cassettes are equally important for modern libraries to preserve the knowledge. In under-developed countires because of a great dearth of microforms, there is a scope to convert library holdings on microforms. Why this is necessary is that such reading material can be consulted only in the library premises and there are chances to retain them for many more years than books. Few years from now will force Indian librarians to switch over to convert library holdings more and more on microforms than books.

Our public libraries should become centre of attraction to the public rather than islotaed, unused or limited use institutions. Hence librarians must constantly ask themselves how to direct their efforts towards more constructive work. How to put theory into practice? According to Ernestine Rose, "all thinking men must plan for tomorrow". The librarians should persistently ask themselves that what actions can help the libraries to be more useful to the people. He should not abandon thinking about providing perfect library service and the ideals which are really dear to his heart. If need arises, he should not hesitate in experimenting new ideas and providing new services. While doing and thinking of new services and experiments, he should not forget the traditions of the society. Hence the librarian has to unite progress with tradition to have balanced view.

Usually it happens while performing all the above activities one feels dejected, resentful, perfunctory or hesitant because his appeals are not given importance by the authorities. Yet he should remain calm and try to improve new techniques and performance to convince authorities.

In order to give effective service to the readers, the librarians should have accurate and specific information about the reading habit of readers. He should know and seek answers of the following: What makes people read? What do they read most eagerly? Why do not they read? Why do not they use the library? It would be wrong to assume that certain type of communities do not care about books and reading. Hence library surverys should be conducted to find out the answers to the above questions.

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1.11 Library and the Changing Society

(Vyas, 1993)A new social order is emerging. The modern society is moving towards an information society. Axial Principle of Development is the centrality of theoretical knowledge and information which is the source of innovation, policy formulation and of executive functions.

Three dimensions are as follows:

1) The change from a goods producing to a service society.
2) The centrality of the codification of theoretical knowledge for innovation in technology.
3) The creation of a new intellectual technology as a key-tool for generation of wealth.

The civilized modern society knows the significance of the public libraries. Hence the state and central government should devise plans for improvement of the public libraries to make our modern society information oriented. The development of science and technology in the society is possible through an active role of the public libraries. It happened in the American society where the public libraries have played a significant role in their social life. For successful democracy the importance and image of the public libraries has to be enhanced. The government alone can do good about the public libraries.

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IN-TEXT QUESTIONS

4. Social institutions are_____.
   (a) Educational institutions (b) business institutions
   (c) art institutions (d) All of these
5. Library promotes _____ for books.
6. The use of the library by the people makes them _____citizens of the society.
7. The modern society is moving towards an information society. True / False
8. _____describes the library as a public institution charged with the collection of books to make these accessible for users.

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1.12 SUMMARY

Education, research, cultural advancement, knowledge, spiritual and ideological interests, pastimes, and relaxation are just a few of the necessities that modern civilization has. To meet these demands, society established a variety of institutions. The library stands out among them since it can satisfy every need equally, unlike other organisations that are only able to address one or a few of them. It supports society's educational and research endeavours, advances culture, disseminates knowledge, satisfies man's spiritual and ideological needs, helps him develop a moral code, and offers recreational opportunities(*Unit-1 Role of Libraries and Information Centres in Modern Society*, 2017).

Knowledge and information have always played a major role in human activity. However, it hasn't been until the latter half of this century that knowledge and information have taken centre stage and emerged as the most vital resources for growth. Information may now be stored, processed, accessed, and legally binding regardless of distance and location because to information technology, which moves data quickly and precisely. Information and knowledge now serve as fundamental resources, leading to the label "information society" for contemporary civilization(*Unit-1 Role of Libraries and Information Centres in Modern Society*, 2017).

The institutional framework for addressing various knowledge and information demands has undergone a significant transformation. The library is today one of several organisations that provide access to knowledge and information(*Unit-1 Role of Libraries and Information Centres in Modern Society*, 2017).

1.13 GLOSSARY

Library: In a library, books are kept, arranged, and shared among its patrons.

Information Centre: Information Centres lay emphasis on information contained in documents as a unit of service.

Social Institution: Social institutions include places of education such as schools, colleges, universities, places of research and culture, places of music and art, places of business, etc.

Modern Society: Societies that fall under the umbrella of the post-industrial, informational, and knowledge societies.

Information Society: A society in which the primary activity is the generation, dissemination, and use of information.

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1.14 ANSWERS TO IN-TEXT QUESTIONS

1. True 2. True 3. False 4. (d)	5. Desire 6. Well informed 7. True 8. S.R. Ranganathan

1.15 SELF-ASSESSMENT QUESTIONS

1. Discuss the role of Library and Information Centres in modern Society.
2. Discuss the services of Library and Information Centres in modern Society.

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LESSON 4

FIVE LAWS OF LIBRARY SCIENCE

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Ranganathan's Five Laws of Library Science
1.3.1 First Law: Books are for Use
1.3.2 Second Law: Every Reader His /Her Book
1.3.3 Third Law: Every Book its Reader
1.3.4 Fourth Law: Save the Time of the Reader
1.3.5 Fifth Law: Library is a Growing Organism
1.4 Interpretation of Five Laws in Digital World
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

1.1 LEARNING OBJECTIVES

The unit provides a glimpse of the Five laws of Library Science which discuss the basic philosophy of library science. On completion of this unit, the learners will be able to:

- Explain explain the characteristics of laws in general and identify them in Ranganathan's five laws;
- describe the Five Laws of Library Science;
- discuss the implications of Five laws in digital era;

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- discuss the application of the Five Laws in the digital era.

1.2 INTRODUCTION

(Khanna, 1987)S.R. Ranganathan conceived of the Five Laws of Library Science in 1924 in embryo form. The statements embodying the Five Laws were formulated in the final form in 1928 and published in 1931 under the same title THE FIVE LAWS OF LIBRARY SCIENCE. The essence of this Classic is that books are for use, and user is the KING whose time must be saved.

The Five Laws of Library Science are:

1. BOOKS ARE FOR USE
2. EVERY READER HIS/HER BOOK
3. EVERY BOOK ITS READER
4. SAVE THE TIME OF THE READER
5. LIBRARY IS A GROWING ORGANISM

What follows in the following pages is the summary and interpretation of this epoch-making work.

1.3 RANGANATHAN'S FIVE LAWS OF LIBRARY SCIENCE

The five laws of library science were created in 1928 by S.R. Ranganathan. In his five laws Ranganathan has tried to show all the activities of library operations and how these are affected by laws of library science. These laws discuss he basic philosophy of library science. Surprisingly, Ranganathan wrote 'Five Laws of Library Science' when he hardly had any long experience in the profession. How could he produce a book of high calibreat such a young age is quite surprising ! The book speaks of his high knowledge of library science. Ranganathan considers libraries as the most powerful institution of the society. When we read the Unit we get a glimpse of library science and we feel like translating his laws of library science into practice. They help us to organize our libraries successfully, and we also strive for the objective of the libraries for which these have been established(Vyas, 1993).

Ranganathan writes that it was during the discussion with his former teachers that the first law of library science. 'The Book are for use' was devised. Our laws just followed it. Ranganathan had an opportunity in December 1928 when the University of Madras invited him to give a course of Vacations Lectures to teachers. It was his first formal experience of

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lecturing to the audience of the teacher when newly enunciated five laws of library science put to test. He put forth his ideas very forcefully and quite satisfactorily. Ranganathan considered the five laws as beginning to his brilliant career of library science.

Ranganathan's, laws of library science work as basic laws. They appear to be so elemental and obvious and yet they are least followed in practice. They are very simple and yet they so profoundly influence and have complete sway over all the domains of library science. Ranganathan elevated librarianship to the level of a discipline in all its branches and secured recognition for it as a science. The laws are rightly called 'five laws of library science'.

If the librarians keep these laws in mind and endeavour to put them into practice in the spirit in which they are meant, the library service can improve considerably. These laws serve as a guide to the librarian in making his library an ideal one, not only in his outward appearance but also in respect of the service it has to perform. It is an effort to describe the significance of these laws so as to refresh the minds of the librarians about the urgency and to impress upon them the necessity of always keeping them in view during their day-to-day work. These laws cover all aspects that the librarian has to care for e.g., library building, library equipment, publicity, book selection, classification, cataloguing, etc.

His five laws are as follows:

1) Books Are For Use
2) Every Reader His or Her Book
3) Every Book-Its Readers
4) Save the Time of Readers, and
5) Library Is a Growing Organism.

1.3.1 First Law: Books are for Use

The first law 'Books are for use' serves to bring out clearly that mere collection of books in the library is not to be an end in itself. It must be remembered that the books are collected for the purpose of enabling the people to read them. Mere voluminous collection of the books is useless, if they are not utilized. Secondly, the librarian is not expected to waste the resources on very costly and rare books. The books which arouse a natural desire for reading and which make pleasant reading should find the place in the library. Besides, such books must be carefully safeguarded also. The old, worn-out and seasonal books are to be weeded out periodically.

This first law of library science is an outcome of the changes which are happening in the world due to onslaught of democracy. It is necessary in a democratic country that its people get access to the knowledge and information which is available in the libraries only.

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This access to knowledge is to be free of all irrespective of caste, creed, religion, race and colour distinction. Only then people will read and write. No democracy can be successful unless the people get formal or informal education and therefore the government owes responsibility towards the people for opening public libraries.

Implications of First Law of Library Science are listed below:

1. **Open Access -** Open access of books enhance their use. In this system, every reader is allowed to go to the shelves and choose the book of his interest. In case he does not find the desired book of his interest, he can choose some other from the shelves("Five Laws of Library Science," n.d.).
2. **Location** - A library should be situated near the central place. If it as an institutional library, then it should be situated near the center of the institutional complex. If it is a public library then it should be in the center of the city.
3. **Library Hours -** The first law demands that a library should be kept open for long hours, and during the hours which suits to its patrons most.
4. **Library Building and Furniture -** There should be a functional library building with pleasant, natural, and electrical light, soothing interior, good looking furniture, comfortable chairs, etc.
5. **Book Selection Policy -** Books should be purchased which are relevant to the needs of the readers. Books should be attractive such as it fills the reader with pleasure.
6. **Library Techniques -** Proper cataloging and classification of books are essential for promoting the use of books.
7. **Publicity** - The First Law demands wide publicity of each and every book of the library. For example, the librarian can bring out the list of new additions and latest arrivals through the Current Awareness Service (CAS) or Selective Dissemination of Information Services (SDI).
8. **Library Staff -** A library cannot come up to the expectation of the first law unless its staff is attentive and cheerful, and cares for the books and readers. Readers should be looked upon as customers. Some readers are shy and are not informed about the complex library techniques. The library staff should help such users to find their desired book. It will not only satisfy readers but also enhance library's use.
9. **Reference Service -** Reference service aims to establish the right contact between the right reader and right book at the right time. A collection of library resources would not be used fully unless the reference librarian makes effort to help the users to exploit the resources of the library. This personal service will lead to the greater use of books.

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IN-TEXT QUESTIONS

1. The Five Laws of Library Science is a theory proposed by_____.
2. The First Law of Library Science is _____.
3. Books are for Use is the second law of Library Science. True / False
4. The Five Laws of Library Science were enunciated in :
   a) 1926 b) 1927
   c) 1928 d) 1929

1.3.2 Second Law: Every Reader His/Her Book

The Second law, 'Every Reader-His Book' indicates what books the library should buy. This implies that the library should be conversant with the needs of its clientele. It should have an idea of their occupations so that it provides facilities to improve their knowledge in the fields in which they are already interested. This is the primary duty of the library. The school library should contain not only the prescribed text-books, but also all other useful reference and relevant books in various branches of learning. The curiosity of the children knows no bounds. Similarly, the public library should also contain books of general interest as well as informative literature. As 'Books are for all', and as the interest of the people vary in multitudinous ways, all useful books of all branches of knowledge should be found in the public library. Then only an individual will feel that his interest has not been overlooked, and thus will make maximum use of that library.

This law emphasizes that the library should have in stock all that its clientele is expected to demand. The librarian and the members of the book-selection committee should know the subject fields, in which the clientele of the library is interested. The books should be procured keeping in view all the classes of readers, e.g. from the elementary to the advanced.

Implications/Obligations of Second Law of Library Science are listed below:

1. **Obligations of the State -** When we say "Every Reader His / Her Book" or "Books for All", the state or government automatically comes in picture. The state has a certain obligation to its citizens and one of these is to provide equal opportunity to read. Ranganathan has discussed obligations of the state under three head. (i) Finance--providing finance by giving grants and by levying library cess (Ranganathan's choice), (ii) Legislation--enacting library legislation, and (iii) Coordination--of activities to ensure "Books for All"

2. **Obligations of the Library Authority -** The second law has something to say to library authorities in respect to the selection of books and staff. A library has limited

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finance. It is therefore desirable to know the requirements of the readers before selecting the books. Similarly, library authority should select staff for their library with professional competence and missionary zeal.

3. **Obligations of Library Staff -** Library staff should be cooperative and service minded. Library staff should form a bridge between readers and books, only then every reader will have his/her book. When a reader enters a library, the library staff should approach him with a helping hand. Second Law strongly advocates user education program in libraries.

4. **Obligations of the Reader -** The Second Law expects the readers also to discharge some responsibilities. Readers should be disciplined and follow rules and regulations. Readers should restrain from cutting pages from books, keeping books beyond the due date, etc. All such acts amount to keeping other readers away from their books.

IN-TEXT QUESTIONS

5. The Second Law of Library Science is _____.
6. Books are not meant for all. True / False

1.3.3 Third Law: Every Book its Reader

The third law is complementary to the second law. The law tells us that for every book we have to make an arrangement of the reader. It is also known that the book itself will not move from its place. Thus what efforts do we make so that the books go in the hands of right readers. In the third law the following issues are involved which require attention. This also makes us concerned as to what has to be done for the use of books by the libraries. The libraries will have to make efforts to see that the libraries provide open access, shelf arrangement, catalogue, reference service, newspapers and journals, publicity, extension service and book selection.

The third law points out that ultimately the book is meant for the reader and not for just filling the stack room. Books cannot reach the hands of the readers on their own accord. It is the duty of the librarian and his staff to bring the readers into the contact with books. If the books were to speak, they will mock at the librarian who does not do this duty ad condemn him as villain who separates the lover (reader) from his lady love, the book. Therefore, the valuable books which lie unused and uncared for, draws the attention of the readers.

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Implications of Third Law of Library Science are listed below:

1. **Open Access SystemOpen Access -** It is one of the most effective ways to ensure that the maximum number of books are seen by the readers. It also happens sometimes that the reader to the shelves in search of a book and in the process of search select many more books.

2. **Book Selection -** Give full weightage to the tastes and requirements of the clientele of the library. Difficulties of the Third Law can be minimized by adopting a well-balanced book selection policy. If the right books are selected it will definitely find its readers

3. **Shelf Arrangement -** If the books are arranged so that the subjects get arranged according to the degree of mutual relationship, then each book would have a higher probability of getting its readers.

4. **Easy Accessibility -** Books should be placed within easy reach of the readers. It has been observed that the books within the comfortable reach of the readers are most frequently used. For easy accessibility, shelves should not be higher than 6.5 ft.

5. **Cataloging -** Proper cataloging of books is very important as even though there may be well planned and arranged books on the shelves but they are incapable merely by itself. Series entry and cross-reference entries are highly useful in drawing the attention of the readers. Analytical entries increase the chance of a composite book getting its reader.

6. **Reference Service -** A reference librarian should know about the world of books and try to find out a reader for every one of these. The reference librarian should act as a canvassing agent for each book.

7. **Publicity -** Publicity is a very powerful weapon to attract readers to the library and thereby to increase the chances of every book to find its reader. For example, the arrival of new books may be brought to the notice of the readers by displaying them, near the entrance of the library, or by communicating the readers through an e-newsletter or broadcasting information about them through the Twitter handle of the library.

8. **Extension Service -** The library attract readers by converting itself into a cultural and social center. A library does this by organizing exhibitions, musical concerts, a magic show, celebration of local and national festivals, etc. Once the people come to these functions, then the library can make an attempt to bring books and readers together.

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IN-TEXT QUESTIONS

7. The Third Law of Library Science is _____.
8. The librarian should see that every book in the library used. True / False

1.3.4 Fourth Law: Save the Time of the Reader

The fourth law, "Save the Time of the Reader", urges that the librarian should retain the custom of those who visit the library at least once. He should not lose his clientele. How this could be done? The best course would be to devise a method in saving the time of the reader, by enabling him to choose the books he needs promptly and quickly. To avoid any delay in the choice of the book, the reference librarian should immediately rush to the help of the readers, getting to know his interests, and guiding him properly. He should be gentle and kind in his approach to the reader. He must have the tact of a salesman, endowed with a sincerity of purpose and sense of the service. The reader should be led to the shelf in which he can find the books he needs. Thus the reader is brought in to contact with the books. The main purpose of the library is to benefit the public by enabling them to improve their knowledge and satisfy their intellectual curiosity. This salient aspect should not be forgotten by any library authority at any time.

The fourth law comes in action when reader comes to the library and goes back from the library without waste of his valuable time. The objective of the law is to save the time of the reader. When we had register catalogue, instead of card catalogue, how difficult it was to search a name of author, call number, almirah number etc. The librarian will search the book when convenient. A most valuable time of the reader would be wasted. Now time is money and money is time. In the closed access method, for searching 200 books one whole day would be wasted. Hence it has been proved beyond doubt that the open access system saves lot of human labour. It saves the time of both i.e., the readers and the library staff. This law would be useful to us and would be in own interest.

Implications of Fourth Law of Library Science are listed below:

1. **Open Access -** In a closed access of books time is wasted unnecessarily. In open access, the time of the readers is saved. If open access is not there then the reader has to make the choice of the books through the searching of the library catalog. Then the reader requests the library staff the book which he has searched in the catalog. The staff searches the required book and if the staff is not able to trace the book, then the reader again needs to search the catalog. These problems can be avoided if open

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access is provided where the readers can themselves go to the shelves to search their book.

2. **Location** - The location of the library is of great importance. It must be centrally located so that it is conveniently accessible to the community served. For an institutional library, it should be in the center of the institution, for a public library it should be in the center of the city. Centrally located library saves the times of the users in visiting it.

3. **Shelf Arrangement, Classification, and Cataloging** - Proper classification schemes should be used in the library. Books should be arranged on shelves according to the classification number. Regular shelf rectification is also essential. In order to save the time of the readers, the library catalog should aim to provide different approaches to the users. It should include analytical entries for composite books.

4. **Stack-Room Guides** - To save the time of the reader, the library should provide an efficient system of stack room guides. It may be quite useful to keep it at the entrance of the stack room, the whole plan of the room indicating the position of the book racks and classes of books in them.

5. **Issue and Return** - Most readers want to read the book at home. For this, the library has to issue the books to the readers. Time-saving techniques for circulation to books should be used so that the user has not to spend more time in getting the book issued (or returned).

6. **Reference Service** - The reference staff establishes a contact between the book and the reader by providing Reference Service and Long Range Reference Services, thereby saving the time of the reader.

7. **Documentation Service** - A substantial time of readers is wasted in the literature search. The library should, therefore, undertake comprehensive or selective, as needed be, documentation services including SDI service to save the time of the reader.

8. **Library Staff** - Library staff should be cooperative. They should help the readers to find their document keeping in mind the message of the Fourth Law, i.e., to Save the Time of the Reader.

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IN-TEXT QUESTIONS

9. The Fourth Law of Library Science is _____.
10. Classification and Cataloguing are the implication of 4th Law. True / False

1.3.5 Fifith Law: Library is a Growing Organism

The Fifth Law viz., "Library is a Growing Organism" is somewhat different from the other laws. The number of readers will definitely increase in any library. To some extent there must be a proportionate expansion in the number of books made available in the library. Similarly, the number of staff members must also be correspondingly increased. Therefore when the building is erected for the library, we must bear in mind to allow enough space for its future growth. At least the foundation must be strong enough for erecting superstructures.

According to the fifth law, a library is a growing organism. In the library there is sudden metamorphic change i.e., growth in every aspect. Ranganathan considers the library as an institution which grows gradually in collection, staff and readers. He cites biological development of the man to justify his argument. The man has come to this stage from a unicellar animal to present man. If this evolutionary process is understood then it is easy to manage and plan libraries. Automation in the libraries poses a problem to this law. Now the impact of computers is felt in the libraries. It may limit the growth of the library staff, but not the growth of information documents as well as of readers. Ranganathan says that this law will affect all the activities of the library.

Implications of Fifth Law of Library Science are listed below:

1. **Reading MaterialsBalanced Growth -** The collection should grow in all the areas of subjects keeping in view the needs and requirements of all the readers, as far as possible.
2. **Casting Off the Old (Obsolete) and Preserving Valuable Books -** Weed out old, obsolete, and unused books in order to provide space for new additions. However, librarians should take necessary steps to preserve valuable materials.
3. **Choice of a Classification Scheme -** We should use a scheme of classification, which is able to meet the onslaught of knowledge reasonably well.
4. **Choice of a Catalog Code -** We should use a catalog code which is able to provide treatment to all kinds of library materials yet acquired as well as new materials likely to be acquired in future.
5. **Modernization -** Libraries may have to think of computerization of the various housekeeping jobs like the acquisition, circulation, cataloging, etc.

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6. **Staff** - When a library grows, the sanctioned staff at some stage become inadequate. So at that time an increase of staff should be considered. Any standard for staffing should be accepted by the libraries, then the library would be able to get the requisite staff.

7. **Library Building** -- Provision for Future - While planning and designing a library building, there should be a provision for the expansion of the building, both horizontally as well as vertically. The library should provide adequate space for the present as well as the future.

8. **Safeguards** - As the number of readers increase, the problem of theft of books from the library becomes acute, especially in the open access system. So, it necessitates some safeguards, such as entrance and exit should be from one gate, windows should be grilled, and all readers should be checked before leaving.

IN-TEXT QUESTIONS

11. The Fifth Law of Library Science is _____.
12. Library is a dead organism. True / False

1.4 INTERPRETATION OF FIVE LAWS IN DIGITAL WORLD

	Ranganathan's Original Conception	New Conceptions in the Current Environment		
First Law	Books are for use.	E-books are for reading.	Netflix is for watching.	Blackboard is for studying.
Second Law	Every person his or her book.	Every listener her iTunes.	Every artist his Photoshop.	Every student her EasyBib.
Third Law	Every book its reader.	Every blog its reader.	Every Google Map, its traveler.	Every digital repository its researcher.
Fourth Law	Save the time of the reader.	Save the time of the listener.	Save the time of the traveler.	Save the time of the researcher.
Fifth Law	A library is a growing organism.			

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Fig.1.1:

Source: (Connaway & Faniel, 2014) (CC-BY-NC-SA)

1. **The new first law: Save the time of the reader**
   As Ranganathan predicted, the fourth law, "save the time of the reader," has risen in importance as the requirements for the first three laws have been progressively satisfied. Given the vast array of content being offered through a multitude of information service providers, scarcity of time and attention is one of the most pressing issues facing people today. Consequently, we believe "save the time of the reader" has become the most important of Ranganathan's five laws and should be the lens through which we interpret a useful reading of the others(Connaway& Faniel, 2014).

2. **What's the new second law? The old second law!**
   If "save time of the reader" is the new first law in our reordering of Ranganathan's laws, what should be the new second law? In today's environment of information abundance and attention scarcity, the new second law has to be the old second law: "every person his or her book." Clearly, connecting every user who walks through library doors or searches library sites with the precise content they need—be it from one library's collection, the collective collection or the web collection—is of paramount importance in distinguishing libraries from other information service providers in the digital environment. There is no value in saving the time of the reader if we cannot pinpoint the information he or she needs.Obviously, sweeping, significant change has occurred over the past 83 years, and today the world, as well as the library, is adapting to the impact of a technology revolution as profound as the switch from mainframes to PCs. The environmental forces reshaping the information landscape— search engines, global connectivity, cloud computing, social networking, big data, hand-held and tablet devices, to name but a few—are redefining once again what it means to be a teacher, a scholar, a business person, a student, and a librarian.
3. **The new third law: Books are for use**
   Ranganathan's declaration that "books are for use" was meant to sound an alarm that a radical shift from preservation to use could not occur without key librarian actions and behaviors, such as providing comfortable space, convenient library hours and locations, and knowledgeable staff who offer excellent customer service. Users take these things for granted today; in 1931, they were the exception. Today, libraries are customer focused and offer a much wider range of content, systems and services than in Ranganathan's day, when the emphasis was primarily books and book lending. That's not to say that service, hours, buildings and furniture aren't still important—they are crucial. Librarians are expected to evaluate wide ranging, constantly

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changing content and service offerings to ensure users' needs are being met and library materials are being made accessible. Operating in an increasingly complex information and technology infrastructure, librarians must provide proactive, reliable service (Connaway, Dickey, and Radford 2011) and must connect with users in the building and on the Internet. Librarians also must constantly communicate changes in the collections and the access channels to the collections and services so that current and prospective users know how to reach the library and what resources exist beyond books.

4. **The new fourth law: Every book its reader**

   The cynical way to achieve "every book its reader," Ranganathan (1931) noted, is to have as few books as possible, drastically decreasing the numerator in the books per reader equation. In previous centuries, the whole purpose of literacy in some cultures was to master a small, specific canon of religious texts. In those circumstances, "every book its reader" would have been an easy task for a librarian. Few books, few readers. Problem solved. A cynical interpretation of this law, however, may not require nearly as much time traveling to encounter. Tired of defending his preferred genre of literature—science fiction—against charges of inferiority based on its worst examples, author and critic Theodore Sturgeon made the now-famous observation (later termed "Sturgeon's Law") that "ninety percent of everything is crud" (Wikipedia contributors 2014).

5. **The new fifth law: A library is a growing organism**

   It is true. The library is growing, but by what and whose measure? We proposed in Chapter 1 that "save the time of the reader" is now the most important of Ranganathan's laws since time, not content, is now the scarcest resource for most library users. If we apply this concept to his fifth law, "a library is a growing organism," we have to ask the question: What does it mean for libraries to grow in today's content-rich, time-poor, attention-driven environment? Ranganathan (1931) considered books, staff and readers as major parts of the library capable of growth. He discussed these three factors together because he believed growth and change in any one of them affected the others. Although not named explicitly along with the other three, he also discussed growth in terms of the library's physical infrastructure, such as the book racks, reading rooms, catalog room and reference desk.

1.6 SUMMARY

All library activities flow from the foundational principles of the five laws of library science. They make up the core ideologies of both librarianship and library science. They assist us in giving an explanation for everything we do or ought to perform at a library. They continuously alert us to the new techniques and procedures we ought to adopt in order to

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improve the library's ability to serve the community. They serve as a benchmark for evaluating the efficacy of all actions taken in regard to a library both collectively and individually. They have limitless potential for innovation in the provision of information services and libraries. The five laws have been revised in light of the evolving state of knowledge.The ramifications of each law make their legitimacy and applicability in the rising role of information in a country's development abundantly evident. The five laws are compatible with the contemporary information society framework.

1.7 GLOSSARY

Book:"A relatively lengthy work, often on a single topic. May be print or electronic."

Library: Library is a collection of materials, books or media that are arranged in classified way for making it easily accessible to its users.

Growing Organism: The growth of a new library will correspond to that of a child growing in all aspects. In case of a service library, once its growth has reached the adult stage, the growth would be in terms of replacing old books by new books and new users will continuously replace old users.

Library Reader/User: People who seek and use the information to meet their information needs are referred to as library users.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. S.R. Ranganathan 2. Books are for Use 3. False 4. 1928 5. Every Reader his/her book 6. False	7. Every book its reader 8. True 9.Save the time of the reader 10.True 11. Library is a growing organism 12.False

1.9 SELF-ASSESSMENT QUESTIONS

1. Mention the Five Laws of Library Science. Discuss the implication of second law of library science.
2. Discuss the implication of fourth law of library science.
3. Discuss the interpretation of Five laws in digital era.

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LESSON 5

NATIONAL LIBRARY OF INDIA: CONCEPT, FUNCTIONS AND SERVICES

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STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 National Library
- 5.3.1 Making of the National Library of India
- 5.3.2 Organisation and Divisions
- 5.3.3 Collections
  - 5.3.3.1. Delivery of Books and Newspaper Act, 1954
- 5.3.4 Collection Organisation

5.4 Functions of the National Library of India
5.5 Services of the National Library of India
- 5.5.1 Lending Services
- 5.5.2 Bibliographic Services
- 5.5.3 Reference Services
- 5.5.4 Reading Room Service
- 5.5.5 Reprography Services
- 5.5.6 Services for Children
- 5.5.7 Digital Collections, e-Resources
- 5.5.8 Training and Guidance Services

5.6 Summary
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

In this unit the readers will learn the basic structure of National Library, the apex Library of a country. The genesis of the National Library of India has been discussed phase-wise starting from 1935. Readers will learn the following points from this unit.

- Meaning of National Library
- Genesis of the National Library of India
- Organisational pattern of the National Library of India
- Delivery of Books and Newspapers Act, 1954
- Functions of the National Library of India
- Services of the National Library of India.

5.2 INTRODUCTION

The National Library of India is de jure national library of our country. It was established before independence as Imperial Library and in 1948 the name of the imperial Library had been changed to National Library. The unique characteristic of National Library of India is that the Library not only acts as deposit library and reference library but also lends its documents to general public of India. The making of the National Library of India starts in the year 1835 when Calcutta Public Library existed. The Calcutta Public Library got merged with Imperial Library in 1903. Many scholars and nationalists contributed their personal collections to enrich the library and in 1948 it became the National Library of India with John Macfarlane as its Librarian. Harinath De became first Indian Librarian of the Imperial Library. Maulana Abul Kalam Azad dedicated the National Library of India on 1st February, 1953 for general public and B.S.Kesavan was appointed Librarian of the National Library.

There are 15 Indian languages and 5 foreign languages divisions in the National Library. Administrative, Professional and Conservative divisions are prominent divisions. Each division is headed by Assistant Library and Information Officer. In collection development process, V.S.Jha committee and Nihar Ranjan Roy committee recommendations have been followed for purchasing of books. Gift, exchange and legal deposits are other factors for collection development in the library. D.B. Act, 1954 plays a very important role in the National Library.

Lending, Bibliographic, References, Reprography, etc. are vital services provided by the National Library. It also trains the Library Professionals and provides internships to Library and Information Science professionals. National Library provides support to Central Reference Library in bringing out Indian National Bibliography monthly and annually.

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5.3 NATIONAL LIBRARY

A National Library is a repository of published documents in a nation and about a nation. It is to be told that Mr. John Dee, a famous English mathematician, conceived the idea to establish a national library for the preservation of rare and old books in 1556. So, the existence of 'national library' can be traced back a long time ago. Every nation has a national library, like Library of Congress of USA, Bibliotheque Nationale of France, The British Library of United Kingdom, National Library of India, and so on. There are different types of definitions prevalent in the context of a national library, but more or less every definition advocates same things. Some definitions are discussed here.

a) According to Collins Online Dictionary, a National Library is a library that is –
   i. established and funded by any national government with the designation 'national'
   ii. and to serve the needs of the government
   iii. and to function as a library of record for the nation's publishing output,
   iv. and in some cases to act as a central agency for library and bibliographic development in the nation.

b) Harrod's Librarians' Glossary and Reference Book also backed the same ideas of a national library and additionally inputs that National Library-
   i. acts as a copyrighted library;
   ii. is consulted for reference purposes and;
   iii. acts as a preserver of information for posterity.

c) UNESCO defines National Library as "Libraries which irrespective of their title, are responsible for acquiring and conserving copies of all significant publications published in the country and functioning as a 'deposit' library, either by law or under other arrangements may be called National Libraries. They will also normally perform some of the functions like; production of national bibliography, collection and conservation of a large and representative collection of foreign literature including books about the country; acting as a national bibliographical information centre; compiling union catalogues and publishing the retrospective national bibliography etc. Libraries which may be called 'national' but whose functions do not correspond to the above definition should not be placed in the 'national libraries' category".

5.3.1 Making of the National Library of India:

The National Library of India has two unique characteristics. First one is, whereas, all the major national libraries all over the world are being used only as the reference libraries, the National Library of India lends out its documents too being the biggest public library in India; and second one is, the National Library of India has been established with different

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libraries subsequently merged and amalgamated to form today's structure. Therefore, the making of the National Library of India can be divided into four phases.

i. First Phase (1835): Calcutta Public Library

Calcutta Public Library was the foundation stone of the National Library of India. Four path-breaking events happened in the year of 1835.

a. First Medical College was established at Calcutta
b. English was declared as official language of India
c. Press was liberated in India
d. A Public Library for general public was established at Calcutta for lending and reference purposes with self-financing scheme.

Though, the enlightened citizen of Calcutta conceived the idea to form a Public Library for general public, history says it was the idea of J.H. Stocqueler behind the establishment of Calcutta Public Library. In a public meeting on 20th August, 1935 at Town Hall, resolution was taken to erect a public library and named as "Melcalfe Library" in honour of Sir Charles Melcalfe, who liberated press in India. It was not a government library, but a library based on public subscription. Rupees 300 was the amount to be paid to become proprietor of the Library. Price Dwarkanath Tagore was the first proprietor of Calcutta Public Library. Other Indians who also contributed were Debendranath Tagore, Prassan Kumar Tagore, Ram Gopal Ghose, Rustomjee, Peary Chand Mitra, etc. A committee was established to frame rules and regulations for the Library. The rules were issued on 8th March, 1836 and the Library was opened for public on 21st March, 1836.The core collections of the library came from acting Governor General Lord Metcalfe who transferred near about 4675 volumes of documents from the college of Fort Williams. Peary Chand Mitra became sub-librarian of the Library. The Library was established at 13, Esplanade Row, the residence of Dr. F.P. Strong. It was only in 1844 when the Calcutta Public Library was shifted to the first floor of the Metcalfe Hall after paying a sum of Rupees 16,398 to get a permanent address.

ii. Second Phase (1891): Imperial Library at earlier stage

After establishment of the Calcutta Public Library (CPL), small and tiny libraries were formed following the model of it. But after the first war of independence in 1857, the British Government could not tolerate the free flow of knowledge within India. A lot of restrictions had been imposed on libraries to curb those free flows. A good number of government libraries were present at the heart of Calcutta, now Kolkata. But their accesses were limited. Home Department Library, East India College Library and the Library of East India Board are famous government libraries which were amalgamated to establish Imperial Library (IL) in the year 1891.

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iii. Third Phase (1903): Imperial Library at later stage

In 1899, Lord Curzon visited the Calcutta Public Library but was very disappointed with the dilapidated condition of the Library. As the Calcutta Public Library was based on proprietary basis, Lord Curzon bought its share and merged it with the Imperial Library to save its documents for posterity.

30th January, 1903 was the date when Imperial Library welcomed general public. Imperial Library Acts says that the Library "should be a library of reference, a working place for students, and a repository of materials for the future historians of India, in which so far as possible every work written about India at any time can be seen and read". After opening the door of new Imperial Library for the public, it was announced that "the general idea of the whole library is that it should contain all the books that have been written about India in popular tongues". Sir Asutosh Mukherjee donated his entire personal collections of 80,000 books to the Imperial Library when he became President of the Imperial Library Council.

In 1923, due to shortage of space and other reasons, the Library was shifted to 5, Esplanade East from Metcalfe Hall. A committee was constituted to look after the Library in 1928. J.A.Richey took over the charge as Chairman of the committee. During World War II, the Library was transferred temporarily at Jabakusum House in 1942 and again replaced at Esplanade East in 1948 after the war was over.

John Macfarlane, the Assistant Librarian of British Museum, was invited to take the charge of First Librarian of newly-formed Imperial Library. Harinath De was the first Indian Librarian of the Imperial Library. J.A. Chapman succeeded him and Khan Bahadur M.A.Asadulla continued in office till 1947.

iv. Fourth Phase (1948): The National Library of India

The Imperial Library became the National Library of India after attaining independence in 1947 through the Imperial Library (Change of Name) Act, 1948. As the National Library would become a national prestige in new emerging India, the space and prestige were prominent issues. C. Rajagopalachari came to rescue at that juncture by offering Belvedere Palace (Viceroy Palace) for the new Library. Maulana Abul Kalam Azad, the erstwhile Minister of Education dedicated the National Library to India on 1st February, 1953 and B.S. Kesavan was appointed as the Librarian of the National Library.

The National Library of India got its “National” status through Article 62 of the 7th Schedule of the Union List of the Constitution of India.

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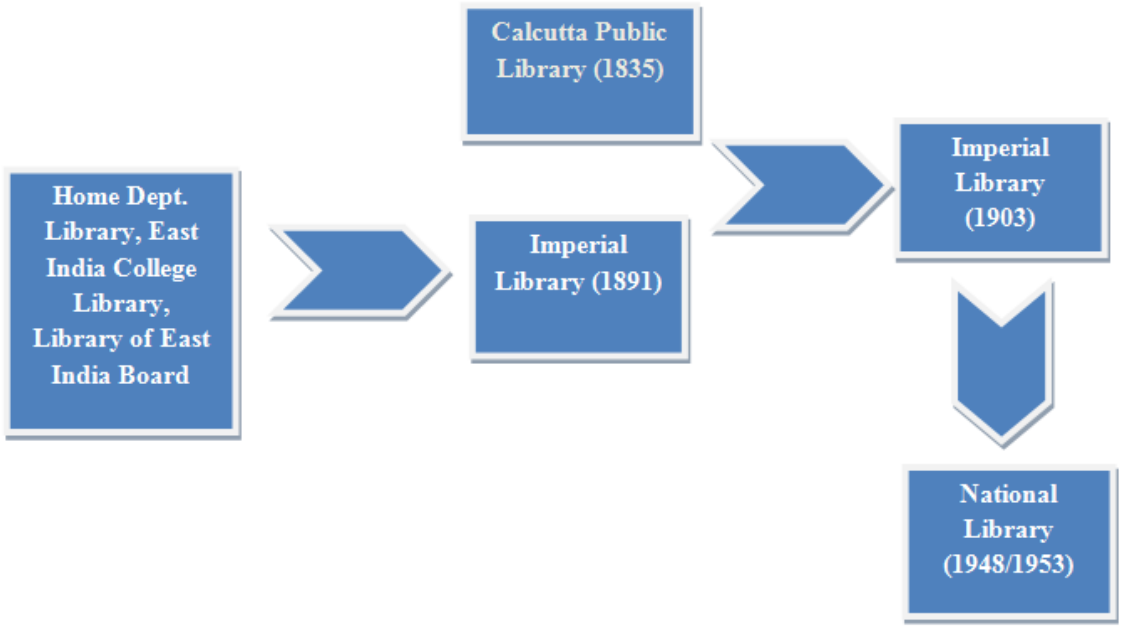

Fig. 5.1: Genesis of the National Library of India

ACTIVITY

1. Find out how many libraries are there under Ministry of Culture, Govt. of India.
2. Find out how many libraries get documents under Delivery of Books and Newspaper Act, 1954.
3. Write down the name of the places where National Library was housed before independence.

5.3.2 Organisation and Divisions:

The National Library is a "public library" under Delivery of Books and Newspaper Act, 1954. It is one of the six libraries under Ministry of Culture, Government of India. The highest post of the National Library is held by "Director" since 1977 instead of Librarian. "Director General" replaced the post of "Director" since 2010 and the Librarian is known as Principal Library and Information Officer. The National Library of India has three basic divisions, namely, Professional Division, Conservative Division and Administrative

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Division. Under Professional Divisions three sub-divisions are there, such as General Professional, Indian Languages and Foreign Languages Divisions. 15 Indian Languages and 5 Foreign Languages Divisions are prevalent. Administrative Division deals in establishment matters, security, gardening, central registry, public relation etc., and General Profession Division deals in library's technical works, such as acquisition, bibliography, Asutosh collection, lending section, etc. Divisions are headed by Assistant Library and Information Officer except Conservation Division where expertise of Chemistry and Reprography is required.

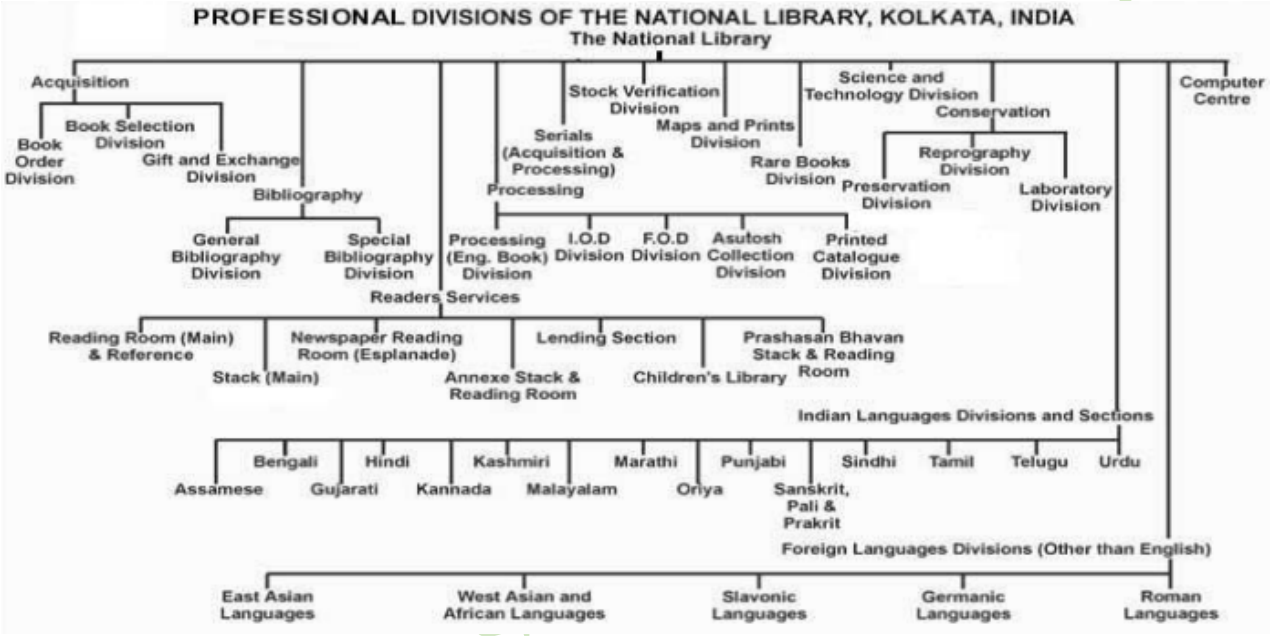

Fig. 5.2: Professional Division of the National Library of India

(Source: *www.nationallibrary.gov.in*)

5.3.3 Collecions:

26 Lakh collections are reported in the National Library of India. The main corpus of the collection comes from different sources- Gift, Exchange, Acquisition, Legal deposit and Repository benefits from international agencies. The National Library of India follows two recommendations while purchasing books.

a. Dr. V.S. Jha Committee recommendations (1969)

i. Books and journals on India brought out anywhere in the globe in any language.
ii. Publications (Indian) prior to 1954 and not present in the library.
iii. Books written by Indian authors but published in abroad.
iv. Standard reference works.
v. Books on Library sciences, education, general histories, agriculture, planning and development, etc.
vi. To fill up gap in collection.

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vii. To weed out books which are not in usable condition and replace them with new ones.

viii. Books (Foreign) which are on demand, etc.

b. Dr. Nihar Ranjan Roy Committee recommendations (1979)

Purchasing books on Science and Technology, Nihar Ranjan Roy Committee's recommendations have been followed, though a revised policy is taken into consideration in the year 2009-2010.

i. History of Science and Technology

ii. Science and Society

iii. Science Culture and Civilization

iv. Scientific Research and Policy and Environment Pollution

Gift section of the National Library enriches its collections in a better way than exchanges. Asutosh Collections has more than 85,000 books. Notable personalities like sir Jadunath Sarkar, S.N.Sen, Barid Baran Mukherjee, Tej Bahadur Sapru, Imambara Zakaria, etc. also donated in developing the collections of the Library. The gift and exchange policy have been governed by the 1969 Report of V. S. Jha committee -

i. Acquire the printed documents which are related to the country with photographic record which are not available in the country.

ii. Act an exchange medium and inter-library loan centre all over the globe.

The National Library has good relationships with many countries in exchanging documents. 111 institutions in 48 countries are in direct contact with the National Library of India in exchange programme. The Library has revised its gift and exchange policy in 2010. The Library gets a huge number of publications for being a repository library from international organizations and Foreign Governments, viz. American Government, Canadian Government, British Government, United Nations, etc.

5.3.3.1 Delivery of Books and Newspaper Act, 1954:

- The Delivery of Books and Newspaper (Public Libraries) Act, 1954 was enacted by Parliament of India with the instruction that every publisher of book and newspapers within the territory of India would deliver the first copy of its publication to the National Library of India and other three public libraries (Delhi Public Library, Delhi; Connemara Public Library, Chennai and Asiatic Society Library, Mumbai) within thirty days from the date of publication.
- The cost of delivery of books/newspapers should be borne by the publisher.
- The copy of the book should be whole one with all maps and illustrations attached to it and the condition of the book should be saleable-like.
- The person in charge of the public library should give receipt to the publisher.
- A fine will be imposed if the procedure is not followed.

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- The Act was amended and the word "Newspaper" had been inserted in 1956. It is popularly known as DB Act. The National Library of India gets first copy of all publications published within Indian Territory (except J&K).

5.3.4 Collection Organisation:

All Indian languages books are processed in their respective language division and English books are processed in English language division. 23rd Edition of Dewey Decimal Classification and AACR 2 (Second Level) cataloguing are used for technical works. Library of Congress subject heading list and Cutter's mark are also used. A stock Verification Division has been established in the Library for regular assessment.

IN-TEXT QUESTIONS

1. Genesis of the National Library of India is divided into_____ phases.
2. Imperial Library was precursor of the National Library. True / False
3. Delivery of books and Newspaper Act, 1954 was amended in the year _____

5.4 FUNCTIONS OF THE NATIONAL LIBRARY OF INDIA

The National Library of India is a custodian of our intellectual and artistic creation. Its functions not only highlight the cultural and intellectual heritage we inculcate but also support the lifelong learning of the community at large and enhance leadership quality at global platform. The functions of the National Library of India are discussed below.

- **National Bibliographic Control**

  Books received under DB Act, 1954 in the National Library of India makes the corpus of volume of the Indian National Bibliography (INB). Central Reference Library brings out INB (annually and monthly), Special Bibliography and Language Bibliography (annually). In other countries, it is the National Library which acts as a controlling authority to bring out national bibliography.

- **International Bibliographic Control**

  Books received through exchanges and different accords among different nations and international institutions expand the horizon for universal bibliographic control like ISBD which helps in revising cataloguing code like AACR or devising a new code like RDA fulfilling the need of the hour.

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- **Legal Deposit**

  National Library of India acts as one of the receivers of printed documents within India. It receives books and newspapers under Delivery of Books and Newspaper (Public Libraries) Act, 1954.

- **Publication of Catalogue**

  Central Reference Library brings out bibliographies on behalf of the National Library of India.

- **Acquisition of literature**

  National Library of India acquires all types of literature related to India and published within India through DB Act, 1954, Gift, Exchange, Purchase, etc.

- **Act as Referral centre**

  Acts as a referral centre as it has accurate knowledge of all bibliographies all over the world.

- **Medium for international book exchange and international book loan**

  National Library of India acts as a medium for exchanging documents among different national libraries and institutions globally.

- **Liaison as an apex body**

  As an apex Library in India, the National Library shows path to all other public libraries in India.

- **Train Library Professionals**

  National Library of India train Library professionals from time to time. Internship programme has also been conducted by National Library for fresh Library Professionals.

- **Preserver of heritage**

  National Library preserves documents for posterity. It has a dedicated conservation division for rare and old books. Rare books have also been digitized. Old newspapers have been microfilmed.

- **Provider of consultation, lending and reference services**

  National Library has an enormous reading room at Bhasha Bhawan. Readers can lend out books. Many national and international scholars consult the Library on daily routine basis.

- **Exhibition**

  National Library arranges exhibition on particular subjects, on special day and on famous personality regularly.

- **Accumulation of Foreign Publication**

  Important foreign publications, reports, etc. have been accumulated and preserved by the National Library.

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CASE STUDY

CAG Report No. 3 of 2010-2011 on National Library of India

Many objections have been raised by Comptroller and Auditor General of India. Though National Library is an apex body of all public libraries in India, strict compliance of rules and laws have not been followed. Under Delivery of Books and Newspaper act, 1954, only 5-12% of books published in Indian vernacular languages were received during the year 2004-2008 which shows that enforcement of DB Act is very weak. Acknowledgement should be sent to all publishers who send books under DB Act, but out of 900 books received, only 252 books were acknowledged by the Library. Therefore, the report said that stand of the Library should be changed in compliance with the rules and procedure prescribed by Govt. of India from time to time.

IN-TEXT QUESTIONS

4. Indian National bibliography is published by _____ .
5. Indian National Bibliography is published weekly. True/False
6. Which committee recommended National library to purchase books on S&T?

5.5 SERVICES OF THE NATIONAL LIBRARY OF INDIA

Different types of services are offered by the National Library though its different wings. Lending services, reprographic services, bibliographic services, reference services are the major services offered by the National Library.

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5.5.1 Lending Services:

Unlike the other National Libraries all over the world, the National Library of India lends out its documents to the general public with some terms and conditions. Readers have to deposit sums to lend out documents. Government publications, gifted books, rare documents, etc. do not fall under the purview of lending services.

- **Local Membership –** One has to become member to opt the facility to lend books from the Library after depositing money equivalent to one and half time of the price of the book.
- **Outstation Membership –** The borrowing institution has to bear the postal charges. Within India and outside India book can be borrowed for a limited period of time.
- **Inter Library Loan –** A few numbers of libraries in abroad and India can opt for this facility. Russian State Library, British Library, etc. are the partners in inter-library loan service.

5.5.2 Bibliographic Services:

A dedicated bibliographic division has been put on place in the year 1951 with an aim to provide special bibliography on request. This service has been provided free of charge. Retrospective bibliographies are also made on the topics which have national importance and value. Comprehensive and detailed bibliographies have been prepared in collaboration with other institutions. List of translations and list of bibliographies which are brought out in India has been sent to UNESCO for their incorporation with Index Translationum. In 1961, A Bibliography on India: Indian Botany has been published. Indian National Bibliography, Special Bibliography, Language Bibliography have been published by Central Reference Library with the help of National Library after getting records of the books received through DB Act, 1954.

5.5.3 Reference Services:

References services are provided to those who visit the Library physically and telephonically when enquired. A specialized group is developed to handle complex queries and resolve within least time.

5.5.4 Reading Room Service:

A large reading room is established at Bhasha Bhawan to accommodate a good numbers of readers. Near about 500 readers can be accommodated in this reading room. Every division like rare section, maps, science and technology division, Asutosh collection division, etc. have separate reading room facilities. Special seating arrangements have been provided to special scholars in the Library.

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5.5.5 Reprography Services:

Without violating copyright act, photocopies, microfilms print out, etc. have been provided to scholars on demand against requisite payment. National Library has in-house printing press for limited use and circulation.

5.5.6 Services for Children:

Children section has more than 30,000 collections. The children section organizes story-telling quiz and debate programmes. The children section has English, Hindi and Bengali books. Any children can use the section without becoming a formal member of the library.

5.5.7 Digital Collection, e-Resources:

The National Library of India has digitized a good portion of its collections which can be accessed through its website. A lot of e-resources, i.e., e-book, e-journals are also made available by the Library. The Library provides remote access to its bona-fide users for e-resources through Access Control software.

5.5.8 Training and Guidance Services:

Training to the Professionals and guidance to the other Libraries have been provided from time to time to become world leader in the field of Library services.

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IN-TEXT QUESTIONS

7. Outstation institution cannot lend books from National Library. True/False
8. Reading Room facility is housed at _____.
9. No children section has been opened in National Library till now. True / False
10. National Library gets national status in which article of the constitution_____.

5.6 SUMMARY

National Library is backbone of a country's cultural heritage. It is a depository and reference library of a country. National Library is established and funded by national government with a designation "national". Under article 62 of the seventh schedule of the Union list of the Constitution of India, National Library of India gets its national status and importance. Four phases have involved in making India's National Library since 1835. Many

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scholars and nationalists had contributed their personal collections to enrich the library. The place of National Library of India has been changed many times prior to getting final destination at Belvedere, Alipore, Kolkata. Asutosh collection is one the prominent collections in the National Library. The library has relationships with many international institutions and foreign governments in exchanging documents and inter-library loan process. The National Library of India plays a very important role to showcase India's cultural heritage in front of world community. Many services have been delivered by the Library to make it a world class library and it also preserves rare and old documents for posterity.

5.7 GLOSSARY

AACR: Anglo-American Cataloguing Rules for cataloguing.

Bibliography: List of books and article used as references.

RDA: Resource Description and Access. A cataloguing code and successor of AACR2

Referral: Type of reference service where information seeker is directed to a place where information may be obtained.

Reprography: Photocopying or making duplicate copies.

5.8 ANSWERS TO IN-TEXT QUESTIONS

1. Four	6. Nihar Ranjan Roy
2. True	7. False
3. 1956	8. Bhasa Bhawan
4. Central Reference Library	9. False
5. False	10. Article 62

5.9 SELF-ASSESSMENT QUESTIONS

1. Explain the functions of National Library along with unique characteristics of the National Library of India.
2. Write the services provided by the National Library of India.
3. Write a short note on Delivery of Books and Newspaper Act, 1954.

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LESSON 2

PUBLIC LIBRARIES, ACADEMIC LIBRARIES AND SPECIAL LIBRARIES

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1.1 Learning Objectives
1.2 Introduction
1.3 Public Library
  1.3.1 Objectives of a Public Library
  1.3.2 UNESCO's Public Library Manifesto
  1.3.3 Functions of a Public Library
  1.3.4 Collection of a Public Library
  1.3.5 Examples of Public Libraries
1.4 Academic Library
  1.4.1 Objectives of Academic Library
  1.4.2 Types of Academic Library
  1.4.3 Examples of Academic Library
1.5 Special Library
  1.5.1 Objectives of a Special Library
  1.5.2 Functions of a Special Library
  1.5.3 Collection of Special Library
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

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- To identify different types of Libraries like Public Library, Academic Library and Special Library.
- To understand how their functions, services, resources differ from one another. The basic services provided by these libraries will remain the same but there will be a little variation with regard to functions, collection and role played by its staff.
- After reading this lesson, you will be able to illustrate different types of libraries with examples.

In the previous lesson, you have learnt about National Library of India and its functions. Now moving further, you will read about different types of Libraries i.e. Public Library, Academic Library and Special Library which will be further divided into sub-types with suitable examples.

Since there has been information explosion with the advent of technology, there arise a need for guidance on what is a reliable source of information and how it can be attained. For this, a Librarian can help assist the readers as they are in possession of credible information sources like subscribed databases which provide reliable information services. The role of a librarian differs for different types of Libraries, they may be called as information officer, documentarist, information analyst, archivist among others.

In this lesson, we will discuss about different types of libraries in detail and their basic objectives, functions and collection etc. As there is a diversity in readers having different reading preferences, there arise a need to have different types of Libraries. The basic objectives and functions remain the same for all libraries but to meet specific information requirements of its readers and to fulfill the objective of it's very existence, these libraries offer specialized services and build their resource collection accordingly. Let us learn more about these in detail in sections below.

A Public Library, traditionally, was considered to be a public institution holding a wide range of printed collection to cater to the information needs of all communities of people irrespective of any discrimination on the basis of age, caste, religion or educational qualification. Such an institution is funded from public sources such as taxes. But in present scenario, the role has expanded and a public library act as a knowledge centre which is expected to provide information requested by its patrons in both print and non-print form.

A Public Library is an institution opened for general public and acts as a social institution for the community. Public Libraries are non-profit Libraries and are operational by public funds and are opened with an aim to provide equal reading opportunities to the members of the society irrespective of their socio-economic background. These Libraries are

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operated on the lines of democracy. Inspired by the definition of democracy, given by Abraham Lincoln, the public library has also been defined as "a library, of the people, by the people, for the people."

A Public Library can have readers from diversified backgrounds and may have different reading interests. A reader may visit a public library for the purpose of information, research, support academics, recreational activities, competitive resources or for general reading interests. There should be sufficient reading collection in both print and electronic means for easy access. The Library must also include collection on local language, culture and historical aspects of the place where it is located.

1.3.1 Objectives of a Public Library

- Provide lifelong informal learning platform
- Provide access to wide variety of latest and updated reading material for varied disciplines
- Acts as a cultural centre for educational and recreational leisure activities
- Cater to informational needs of person with special needs like visually impaired, handicapped and disabled, residents of orphanages and old age homes or those who cannot access library physically like patients or prisoners.
- Provide solution to eliminate linguistic barriers, minimal computer skills
- Publicize information products and services to reach out to greater masses through social media platforms

1.3.2 UNESCO's Public Library Manifesto

A Public Library Manifesto was formulated by UNESCO for its member countries in 1949 and revised in 1972. The main objective of this manifesto was to provide free access to knowledge to all sections of the society irrespective of any discrimination. This manifesto was further revised in 1994 and recently in July 2022 in association with International Federation of Library Associations and Institutions (IFLA). It aims to promote use of public libraries and provides guidelines with regard to objectives, services and functions of a Public Library which is widely accepted by all the member countries of United Nations. It also highlights the funding, legislation, networks, its operations, management and implementation of the Manifesto.

Click on UNESCO's Public Library Manifesto for the detailed document.

1.3.3 Functions of a Public Library

1. Supplements Educational needs- Public Library generally has a huge collection of print and non-print resources and this can be beneficial specially for those who are into self-learning. Hence, a Public Library is also considered people's university as it emphasizes to eradicate illiteracy and focus on adult and social education by uplifting weaker sections of the society through its information programs.

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2. Acts as a Cultural Centre- Public Libraries acts a cultural centre and organizes programs and recreational activities such as lectures, discussions, book exhibitions, film screening, debate competitions, street plays and story hours and educational games for children. These creative activities enhance the capability of the intellectual minds of people, boosts their confidence and helps in their overall development. For this, a network with social, educational and cultural institutions is must for promotion of art and culture.

3. Preservation of knowledge- Since it is a public institution which provides information to a huge community of people, in order to keep its users informed of the cultural, historical and geographical perspectives, public libraries preserve documents emphasizing on these themes. With the advancements in technology, preservation activities can be done with the help of content management software like Greenstone Digital Library, Eprints Archives and Dspace etc. These softwares allow storing and managing digital files, easy access and retrieval of documents.

4. Induces reading habits- A public library must have a rich collection of motivational, self-help books, fiction/ non-fiction books, magazines, biographies of prominent personalities etc. to help it's readers to engage themselves in effective intellectual reading in their leisure time as per their interest. Reading habit if inculcated at the nascent stage can go a long way, students should pick books of different authors to get exposure and read for pleasure. Hence, special reading related activities must be arranged for children by public libraries.

5. Mobile Library- A mobile library is also called "library on wheels" as it is a bus carrying books on various topics/ subjects and visits different areas of the city as per schedule. Mobile Libraries help bridge physical gap between readers and available books by reaching out to people residing in remote areas who have physical or geographical barriers and hence cannot avail services of a public library.

6. Using Social Media Platforms- Since Public Libraries run on limited funds and resources, available social media platforms like are Facebook, Twitter, YouTube, Instagram, WhatsApp, Telegram, Snapchat among many others can help advertise their products to a broader audience. The potential of these platforms can be utilised to reach out to people of all age groups for publicizing services of a Public Library at no cost or minimal charge. These platforms act as a broadcaster for posting information w.r.t. new service launched, competitions or events organised, change in Library timings, schedule of Mobile Library etc.

1.3.4 Collection of a Public Library

Public Libraries are a service oriented institution and plays a pivotal important role in nurturing well-informed, skilled and learned citizens. Since it serves larger community it needs to function as a fully equipped information resource centre and must ensure that its readers get latest and updated information in required formats. In order to serve readers from different sections of the community, a public library must procure reading material of diverse nature but majorly must have the following in it's collection:

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Fig 1.1: Collection of Public Libraries

1.3.5 Examples of Public Libraries

- Delhi Public Library, Delhi
- Rampur Raza Library, Rampur
- Khuda Bakhsh Oriental Public Library, Patna
- Connemara Public Library, Chennai
- Allahabad Government Public Library, Uttar Pradesh (also called Thornhill Mayne Memorial)
- State Central Library, Kerala (also called Trivandrum Public Library)
- Thanjavur Maharaja Serfoji's Sarasvati Mahal Library, Thanjavur

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Libraries and Education coexist where Academic Libraries supplements formal educational programs. Academic libraries comprise School, College and University libraries and its services are majorly utilized for educational and research purposes. These libraries work on the ideologies and principles of the campus it is associated with and strives to serve its students/ faculty/ researchers in their academic and research endeavors. The collection, services, staff, their qualification, designation differ in each type of Academic Library.

The user database in these libraries mostly comprise of students, faculty, research scholars, administrative and other staff, hence the collection of these libraries reflect the range of core subject areas of it's users. Collection of an academic library majorly include books, periodicals, reference books, subject dictionaries, research articles, core subject related reading material in print or electronic form. The Librarian working in these libraries must ensure that latest and updated books and reading material is procured in order to provide latest knowledge in the field.

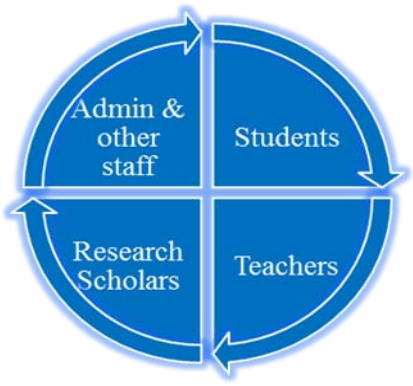

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Fig 1.2 Types of Users in an Academic Library

1.4.1 Objectives of Academic Library

- Fulfill information requirements of users associated with the academic community
- Procure latest reading and reference material to supplement formal curriculum
- Maintain updated collection of print and non-print reading material
- Provide material for extracurricular interests, like art, music, photography, fiction books
- Provide separate reading room and computer room with internet facility
- Render lending service appropriate to students, teachers and researchers;
- Maintain Reference Corner for referral and reference services

1.4.2 Types of Academic Library

In order to understand the roles played by different types of Libraries, a comparative statement of objectives, functions, type of users and resource collection of School, College and University Library has been given below to highlight how they differ from one another. The basic objective of any Library is to fulfill the information needs of its users; but the prime motive of a Library must be customization of it's services, procuring resources which are most suitable to their needs in order to provide effective services.

Table 1.1: Comparative study of Libraries under Academic Library

Tools	School Library	College Library	University Library
Objectives	● Supplement educational programs ● Inculcate reading habits ● Develop self-learning skills ● Supplement teaching skills with teacher resources Organize events to boost speaking and writing skills	● Supplement Bachelors/ Masters/ Ph.D and vocational Courses ● Develop a habit of self-learning ● Guidance for higher studies ● Prepare students for varied professions ● Provide latest editions and multiple copies of subject related materials	● Supplement programs like M.Phil, PhD, D.Lit, etc. ● Support academic, teaching and research activities ● Provide facilities for learning and educational programs ● Assist researchers to generate new knowledge Conservation & Preservation of research findings

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Functions	● Provide reading environment like adequate light, comfortable furniture etc. ● Develop collection to support formal education ● Develop collection w.r.t. motivational books, biographies, fiction/ non-fiction books ● Lending of books and reading material ● Guidance and counselling	● Develop collection to support educational programs and acquire in depth knowledge of the subjects ● Organising collection for easy retrieval by classification, cataloguing and shelving ● Provide reading spaces with adequate lightning and furniture ● Maintaining a Question Bank for reference ● Collection of Developing general books like motivational, literature etc.	● Develop collection to support teaching, learning and research programs ● Storage and easy retrieval of resources of the library ● Assist users in retrieval of documents from the collection ● Provide reference, CAS, ILL, documentation services ● Bring latest developments in the field to the notice of the researchers Adopt latest technologies to be effective in providing service
Readers	● Students ● Teachers ● Administrative staff	● Students ● Faculty ● Alumnus ● Administrative staff	● Students ● Researchers ● Teachers ● Administrative staff
Collection	● Textbooks ● Help Books ● Story Books ● Novels ● Magazines ● Newspapers Dictionaries among others	● Subject Helpbooks ● Reference Books ● Subject Dictionaries ● Periodicals ● Newspapers ● Previous Year Question Papers ● General Books	● Research Articles ● Research Findings ● Journals/ e-Journals ● Press Clippings ● Newspapers ● Govt Publications Thesis and Dissertation

1.4.3 Examples of Academic Library

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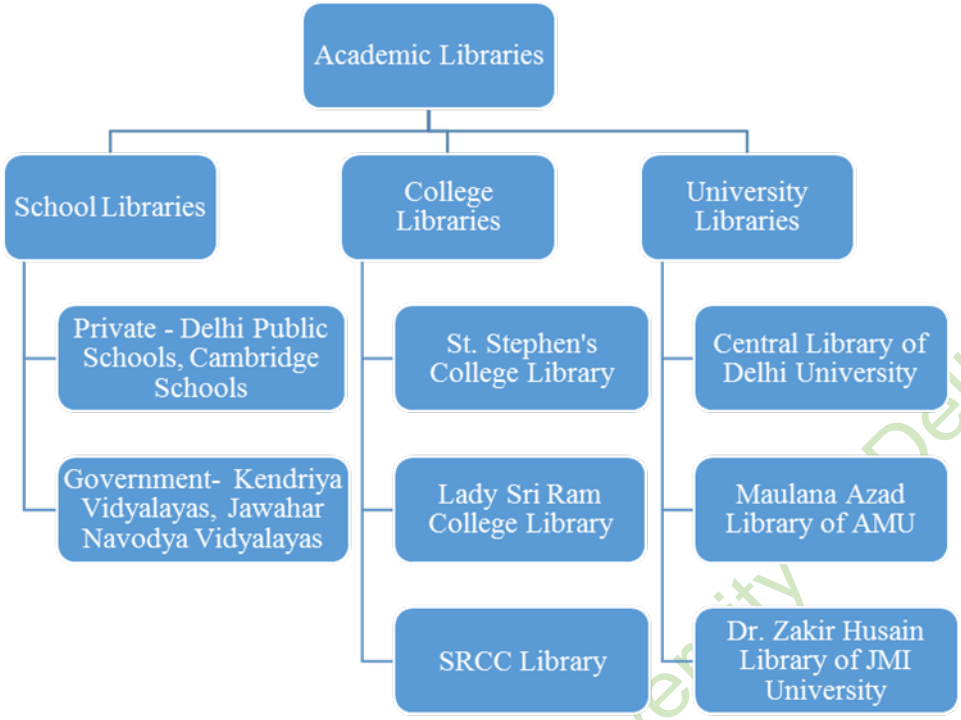

Fig 1.3 Examples of Academic Libraries

Academic Libraries being heart of an educational setup plays crucial role at all levels whether School, College or University level. Children are considered national builders for any country hence, inculcating reading habit at school level goes a long way in making them responsible citizens of the country and contribute to its economic growth. Hence, they should be motivated to adopt self-learning techniques by utilizing library resources in order to find solutions to their queries. Once this process becomes their habit, at a later stage in their life, college and research libraries can help supplement their higher education and research programs in a big way.

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“Libraries have existed for more than a thousand years. At that time, many of them have specialized in a specific subject area, but without ever being called ‘‘special libraries’’. So credit for the creation of special libraries as a separate class goes to John Cotton Dana, librarian of Newark Free Public Library, who in 1909, along with 26 other librarians from North America, met at Bretton Woods, New Hampshire. to discuss a new kind of library that had appeared on the American scene.” (Singh, 2006)

Special Library, as the name suggests, caters to information needs of special user groups i.e. researchers, scientists, lawyers, doctors, administrators, traders etc. These Libraries work on the lines of objectives of their parent organization and procure resources according to the subject needs of its patrons. These Libraries design their services, information products, collection development, conduct events keeping in mind the information requirements of its readers associated with the parent organization/ institution. It could be a Research and development centre, medical library, Law Library, resource centre of a MNCs or others in which people working or studying under the same roof have common objective.

The American Library Association’s (ALA) Glossary of Library and Information Science defines Special Library as, "a library established, supported and administered by business firms, private corporations, associations, government agencies, or other special interest groups or agencies to meet the information needs of its members or staff in pursuing the goals of the organisation. The scope of services is limited to the subject interest of the host or parent organization”.

1.5.1 Objectives of a Special Library

- To support and assist in achieving objectives of the organization it is associated with

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- To develop current and retrospective collection, resources in the concerned subjects
- To design customized services as per the information requirements of its patrons
- To provide current and latest trends associated with the subject to its patrons
- To organize programs, events, seminars in connection with the concerned subjects

1.5.2 Functions of a Special Library

1. Act as a Resource Centre- A Special Library must procure all the reading material in print or non-print form to keep its users updated with the latest trends. In order to assist research programs of the organisation, a variety of documentary resources like research reports, monographs, pamphlets, critical reviews, state of the art reviews etc. can be made available.

2. Customized Reference services- Reference services like Current Awareness Services (CAS), Selective Dissemination of Information (SDI), and Translation Services can be customized as per information requirements of its patrons to provide pin pointed and repackaged information. Repackaged information means to rearrange knowledge by filtering, analyzing, evaluating and storing for easy access and retrieval for specific group of users. On demand services to prepare indexes, abstract, summaries, bibliographies, accession lists can also be provided.

3. Collection Development- It is one of the crucial functions of a Special Library to select, procure and organize documentary and non-documentary resources for easy retrieval by the users. A library cannot have all the resources available hence advice of the concerned subject experts, specialists in the field may be taken in selecting the scholarly literature for the Library. In order to provide most updated information, a special library must have a rich periodical collection. A major chunk of budget must be allocated for subscription of print journals and e-journals.

4. Inter Library Loan (ILL)- A network of libraries associated with the concerned subject field can help provide assistance beyond the walls of the Library. Inter Library Loan services allows users of one library to get access to multiple resources of other libraries which are part of the network at a divided cost. This allows access to resources of multiple Libraries and also reduces the burden of financial and human resources required to organize the collection.

5. Translation Services- Keeping in view multilingualism, there may be worthy literature available in languages other than English. Special Library should also provide translation services to the researchers, scientists and other patrons so that language is not a barrier for them and they can make use of latest and updated literature available across languages.

6. Subscription of e-Resources- Since there has been an exponential growth of information, much of the information is also available in electronic form also. Hence, subscription to subject related e-journals, magazines can assist the users to access these

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resources anytime anywhere. With the help of login credentials access to these resources can be provided to the users. But while subscribing to these e-resources, special consideration must be given to terms and conditions of licensing like full text/abstract access, retrospective access, cost involved, currency, reliability, ease of access etc.

7. Support for technical communication- For researchers and scientists, assistance may be provided by library staff for technical writing, editing, compiling, formatting and publishing of research paper.

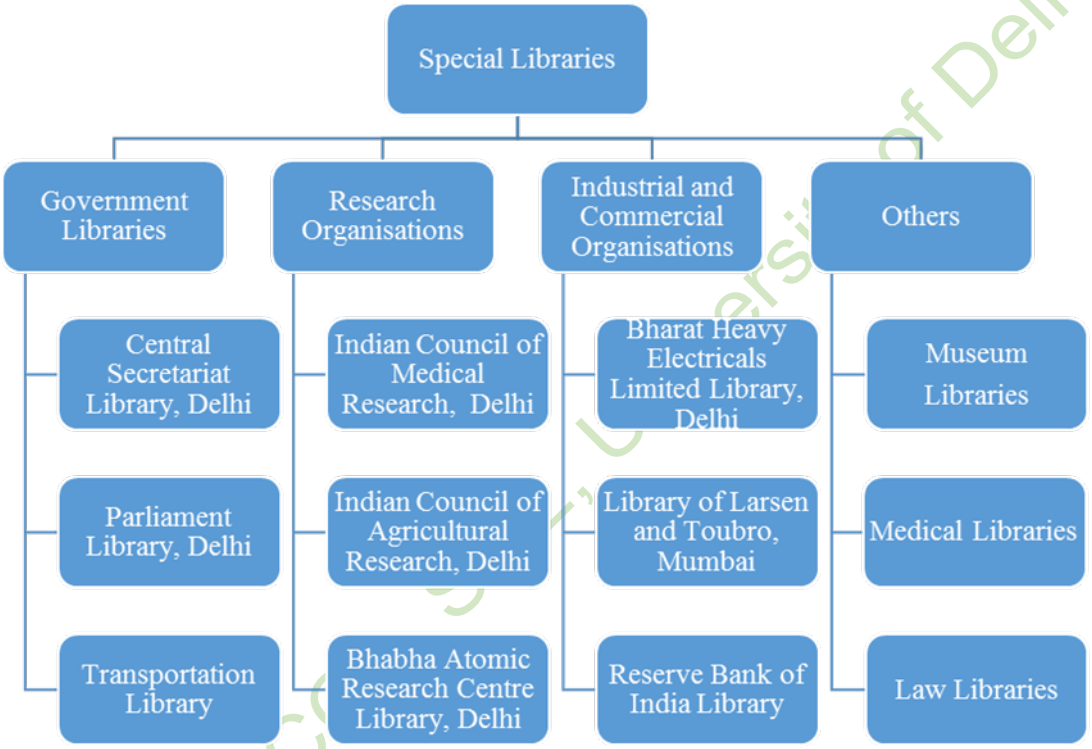

Fig 1.4 Types of Special Libraries

1.5.3 Collection of Special Library

In order to contribute to the overall development of the parent organization, librarians of special library need to have a clear perspective of objectives of the concerned institution and it's future plans. For this, understanding the structure of the organization, departments/ sections within the organization, hierarchy of the staff, their project requirements are crucial pointers without which information requirements of staff are difficult to satisfy. Once the clear understanding of operations of various departments is understood, efforts need to be made by librarian to procure required reading material in print and digital formats. Apart from usual collection consisting of books and magazines, the collection of different Special Libraries may vary from each other, but majorly consist of the following:

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Fig 1.5 Collection of Special Libraries

A Special Library provides two basic types of information services, namely "on demand information service" and "anticipated information service". On demand information service means to prepare and package information consulting various library resources after a user has approached the Librarian for a specific information. While on the other hand, anticipated information service means, based on the experience and queries of the researchers, the Librarian keeps the information which concerns the topic of their research readily available.

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In this lesson, we learnt the following key points about different types of libraries:

Public Library:

- Non-profit Libraries and are operational by public funds
- Cater to the information needs of all communities of people irrespective of any discrimination
- Acts as a cultural centre
- In the words of Abraham Lincoln, the public library has also been defined as "a library, of the people, by the people, for the people."

Academic Library:

- Academic libraries comprise of School, College and University Libraries
- Work on the ideologies and principles of the campus it is associated with
- Objectives, functions, type of users and resource collection differ for School, College and University Libraries
- Services are majorly utilized for educational and research purposes
- Users of Academic Library- students, faculty, research scholars, administrative and other staff

Special Library:

- Caters to information needs of special user groups i.e. researchers, scientists, lawyers, doctors, administrators, traders etc.
- Types of special libraries- Government Libraries, Research Organisations, Industrial and Commercial Organisations
- Work on the lines of objectives of their parent organization
- Act as a Resource Centre
- Provides “on demand information service” and “anticipated information service”

Inculcate: to influence someone to accept an idea

Nascent: beginning to exist or develop

Patrons: a person who is a customer or client of a store or the like.

Customize: to modify or build according to personal specifications

Endeavour: an effort to do or attain something

Alumnus: former student of a specific school, college, or university

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1. Delhi Public Library ; Khuda Bakhsh Oriental Public Library ; Connemara Public Library; Allahabad Public Library ; State Central Library 2. Trivandrum Public Library 3. July 2022 4. All of the above 5. Competitive Books, Newspapers, Magazines, Encyclopedias, Gazettes 6. School, college and University Libraries 7. Students, Teachers, Research Scholars and Administrative and other staff of the institution 8. University Library	9. School Library 10. University Library 11.Government Libraries, Research Organisations, Industrial and Commercial Organisations, Museum Libraries, Medical Libraries, Law Libraries among others 12. i) Indian Council of Medical Research, Delhi ii) Bhabha Atomic Research Centre Library, Delhi 13. Research Articles, Patents/ Standards, Annual Reports, Annual Reports, Conference Proceedings 14. ILL 15. Terms and conditions of licensing

1. Write any two objectives of a Public Library.
2. Describe how Public Libraries can be benefitted by Social Media Platforms.
3. Write any three functions each of School Library and University Library.
4. List the nature of the collections in a special library.
5. Discuss types of Special Libraries in short.

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LESSON 1

NATIONAL AND INTERNATIONAL ORGANIZATIONS: RRRLF, UNESCO AND IFLA

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STRUCTURE

4.1 Learning Objectives
4.2 Introduction
4.3 Raja Rammohun Roy Library Foundation
- 4.3.1 Purposes
- 4.3.2 Organization
- 4.3.3 Activities
  - 4.3.3.1 Assistance to Libraries
  - 4.3.3.2 Events, seminars and Conferences
  - 4.3.3.3 Projects and Fellowships
  - 4.3.3.4 Grant to Book Associations
  - 4.3.3.5 Library Act
  - 4.3.3.6 National Library Policy
  - 4.3.3.7 Digital Library Initiatives
  - 4.3.3.8 Promotional Activities
  - 4.3.3.9 Skill Development Programme
- 4.3.4 National Mission on Libraries (NML)
- 4.3.5 Publications

4.4 United Nations Educational, Scientific and Cultural Organization
- 4.4.1 Objectives
- 4.4.2 Organizational structure
- 4.4.3 Functions and Activities
- 4.4.4 UBC and UNESCO
- 4.4.5 Copyright and UNESCO
- 4.4.6 Standards
- 4.4.7 India and UNESCO

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4.5 International Federation of Library Associations and Institutions
4.5.1 History
4.5.2 Mission and Vision
4.5.3 Organizational Structure
4.5.4 Functions and Programmes
4.5.5 Seminars and Conferences
4.5.6 Membership
4.5.7 Publications
4.5.8 Awards and Fellowships
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

The unit is aimed to teach lessons related to national and international organizations attached with library and information services. After completing the unit, readers will be able to learn-

1. Basic structures and functions of national and international organizations;
2. the roles of RRRLF, UNESCO and IFLA in promoting and developing library services locally and globally.

4.2 INTRODUCTION

Promotion, coordination and dissemination of information are three functions played by national and international organizations engaged in library and information services. Some organizations are centrally funded, some are backed by foreign governments and member states. RRRLF is a nodal agency in implementing National Mission on Libraries and is working for upliftment of public libraries like UNESCO, which also developed a model public library in India. IFLA is a professional body for elevating Library and Information professionals all over the world. The three institutions are elaborately discussed here to give broad view about their functioning and roles in Library and Information services.

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4.3 RAJA RAMMOHUN ROY LIBRARY FOUNDATION

Raja Rammohun Roy Library Foundation (RRRLF) is an autonomous organization which is fully funded by the Central Government. It acts under the Ministry of Culture, Govt. of India. RRRLF is a registered organization under the West Bengal Societies Registration Act, 1961 having head office at Kolkata with five zonal offices.

Fig. 4.1: Zonal offices of RRRLF

RRRLF was established on 22nd May, 1972 to commemorate bi-centenary year of birth of social reformer Raja Rammohun Roy. The year was also taken for consideration due to following reasons-

- Silver jubilee celebration of independence of India.
- International Book Year with "Books for All" slogan.

Raja Rammohun Roy Library Foundation was set up to unfurl library services to general mass of the country in cooperation with state governments, union territories and organizations working in the field of library services. It is a nodal agency of Govt. of India for promoting library movement throughout the country and supports public library services and systems in India. The de-facto policy making body of RRRLF is the Foundation which comprises twenty-two (22) nominated members from different disciplines, viz., education, library, administration and govt. functionaries. Minister of Culture, presently G.Kishan

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Reddy, is the Chairman of RRRLF and Director General, presently Prof. Ajay Pratap Singh, is the executive head and ex-officio Member-Secretary of the Foundation.

State Library Planning Committee (SLPC/SLC), which is set in each state at the occurrence of the RRRLF, is an apparatus through which the Foundation works in near affiliation and dynamic participation with diverse State Governments and Union Territory Administrations. To take part in Foundation's program, a State Government/Union Territory is required to contribute a certain sum settled by the Foundation.The Foundation has also taken up activity to create District Youth Resource Centre (DYRC) in collaboration with Nehru Yuvak Kendra Sangathana, an autonomous organization under Ministry of Sports and Youth Affairs since 2005-2006.

4.3.1 Purposes:

RRRLF has 29 objectives for "supporting and promoting a network of libraries, which could carry books and the reading habits to remotest parts of the country". It performs as a consultative and advisory institution for library development in India.Some of the objectives are-

- **i.** Encourage in stimulating library movement in the country.
- **ii.** Articulate a national library strategy and aid in establishment of a national library system.
- **iii.** Offer financial and technical support to libraries.
- **iv.** Offer financial support to regional and national organizations working to further library movement.
- **v.** Publish relevant literature and serve as a clearing house for information and ideas for growth of libraries in India and outside India.
- **vi.** Advance study of issues related to library development.
- **vii.** Provide advice to the government on all issues relating to development of libraries in India.
- **viii.** Set up Regional Library Service Centre for the country.
- **ix.** Encourage state governments to pass library acts.
- **x.** Maintain register for qualified library professionals and their field of specialization.
- **xi.** Enhance research and training in library science and services.

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ACTIVITY

1. Discuss about genesis of RRRLF.
2. How RRRLF encourages State overnments to enact Library legislation?
3. Write down the name of public libraries under Ministry of Culture.

4.3.2 Organization:

Chairman (Minister of Culture) is in the apex position of organizational structure. There are different committees also to run the institution smoothly in addition to hierarchical staff. They are-

- Foundation Committee
- Administrative Committee
- Grants Committee

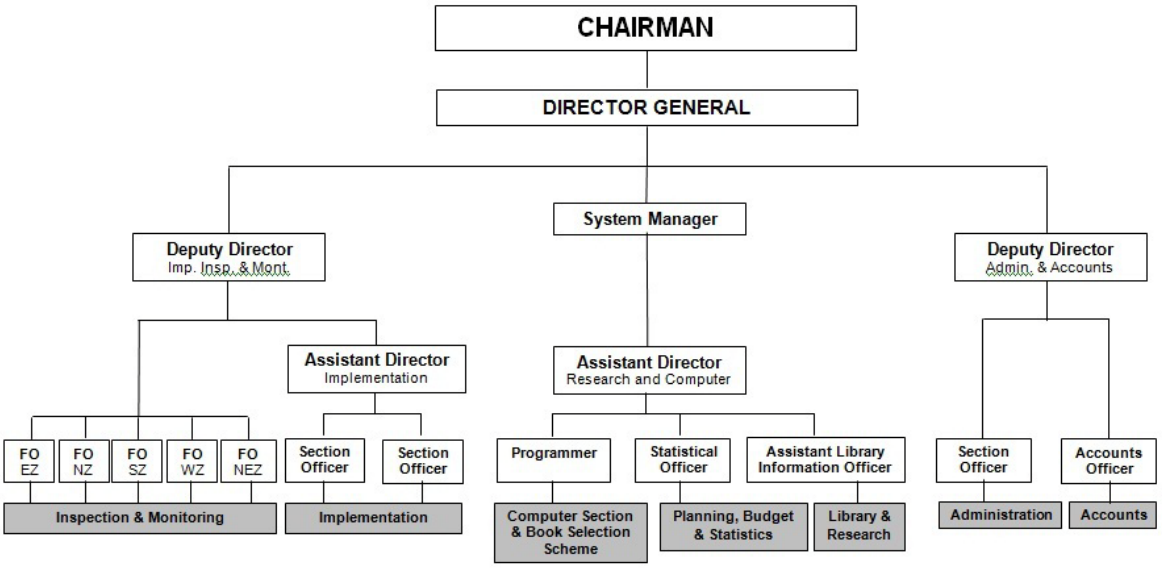

Fig. 4.2: Organizational Structure of RRRLF (Source: *www.http://rrrlf.nic.in/)*

4.3.3 Activities:

A lot of activities and programmes are offered by RRRLF. They are-

4.3.3.1. Assistance to Libraries:

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To help public libraries, numerous schemes have been initiated and administered throughout a year. The most prominent among them are-

- **Matching Assistance** – Matching grants are given by sharing resources with states and union territories administration on matching basis. The ratio of matching grant has been fixed as-
  - Developed States – 50:50
  - Developing and lagging States – 60:40
  - North-Eastern States – 90:10

  For matching grant different schemes have been finalized for assistance.

  a. Help in building sufficient stock of books and reading equipment.
  b. Support for establishment of Mobile Library Services and Rural Book Deposit Centers.
  c. Support for conducting seminars, workshops, training courses (orientation/refresher), book exhibition and library awareness programmes.
  d. Financial assistance for purchasing library furnishings, supplies and other items to provide facilities for readers.
  e. Support for public libraries to expand their facilities.
  f. Support for modernization of library services at public libraries.
  g. Support for development of resources for Divyangjan readers.
  h. Help in digitization works of manuscripts which are in public domain, rare books, rare documents, old journals, historical records and other necessary documents.
  i. Support for growth of Library on Wheels services.

- **Non-Matching Assistance** – Assistance under non-matching grant is provided to the beneficiaries from the Foundation's own funds and resources. While distributing resources to Non-Government Organizations (NGOs), RRRLF provides 90% of its resources and rest 10% has to be borne by NGO itself. Following schemes are taken under non-matching grant-

  a. Support for creating appropriate book stock through central selection (central book selection).
  b. Support for NGOs which are involved in library services.
  c. Support for RRRLF Knowledge Corner Development in public libraries.
  d. Support for public libraries in celebrating 50^{th}, 60^{th}, 75^{th}, 100^{th} years etc.
  e. Support for national seminar, workshops, training and awareness programme.
  f. Support for gathering and compiling library statics through official and non-official organizations.

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g. Support for government-sponsored libraries.
h. Support for children's libraries and development of the RRRLF Children's Corner.

4.3.3.2. Events, Seminars and Conferences:

RRRLF organizes conferences, seminars etc. Events can be categorized into two groups.

i. RRRLF events which are organized by RRRLF itself.
ii. RRRLF sponsored events.

4.3.3.3. Projects and Fellowships:

A dedicated research cell has been established for carrying out projects on Library and Information Science, public libraries and allied subjects. The cell also acts as an advisor and consultant in addition to preparing a report on loss of books in different libraries for the Govt. of India.

Under fellowship programme, outstanding merits have been encouraged to work with various institutions under the Ministry of Culture to discover and utilize unexplored resources.

4.3.3.4. Grant to Book Associations:

RRRLF gives financial assistance to various book associations for organizing seminars, workshops and conferences related to public libraries and allied subjects.

4.3.3.5. Library Act:

The Foundation constantly endeavours to legislate State Library Act in each and every state to spread library services to remotest corner of the country. Chairman of RRRLF pursues State Governments in enacting laws. Nineteen (19) states have so far legislated Library Acts.

4.3.3.6. National Library Policy:

In 1981, a vibrant team was constituted to draft National Library Policy. A draft National Policy on Library and Information System (NAPLIS) was formulated in 1983. Under the chairmanship of D.P.Chattopadhyaya, the NAPLIS was revised and finalized in 1985. The report was handed over to the Ministry of Human Resource Development, the erstwhile guardian of Department of Culture in 1986. Different recommendations have been entrusted, but Government of India has not taken it as an official policy till date. Therefore, the recommendations work as an advisory and suggestive in nature. Some main features of the policy are as follows.

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i. Establishment of free public libraries in the country.
ii. Focus on community library which will act as an information centre for rural people.
iii. Help in catering adult education through public libraries.
iv. Hierarchies of public libraries should be like - District Library, Town Library and Village Library.
v. Special libraries should be built, such as, community library, children's library.
vi. RRRLF will act as a nodal agency for development of public library system and services in India.

4.3.3.7. Digital Library initiatives:

RRRLF has undertaken digitization projects to digitize rare and valuable books such as pre-independence newspapers, journals, paintings, photographs, other public domain materials stored in public libraries to give free access to general public. National Digital Repository and National Digital Preservation programme are most important initiatives to preserve cultural heritage for posterity in addition to hosting contents on libraries, library development and library systems and services in India.

Visva Bharati and Rabindra Bharati Universities have already digitized their collections with the help of RRRLF and Bangiya Sahitya Parisad is going though digitization process. RRRLF has expertise in library automation works though Koha software. Archaeological Survey of India approached RRRLF for digitization and automation projects for the Central Archaeological Library, New Delhi though the project has not been taken up finally due to administrative reason.

4.3.3.8. Promotional activities:

Many promotional activities have undertaken by RRRLF on day-to-day basis for "qualitative improvement of library services".

i. Provide guidelines on public library systems and services.
ii. Raja Rammohun Roy Memorial Lecture annually.
iii. Liaison with international, national and regional professional bodies like IFLA, ILA, IASLIC and state library associations.
iv. Raja Rammohun Roy Annual Award to the best contributor of article written on topics related to public library and allied subjects.
v. Seven awards annually- one for best State Central Library and six for best District Libraries of six regions in the country. Best Rural Library Awards- One for each state, have also been institutionalized since 2005.
vi. RRRLF Fellowship to five eminent personalities in the field of library services and movement.

4.3.3.9. Skill Development Programme:

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It is to say that to enhance existing skills and working style, training modules have been developed by RRRLF for Library Professionals working in public libraries. They are categorized in three levels.

i. **Level 1**: This level deals with senior level officers engage in administrative and policy making process of state governments. It is strategic planning workshop focuses on futuristic aspect of public libraries.
ii. **Level 2**: This level deals in practical ICT training, enhancing administrative and managerial skills, etc. It aims for middle management level staff in state central libraries, district libraries and city libraries.
iii. **Level 3**: It aims for ground level staff and lower level officials who deal with general public. This level is basically for day-to-day routine works of libraries. Local trainer is hired to train staff of library in local languages; so that they can handle users in friendly manner.

4.3.4. National Mission on Libraries (NML):

NML is an initiative of the Ministry of Culture to connect more than 9000 libraries across India to give access to information digitally. It was launched by the President of India in 2014. After getting ten recommendations from National Knowledge Commission (NKC) in its 2011 report, NML was kicked off. Raja Rammohun Roy Library Foundation is nodal and central agency for NML in administration, logistics, planning and budgetary purposes. To refurbish existing public library systems and services and to give access to digital content to public at large, NML was rationalized.

RRRLF organizes Capacity Building Programme for Library Professionals to train with modern and state-of-the-art techniques of library services and application of ICT throughout the year in different states.

4.3.5. Publications:

Different types of literature have been published by RRRLF.

i. E-Publication
   - Directory of Public Libraries
   - Tagore Bibliography

ii. Print Publication
   - Books for the millions at their doorsteps: information manual of RRRLF programmes
   - National Policy on Library and Information Systems and Services for India: perspectives and projections
   - Indian libraries: trends and perspectives
   - Granthana: Indian Journal of Library Studies

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- Raja Rammohun Roy and the new learning: Raja Rammohun Roy memorial lectures
- Souvenir

iii. Newsletter

iv. Annual Report

Though RRRLF has incessantly trying to improve India's public library systems and services, there are many areas to focus on and to improve.

- Users' need has to be addressed in line of change management.
- Improve reading habits in rural communities.
- Increase internet connectivity to the remotest part of the country.
- Reach to the unreached and poor sections with proper information.
- More action rather than interaction in management level.

IN-TEXT QUESTIONS

1. How many objectives are there in RRRLF?
2. Matching Grant is not provided to North-Eastern States. True/False
3. D.P.Chattopadhyaya was chairman of NAPLIS. True/False
4. Which is the nodal agency to implement NML in India?

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4.4 UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

Like IFLA, United Nations Educational, Scientific and Cultural Organization's (UNESCO) origin can also be traced back to the "League of Nations" resolution on 21st September, 1921 to form an international grouping aftermath of World War I. It is an exclusive institution of the United Nations. Its intention is to promote "world peace and security through international cooperation in education, arts, sciences and culture". With 193 member states and 12 associate members, UNESCO spreads its wings in advocating peace, fostering sustainable development goals and facilitating human rights through education natural sciences, social/human sciences, culture and communication/information. Ratified by twenty signatories including India, UNESCO came into existence on 4th November, 1946 though founded one year earlier in 1945. It sponsors many projects ranging from technical training to cultural diversity. In every sphere of life, in every field of study and in every diverse field of humanity, UNESCO leaves its mark as omnipresent. The constitution of UNESCO reverberates the same thing - it "shall maintain, increase and diffuse knowledge by assuring the conservation and protection of world's inheritance of books, works of arts and monuments of history and science…all branches of intellectual activity".

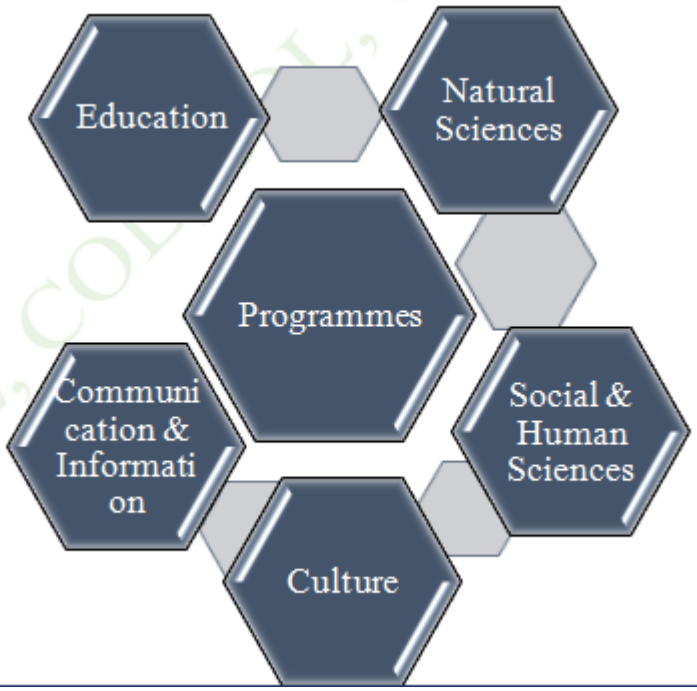

Fig. 4.3: Programmes under UNESCO

4.4.1 Objectives:

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UNESCO roams about in five fields of programmes. The trans-disciplinary approach with these five core fields make UNESCO a world leader in the sector of knowledge society. The main agenda of UNESCO is to empower people throughout the globe with its action and interaction. UNESCO focuses on public libraries to educate mass people and children to "catch them young". In the field of information and communication, priorities of UNESCO are –

i. to empower people through access to information and freedom of expression;
ii. to boost the mass to make use of ICT tools for education, science and culture;
iii. to give chance for personal communication development.

The Public Library Manifesto (1994) and School Library Manifesto (1999) also stipulate key objectives of UNESCO.

i. Inculcate reading habits among children.
ii. Boost oral tradition
iii. Access to performing arts
iv. Stimulate imagination for creative development
v. Participate in cultural activities
vi. Access to resources, support in learning and practicing
vii. Work with stakeholders to achieve goals.

4.4.2 Organizational structure:

The General Conference is the apex body which meets in every two years. It consists of Member States and other institutions with voting rights. There is also Executive Board which looks after overall functioning of UNESCO. The Secretariat at Paris is headed by Director General and other officials.

4.4.3 Functions and Activities:

- **Universal Access to Information –** Access to information and knowledge is utmost priority of UNESCO as the organization has come up after devastating two world wars. UNESCO promotes free flow of information through trans-boundary or trans-border data flow. According to UNESCO's manifesto individuals and communities' overall development is very important for growth of knowledge society. For this purpose, UNESCO makes standards, promotes awareness and thrives incessantly to accomplish missions. Library and Information professionals are trained to provide and manage free access of information and knowledge.
- **RAMP –** The advent of information communication technology has abruptly changed the way of acquisition, storage and dissemination of information. In 1979, UNESO started Records and Archives Management Programmes (RAMP) for under-developed and developing countries to manage their historical records which have cultural value for posterity. The aims of RAMP are –

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i. to safeguard cultural heritage and make people aware about value of digitization;
ii. to help member states in establishing record management systems by providing infrastructure, guidelines, standards, training, etc.;
iii. to foster healthy competitive atmosphere in the field of archival study.

- **Memory of the World–**It was established in 1992. Social upheavals and turbulence of war are key factors in preserving documentary heritage of the universe. To get access of historical and cultural documentary heritage, preservation is very much necessary. Destruction, illegal trading, inadequate storage vanished many endangered and rare documents. Therefore, the programme has come up to rediscover documents from oblivion.

  International Advisory Committee's (IAC) meeting in Poland in 1993 introduced the plan to be implemented by UNESCO. It has been assigned to educate stakeholders (Govt. and other organizations) to implement digitization project in letter and spirit. International Council of Archives (ICA) and IFLA also partnered in archiving documentary heritage. Numerous endangered collections got benefitted through the project. Radzivill Chronicle, Memoria de Iberoamerica, RAMP project on Peru are some successful missions.

- **Bridging the Unbridged –** Community Multimedia Centre (CMC) is a programme of UNESCO which offers digital opportunities to underprivileged. Community radio, community telecentre and community multimedia centre are gateways to global knowledge-village. The programmes address concern of digital divide and lessen the gap.

  Through local language, a low cost operative radio educates, inform and entertains a community. Thus empowers communities by giving voice to the voiceless. To exchange information and to communicate with the whole world, community multimedia centre plays an important role in The Third World. Operated by small groups, it benefits students, patients, cultivators and citizens at large. It becomes global voice of local people enhancing the scope of open learning and self-employment.

- **World Digital Library (WDL)** – It is an international digital library jointly carried out by UNESCO and Library of Congress. The main aim of this library is to reach to the unreached and narrow down gap of digital divide. It was launched on 21st April. 2009 with an aim to lessen biasness of English contents in internet and supremacy of European countries. WDL contributes in the field of scholarly research available freely over internet in multilingual format. World cultures, maps, rare books, music, recordings, films and photographs, prints and architectural drawings are major subjects that enrich WDL. Google has partnership with WDL to enrich its collections that "institutions, libraries, and museums have preserved could be given back to the world free of charge and in

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a new form for more universally accessible than any forms that have preceded it".

- **Capacity Building through ICT** – UNESCO believes that e-governance can bring good governance. UNESCO launched series of e-governance related capacity development programmes in Africa, Latin America and Caribbean regions. ICT tools have been used to improve local governance. To promote use of ICT tools in rural and municipal government, UNESCO gives training to government officials for good governance.
- **Information Processing tools** – UNESCO developed CDS/ISIS which is an Information Storage and Retrieval systems. It ran on IBM PC under MS-DOS environment. Initial release of CDS/ISIS was in 1985. To catalogue and to make bibliography, CDS/ISIS was extensively used in small and medium libraries. WINISIS is the windows version of it released in 1995. JavaISIS was designed in 2000. It allows remote database management from Windows, Linux and Macintosh computers. GenISIS is the product which allows HTML production. It also allows Application Programming Interface (API). J-ISIS project is the recent development in CDS/ISIS platform, which is a renewed version of Free and Open Source Software (FOSS) using UNICODE system.

  CDS/ISIS is used for database management and IDAM is used for statistical data analysis of data mining procedures. Internationally developed Data Analysis and Management Software (IDAMS) deals in survey data, advanced statistical data, etc. WinIDAMS is new version for Windows OS and is available in four languages.

  UNESCO provides training to use different software packages. Online tutorial also available in different languages. For exchanging data and to facilitate between CDS/ISIS and IDAMS, IDIS is used.
- **UNISIST** – An international sponsored project of UNESCO to encourage and harmonize bibliographic services rendered by numerous institutions. The Inter-governmental programme facilitates to exchange information at regional, national and international levels. It deals in scientific and technical information.
- **NATIS** – It is a concept of UNESCO for maximizing pertinent information by government organizations related to documentation, libraries and archives.
- **ASTINFO and APINESS**–For socio-economic development, to boost regional cooperation and use of information & data, Regional Network for the Exchange of Information and Experience in Science and Technology in Asia and Pacific (ASTINFO) has been launched in 1984. Asia Pacific Information Network in Social Sciences (APINESS) came later in 1986.
- **General Information Programme** – It is commonly known as PGI which was created by merging UNISIST with NATIS in 1976. It was intended to be a "transverse programme". Its objectives were to develop computer application and ICT in Library and Information services for exchanging information and

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sharing data among countries. PGI has been replaced by Information for All Programme in 2001.

- **Other Programmes** - Many other programmes have been offered by UNESCO. Such as-
    i. New World Information and Communication Order
    ii. Intergovernmental Programmes for Development of Communication (IDDC)
    iii. International System in Research in Documentation (ISORID)
    iv. Science and Technology Policies Information Exchange System (SPINES)
    v. Data Retrieval System for Documentation in the Social and Human sciences (DARE)
    vi. International Bureau of Education Documentation and Information System (IBEDOC)

UNESCO also promotes "information commons" or information which is available on public domain. Universal Access of Information is the right of mankind. UNESCO works towards preserving heritage digitally. UNESCO charter on Preservation of the Digital Heritage is a right step towards sustainable development. UNESCO is a torch bearer for Information for All Programme. It propagates towards accessibility of information towards creating a knowledgeable society through Free and Open Source Software, Open Educational Resources, etc.

4.4.4 UBC and UNESCO:

Universal Bibliographic Control (UBC) is a joint venture of IFLA and UNESCO started in 1984 at Vienna Conference. In this programme every nation prepared their catalogues of published documents and incorporated them in UBC to make aware of availability of document, location, language and other bibliographic details.

4.4.5 Copyright and UNESCO:

Universal Copyright Convention (UCC) was adopted under the aegis of UNESCO in 1952. It is one of the two important international copyright conventions in the world. It was developed by UNESCO as an alternative of Berne convention. To make copyright bias-free from the control of European countries, UCC was advocated.

4.4.6 Standards:

Common Communication Format (CCF) is a bibliographic record format for exchanging records between different information organizations and libraries. It was published in 1984 and a subsequent second edition in 1988. It implements ISO 2709 standard. It has three formats- Record Labels, Directory and Data Fields. CCF has some limitations that all types of libraries cannot use it.

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4.4.7 India and UNESCO:

India joined UNESCO on 4th November, 1946. UNESCO has office at New Delhi which promotes international cooperation. The activities of UNESCO in India can be grouped below.

i. UNESCO assisted to establish INSDOC in 1952.
ii. Regional workshop on Thesaurus construction was organized by INSDOC.
iii. Delhi Public Library was established in 1951 as a model public library.
iv. NISSAT was considered as main point of UNISIST/PGI and ASTINFO programme and NASSDOC for APINESS programme.
v. Science Olympiad was conducted with IGNOU.
vi. Kalinga Award has been institutionalized.

UNESCO is playing a vital role in accumulating, organizing and disseminating knowledge to give birth a knowledge based and biased-free society. It has collaboration with many international organizations like IFLA, International Council on Archives (ICA), Committee on Data for Science and Technology (CoDATA), etc. UNESCO provides fellowships, travel and study grants for Library and Information professionals. It asks Indian library professionals to represent as experts and advisors in developing countries. UNESCO has a dedicated digital library called UNESDOC. UNESCO arranges seminars, meetings, conferences. Workshops, meetings for professional growth. UNEVOC acts in the education sector by catering technical and vocational training with support of German Government. Though UNESCO publishes literature regularly on diverse fields, the most important publications were –

i. Public Library Manifesto (IFLA/UNESCO)
ii. School Library Manifesto (IFLA/UNESCO)
iii. UNESCO Thesaurus
iv. World Guide to Library Schools and Training Courses in Documentation
v. UNESCO Journal of Information Science, Librarianship and Archives Administration
vi. World Atlas of Gender Equality in Education
vii. Public Libraries and their mission.

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IN-TEXT QUESTIONS

5. Public Library Manifesto was published in which year?
6. Which institution started Memory of the World Programme?
7. UNESCO does not advocate for public domain materials?
8. Delhi Public Library was established by UNESCO. True/False

4.5 INTERNATIONAL FEDERATION OF LIBRARY ASSOCIATIONS AND INSTITUTIONS

The International Federation of Library Associations and Institutions (IFLA) is an independent, non-governmental and not-for-profit organization which represents library and Library & Information Science Professionals at global stage. At the Annual Meeting of the United Kingdom Library Association held in Edinburgh, Scotland, IFLA came into existence on 30th September, 1927. The official journey was started in 1929 with 15 members from 15 countries. IFLA has now over 1700 members in 155 countries. Its headquarter is in the Hague at Koninklijke Bibliotheek, the National Library of the Netherlands. The initial aim of IFLA was to promote international compassion and cooperation, deliberation and research & development in all spheres of library activity including bibliography, information science and education of library professionals and establishments of an international professional body with common interests. IFLA has awarded consultative status by UNESCO for the world librarians' community. IFLA has seven official languages, though most official works have been done through English language - Arabic, Chinese, English, French, German, Russian and Spanish.

4.5.1 History:

Genesis of IFLA can be divided into four phases. They are-

- The Prelude (1926-1930) – This is post-war period (World War I) when building blocks or associations in every walk of life was necessitated. The vibrant League of Nations showed the path in strengthening extraordinary cooperation among nations. League of Nations' Library Conference made the base of it. Gabriel Henriot was called the spiritual father of IFLA. International Congress of Librarians and Booklovers at Prague in 1926 also acted at the background of genesis IFLA. World Congress of Librarianship and Bibliography in 1929 held in Rome gave constitution of IFLA. In 1930, IFLA

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started to expand with its membership from 20 countries and the membership grew to 41 in 31 states in 1939. There were annual sessions of the International Library Committee for library cooperation and making cultural policies.

- The Cessation (1931-1951)–Political turmoil after World War II halted the growth and major activities of IFLA. The international meeting conducted by IFLA resumed only in 1947. This phase saw major ups and downs in working of IFLA as an international organization.
- The Renovation (1952-1969) –The need to revamp the organization was felt during this period. The old structure which existed before the war felt narrow and patriarchal. Europe's back footing in the world's stage, declination of imperialist colonialism, emergence of socialistic countries and cultural participation of the Third World forced IFLA to rewrite its statues to distance itself from its former cult – International Library Committee became IFLA-Council. Prominent international associations also joined ranks of IFLA at Brussels- International Associations of Theological Libraries, the International Agricultural Librarians and Documentalists and the International Associations of Technical University Libraries.
- The New Avatar (1970 onwards)–The year 1970 was celebrated as transition period of IFLA when 750 participants from 40 countries join the Association. IFLA got its new secretariat at Hague. IFLA cooperated with UNESCO in celebrating International Book Year in 1972. The horizon of IFLA went into such a height that it was no longer a library association only. Bibliographic and information institutions also joined the Association to augment its periphery and the word "institution" had been added to IFLA in 1974 to be called "International Federation of Library Associations and Institutions".

4.5.2 Mission and Vision:

IFLA has some objectives and core values to run the Federation in the line of professional growth. The Federation acts-

i. as a forum for Library associations, libraries and librarians;
ii. as a global voice for Library Professionals;
iii. to make a robust and united global library field;
iv. to "inspire, engage, enable and connect" library professionals from all over the world;
v. to represent library and librarianship in common interest areas;
vi. to boost continuing education of Library Professionals;
vii. to expand and nurture guidelines of library services.

To strengthen the mission, IFLA emphasizes on four core values.

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i. Freedom of access to information as stated in the Universal Declaration of Human Rights.
ii. Equitable access to information, ideas and intellectual works to every people, every section of society and organizations for uplifting social, economic, cultural, educational and democratic wellbeing.
iii. A good quality Library and Information services can only deliver the access of above-mentioned things to the society.
iv. Irrespective of caste, ethnic group, geographical boundaries, gender, language, political affiliation, religion, etc., everybody will be benefited by the activities of the Federation.

4.5.3 Organizational Structure:

IFLA has different layers of organizational structure.

- General Assembly – Highest governance body for policy making. It meets once in a year.
- Governing Board – It is responsible for management of the Federation. It deals in financial, professional and executive matters.
- Councils, Divisions & Units – There are Professional Council to look after professional works, policies and programmes and six Regional Council for strengthening regional brotherhood. To carry out different activities and programmes, eight Professional Divisions have been constituted along with different Sections and Special Interest Groups (SIG).

A. Division A - National libraries; Public libraries; Metropolitan libraries; Library buildings and equipment; Library services to multicultural populations; Local history and genealogy; National organizations and International relations (SIG).
B. Division B - Govt. libraries; Library and research services for Parliaments; Law libraries; Govt. info and official publications; Access to Information Network-Africa (SIG); Women, information and libraries (SIG).
C. Division C - Continuing professional development and workplace learning; Education and training; Library theory and research; Management of library associations; LIS education in developing countries (SIG); New professionals (SIG).
D. Division D – Academic and research libraries; Science and technology libraries; Libraries serving people with print disabilities; Audiovisual and multimedia; Library services to people with special needs; Management and marketing; Library publishing (SIG).
E. Division E – School libraries; Indigenous matters; Information literacy; Library for children and young adults; Literacy and reading; Reference and information services; Library history (SIG).

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F. Division F – Art libraries; Document delivery and resource sharing; Acquisition and collection development; Preservation and conservation; Rare books and special collections; LGBTQ users (SIG); Religions: libraries and dialogue (SIG).
G. Division G – Health and biosciences libraries; Social science libraries; Serials and other continuing resources; Environment, sustainability and libraries; News media; Digital humanities/ Digital scholarship (SI); Evidence for global and disaster health (SIG).
H. Division H – Bibliography; Cataloguing; Information technology; Knowledge management; Subject analysis and access; Statistics and evaluation; Big data (SIG).

- Advisory Committees – They advise the Governing Board. There are four advisory committees with ten members each in the committee. Advisory Committees play a very pivotal role in IFLA's developmental works.

A. Committee on Standards (CoS)
B. Copyright and other Legal Matters (CLM)
C. Freedom of Access to Information and Freedom of Expression (FAIFE)
D. Cultural Heritage.

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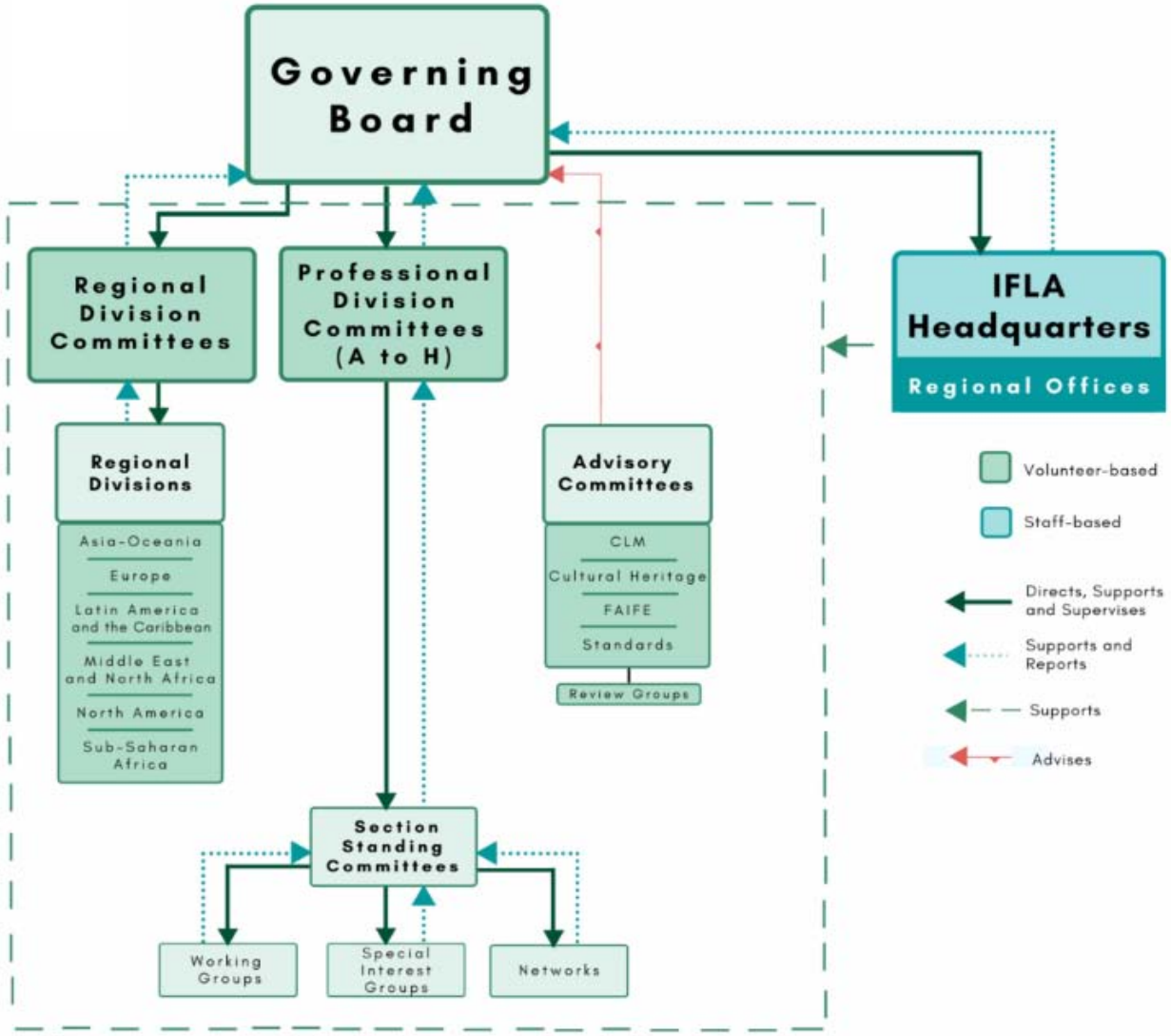

Fig. 4.4: Organizational Structure of IFLA (Source*: https://www.ifla.org/)*

4.5.4 Functions and Programmes:

A. Standards

IFLA works on professional standards and practices guidelines. It keeps liaison with international standard organization-ISO, CEN and ISBN.

i. **Bibliographic Conceptual Models (BCM)**–The conceptual model for bibliographic data has been developed since 1990s. Functional Requirements for Bibliographic Records or commonly known as **FRBR** was first of its kind published in 1998. It is a conceptual entity-relationship model used for retrieving information from online library catalogue and bibliographic databases. FRBR

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has group of entities known as Group 1, Group 2 and Group 3. Work, Expression, Manifestation and Item (WEMI) encompass Group 1 which represents intellectual and artistic creation of an author. Group 2 represents author and Group 3 represents production of Group 1 and Group 2's artistic and intellectual creation.

FRBR works on bibliographic data. Two types of data are there. One is Functional Requirements for Authority Data (FRAD) another is Functional Requirements for Subject Authority Data (FRSAD). For object orientation tool FRBRoo has been developed after FRBR. PRESSoo represents bibliographic information about continuing resources (journals, serials, etc.). The latest conceptual model is IFLA LRM (Library Reference Model). This model is based on entity-relationship modeling framework. It was developed in August, 2017 and endorsed by Professional committee for finalization.

ii. **International Standard Bibliographic Description (ISBD)** – ISBD is a standard or set of rules to write bibliography or library catalogue in human-readable format. It was published in 2011. To record or transcribe data elements in a particular sequence or to catalogue a resource, ISBD is used as a code. The punctuation marks in ISBD authenticates data to recognize and comprehend without language constraint.

"2021 Update to the 2011" is the latest edition of ISBD. Before consolidated edition of 2011, there were separate edition for different resources- monographs, serials, electronic resources, printed music, etc. ISBD supports Universal Bibliographic Control (UBC) programme of IFLA.

iii. **UNIMARC–**The Universal MARC (Machine-Readable Cataloguing) is an international standard for depiction and interchange of bibliographic data in machine-readable form. To exchange data between countries, UNIMARC has been facilitated. It is used widely and throughout the world. There are four metadata schemas present in UNIMARC- Bibliographic record, Classification record, Authority Record and Holdings information.

B. Copyright and Access to Knowledge

Copyright and Intellectual Property Right are central issues when comes to collection development process in libraries and document delivery system. IFLA works on matters related to international copyright law with World Intellectual Property Organization (WIPO) to enforce legal rights and deliver reforms at regional, national and global levels of library services. IFLA acts in this segment for-

i. libraries and archives in the matter of copyright and copyright infringement;
ii. copyright and its exception for people who are visually challenging (Support Marrakesh Treaty);
iii. liaison with WIPO for updated and developmental issues;
iv. negating broadcasting treaty of WIPO;

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v. preserving traditional knowledge at WIPO.

C. Access to Information and Freedom of Expression

Its core work is to promote intellectual freedom and freedom to access information by everybody irrespective of caste, creed, religion, boundary, etc. Librarians are gate keepers of intellectual and artistic creation of mankind. IFLA makes aware of intellectual freedom and promotes its development by interlinking libraries and librarianship. The main objectives are to–

i. establish interconnection between librarianship and freedom of expression and access to information;
ii. prepare and circulate materials related to freedom of expression by instructing advocacy to librarians to take necessary action;
iii. act as central point of freedom of expression, libraries and library profession.

D. Promoting and Safeguarding Cultural Heritage

IFLA is a member of Blue Shield organization which protects cultural heritage in any country at the time of war and natural disaster. To promote inclusive sustainable development, libraries have to play a very important role. Therefore, it focuses on-

i. to preserve tangible and intangible heritage of the world;
ii. cooperation with other countries for sustainable development;
iii. safeguarding the "memory of the world", library and librarians have key roles;
iv. proper support in the form of laws and funding to maximize reach and impact.

E. Library Map of the World- Started in 2017, it gathers library statistics and visualize it by comparing libraries about their contributions towards UN Sustainable Development Goals (SDGs). It covers all library types, its environment, policy, legislation, education in a country.

F. Action for Development through Libraries Programme- It was started in 1984 in Nairobi. Its aim is to strengthen library profession, institutions and library and information services in developing continents and countries like Asia, Africa, Latin America, Carribean, etc.

G. IFLA-CDNL Alliance for Digital strategies- It is a joint project of IFLA and Conference of Directories of National Libraries (CDNL) established in 2008.

4.5.5 Seminars and Conferences:

Annual World Library and Information Congress (WLIC) is held on regular basis. Regional meetings are also conducted to boost regional cooperation at international level. The very famous conference was held in Paris in 1961 which is known as the International Conference on Cataloguing Principles.

4.5.6 Membership:

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Three types of membership are there in IFLA- Associations, Institutions and Individual with certain annual fees and voting rights. India has representation in Executive Board of IFLA.

4.5.7 Publications:

IFLA has lot of publications in its credit. It can be divided into two parts:

a. Current
   - Trend Report
   - IFLA Journal
   - IFLA Publication Series
   - IFLA Series on Bibliographic Control
   - IFLA Professional Reports

b. Previous
   - IFLA/UNESCO Public Library Manifesto
   - IFLA/UNESCO School Library Manifesto
   - IFLA/UNESCO Multicultural Library Manifesto
   - IFLA/UNESCO Manifesto for Digital Libraries
   - IFLA Manifesto for libraries serving persons with a print disability
   - IFLA Internet Manifesto
   - A Library Manifesto for Europe.

4.5.8 Awards and Fellowships:

IFLA offers variety of awards and fellowships

- Honorary Fellow
- IFLA Medal
- IFLA Scroll of Appreciation
- Guust Van Wasemael Literary Prize
- Jay Jordan IFLA/OCLC Early Career Development Fellowship
- MargreetWijnstroom Fund
- Dr. Shawky Salem Conference Grant
- IFLA International Marketing Award.

IFLA advises library associations, institutions and library professionals in the field of library and information science and services. Copyright laws, inter-library loan, designing of library building, legal deposits are all key areas where consultancy and advocacy have been provided from time to time. IFLA has a dedicated network called IFLANET which advocates worldwide network of information. IFLA has cooperation with many international organizations- World Trade Organization (WTO), International Council of scientific Unions

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(ICSU), International council of Museums (ICOM), International Council on Monuments and Sites (ICOMOS), International Organization for Standardization (ISO) and many more.

CASE STUDY

Digitization Poject in Maldives, 2022: A Case Study

The restoration works in the history of the Parliament of Maldives started by IFLA in 2022 for century-old books. Mishandling and frequent changes of Parliament damaged the collections which dated back 1934-1939. Library and Archives of People's Majlis have started preserving all cultural heritage available to them for posterity with the help of IFLA.

IN-TEXT QUESTIONS

9. In which year name of IFLA changed?
10. Governing Board is the highest body of IFLA. True/False
11. Marrakesh Treaty is related to bling person. True/False
12. India has no place in Library Map of the World. True/False

4.6 SUMMARY

The development of library and information organizations in India is in nascent stage though they work incessantly towards achieving desired goals. The international institutions are far ahead of Indian organization in developing library professionals and library services. RRRLF works towards elevating nation and public library system like UNESCO which aim

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to disseminate information for all. IFLA trains library professionals the way how to deliver free flow of information without boundary for sustainable development.

4.7 GLOSSARY

Archives: Storehouse of historical documents.

Copyright: Intellectual Property Right of creator.

Digital Library: Digital collection in an online database.

Documentalist: Person engaged in safeguarding records and provides information.

Fellowship: A position in college/university to conduct research.

Marrakesh treaty: Adopted in 2013 for blind and visually impaired people to give access to copyrighted works.

National Knowledge Commission: A commission constituted by Govt. of India in 2005 to build knowledgeable society in five key areas- Access, Concepts, Creation, Application and services.

Public Domain: Available for public without copyright or legal restriction.

Special Interest Group: Community with a shared interest working in a specific field.

Standardization: Formulation, publication, and implementation of guidelines and rules.

Sustainable Development: Human development without compromising natural resources for future generations.

4.8 ANSWERS TO IN-TEXT QUESTIONS

1. 29 2. False 3. True 4. RRRLF 5. 1994 6. UNESCO	7. False 8.True 9. 1974 10. False 11. True 12. False

4.9 SELF-ASSESSMENT QUESTIONS

1. Discuss the major activities undertaken by RRRLF.

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2. Explain the major core programmes of IFLA.
3. Write a short note on functions and activities of UNESCO.

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LESSON 1

LIBRARY LEGISLATION: NEED, PURPOSE, OBJECTIVES AND MODEL LIBRARY ACT

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Library Legislation
1.3.1 Definition of Library Legislation
1.3.2 Need of Library Legislation
1.3.3 Structure of Library Legislation
1.4 Model Library Act
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

1.1 LEARNING OBJECTIVES

After studying this unit, you will be able to:

- to explain the need for library legislation.
- to understand the structure of library legislation.
- get aware of the essential components of the Model Public Library Act.

1.2 INTRODUCTION

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An Act is called legislation when it is passed by the Parliament at the Centre or the Legislative Assembly in the State. An Act refers to the rules or laws that are made and enforced by the government. Similarly, through the Library Act and Library Legislation, financial management as well as infrastructural facilities are developed for public libraries. Apart from this, provision for taxes or cesses is made through this Act, so that proper management of public libraries can be done.

The main purpose of the public library is to help the readers use the documents to make good use of their free time, to improve their livelihood or business, or to enhance their knowledge for other purposes, and without the Library Act, proper development of public libraries is not possible. The role of public library acts in enabling libraries to provide effective service to citizens cannot be overlooked.

The Library Act was first passed in Britain in 1850, and after that, efforts started in other countries. Dr. Ranganathan made the first effort towards preparing the Library Act in India. At the All-Asia Education Conference, which was held in Varanasi in 1930, he talked about the "Draft Model Library Act."

1.3 LIBRARY LEGISLATION

1.3.1 Definition of "Library Legislation"

In the context of the library, the word "library act" or "legislation" means a law that is enacted for the purpose of providing a public library system, either by the central government or state government. It gives a statutory form to maintenance, services, functions, and management of public libraries.

1.3.2 Need for Library Legislation

According to Dr. S. Dasgupta, the Library Act helps in the development of libraries in the prescribed manner. It helps in preventing the monopolies of publishers, keeps the library administration stable, and provides financial security. In this way, it is necessary to have a Library Act for a permanent, developing and coordinated library service, and only through this can the idea of modern library service be translated into action. In this way, every person in society can benefit from all kinds of funds and their sources according to his ability and need: educational, cultural, scientific, etc.

Dr. S. R. Ranganathan realised its need in India and requested the government for the establishment of libraries and their systematic operation according to the legislation in

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each state. In this way, a constitutional basis can be provided for effective and prompt library service to the country. Along with this, it is also necessary to arrange finance for the operation and management of the libraries and this is possible only when there is a legal framework in a country, i.e., the Library Act has been implemented.

Therefore, we can say that the Library Act is a piece of legislation passed by any government, whether it be a national or provincial government, according to which funds are arranged for the establishment, development, and maintenance of libraries in all areas and to establish a continuous library network. The Library Act is necessary for the following reasons:

(1) In order to establish libraries

According to the provisions of the Library Act, the government receives tax from the public in the form of library cess. Therefore, it becomes the responsibility of the government that, through this, the government should establish libraries to provide library service to the residents living in every part of their geographical area.

(2) For the growth of libraries

In addition to the libraries that have already been established, new libraries can be established in the areas that are without libraries, so that the maximum number of people in society can get the library service. Continual efforts are needed for the development and operation of the libraries that have already been established. This is possible only through the Library Act.

(3) For the upkeep of libraries

It is necessary to maintain and protect already established libraries. It is the responsibility of the government to take care of them. It should not happen that care should be taken for their maintenance for some time and then no further attention should be paid to them. The Library Act is necessary to solve this problem.

(4) For the establishment of a library network

Through the Library Act, a network system of libraries can be established in any state or country, such that through the network in any state or country, every person in that area, whether urban or rural, has access to library service. For establishment of library network, a central library of the state can be set up in any state, then divisional libraries, district libraries, city libraries, rural libraries, and finally mobile libraries are established.

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(5) For progressive growth

Through the Library Act, a network of libraries is established in any country or state, so progressive development of libraries is possible and the give way to establishment of libraries in any area where there is no library.

IN-TEXT QUESTIONS

The first Public Library Act was passed in which country?

(a) India (b) USA (c) UK (d) Russia

The Library Legislation is necessary for:

(a) Academic Library (b) Public Library (c) Special Library (d) All of the above

Which one among the following tried to implement Library Legislation in India?

(a) Dr S R Ranganathan (b) Allen Border (c) Dr C V Raman (d) None of these

1.3.3 Structure of Library Legislation

1. Preamble: This part should contain a precise description of the act and a brief description of the matter. It should be clear and concise.
2. State Library Authorities: This part of the Act describes the organisational system and services. The State Library Authority is in charge of setting up a library system in the state so that all of the people who live there can get good library service.
3. This section deals with the constitution, structure, services, and financial provisions of the State Library, District Library, Urban Library, and Rural Library.
4. Financial Provision: Development of any service is not possible without financial provisions. Similarly, library development also needs a continuous flow of funds. It is the legislation and its written rules that ensure proper funding for all-around library development so that modern library services are available to all citizens.
5. Employees: The Act should provide for the establishment of a cadre of state library services and the terms and conditions of their appointment should be such as to ensure a high quality of library service.

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6. There is a provision in this part that the activities and income and expenditure of the public library system can be inspected and supervised according to the rules of government audit.
7. Book Registration: In this part, there is a provision that every publisher in the state will submit prescribed copies of each of its publications to the prescribed libraries.
8. It is the responsibility of the state government to improve the public library, and without the Libraries Act, the development of a public library cannot be imagined. For the betterment of any service, it is necessary that there be a statutory basis for it.

1.4 MODEL LIBRARY ACT

While on a foreign trip to England, Dr S R Ranganathan was very impressed by their provision of public library services. He realised that this was possible due to the public library act in the country. Therefore, after his return to India, he decided to work to formulate a Model Library Act in India. During the "First All Asia Educational Conference", which was held in Banaras from 26–30 December 1930, Dr S R Ranganathan put forward his idea of the Model Library Act. After thorough deliberations in the Conference Dr. S R Ranganathan published it in his book 'Five laws of Library Science' as "Draft Model Public Libraries Bill." It was further reviewed in 1957 and 1972 by Dr. S. R. Ranganathan himself. In 1957, the second edition of the book 'Five Laws of Library Science' carried the reviewed act. Again, in 1972, Dr S R Ranganathan, along with Neelameghan, published the further reviewed act as the "Model Public Library Act" in their another book, "Public Library System".

1.4.1 Model Library Act of Dr. S R Ranganathan:

Its salient features are depicted as follows:

(a) State Library Authority, chaired by the Education Minister.

(b) The imposition of library fees, with the State Library Authority in charge of ensuring their proper application.

(c) Provision of a "State Library Council" to give advice to the State Library Authority

(d) "Regional Library Authority" in every district and town.

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(e) A network of public libraries in every town, city, village, and so on.

Apart from the Model Library Act of Dr. S. R. Ranganathan, two more model bills were prepared. These are the "Model Public Libraries Bill" of 1963 and the "Model Public Libraries Bill" of 1965, prepared by the Education Ministry of India and the Planning Commission of India respectively.

In 1989, the third 'Model Public Libraries Bill' was prepared by Dr. Velaga Venkatappaiah and it was named the "Model Public Library and Information Services Act".

However, several efforts were made by Dr S R Ranganathan and others, both at the government and individual level, to formulate a Model Library Act. However, for one reason or another, none of the model bills could be implemented in India until today.

Apart from the Model Public Library Act of Dr S R Ranganathan, a few other Acts drafted in India are briefly described below:

1.4.2 Model Public Library Act (1963):

In 1963, a committee was established under the chairmanship of Dr M D Sen to make a draft of the Model Library Act. The salient features of the draft are:

1. The provision of a 'State Library Committee' under the chairmanship of the education minister
2. Provision of one 'State Library Council'.
3. State government funds will be provided
4. Thank you to the State Library Director for overseeing everything.
5. The employees of the public library will be on par with those of education department employees.
6. There is no mention of a library tax.

1.4.3 Planning Commission, Model Library Act of the Government of India (1965):

The Working Group on Libraries of the Planning Commission, founded in 1964, submitted the draft of the Model Library Act in 1965. Some of the important recommendations of this group are:

(1) It is the state government's responsibility to establish, maintain, and develop library services in the state.

(2) the 'State Library Council' to advise on matters related to public libraries.

(3) A committee of experts should be formed to oversee the functioning of library services.

(4) Each state's network of the following libraries:

1. Central State Library

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2. The State Regional Library
3. The District Library System

(5) Publishers in the state are required to submit one free copy of their publication to the State Central Library.

IN-TEXT QUESTIONS

4. The First All Asia Educational Conference was held in

(a) Delhi (b) Madras (c) New York (d) Banaras

5. Dr S R Ranganathan proposed his Model Public Library Act for the first time in:

(a) 1960 (b) 1865 (c) 1930 (d) 1965

1.5 SUMMARY

After reading this unit, you will be able to know what library legislation is. The need for library legislation, its structure, importance, etc. Let us summarise our discussion.

Public Library Legislation is an act passed by the Centre or State Government to make provision for public library services in their respective jurisdictions. Public libraries are considered centres of all-round education. Their development needs some legal framework.

The library legislation is needed for the following reasons:

1. Library Legislation: It helps in creating suitable conditions under which public libraries can be established in a country.
2. To establish rules and procedures for securing funds through a library tax levy.
3. To free the public library from reliance on subscriptions, donations, or private gifts, among other things.
4. Establish a solid administrative structure and pay employees.
5. To resolve land, building, legacies, and other issues.

The goal of the Library Act is to control how the authority in charge of the library does its job and make sure that it does its job in a way that lets the National Library Service work in a way that is efficient, effective, and complete.

1.6 GLOSSARY

The Library Legislation: The Library Legislation is an Act passed by the Government to provide rules for the provision of finance, human resources, etc. for public libraries.

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Public libraries are libraries that are run by the public in the interest of the public.

The State Library Act: Legislation enacted by various state governments in their respective states.

A library cess is a percentage of the tax collected on various services to fund the development of public libraries.

1.7 ANSWERS TO IN-TEXT QUESTIONS

1 UK

2Public Library

3Dr S R Ranganathan

4Banaras

51930

1.8 SELF-ASSESSMENT QUESTIONS

1. Explain the purpose of Library Legislation in detail.
2. Explain need of the Library Legislation specially in India.
3. Discuss the main parts of any Library Legislation in detail.
4. Write the salient features of Model Public Library Act drafted by Dr S R Ranganathan.

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LESSON 2

LIBRARY LEGISLATION IN INDIA: : STRUCTURE AND SALIENT FEATURES

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Library Legislation in India
1.3.1 Madras Conspiracy Library Act 1948
1.3.2 Andhra Pradesh Public Library Act 1960
1.3.3 Karnataka Public Library Act 1965
1.3.4 Maharashtra Public Library Act 1967
1.3.5 The West Bengal Public Library Act 1979
1.3.6 Manipur Public Library Act 1988
1.3.7 The Civil Public Library Act 1989
1.3.8 Haryana Public Library Act 1989
1.3.9 Mizoram Public Library Act 1993
1.3.10 Goa Public Library Act 1994
1.3.11 Gujarat Public Library Act 2001
1.3.12 Orissa Public Library Act 2001
1.3.13 Uttaranchal Constituent Library Act 2001
1.3.14 Rajasthan Public Library Act 2006
1.3.15 Uttar Pradesh Public Library Act 2006
1.3.16 Bihar State Public Library and Information Center Act 2008
1.4 Other Library Legislations
1.4.1 Press and Registration Act
1.4.2 Delivery of Books (Public Libraries) Act
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

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1.1 LEARNING OBJECTIVES

The students were introduced to the topic "Library Legislation" in the unit discussed earlier. They were told about the need, purpose, and structure of library legislation. In the end, a few model bills drafted in India by various bodies were also introduced to them.

After becoming acquainted with the topic of Library Legislation in general, they will be taught various library legislation passed or implemented in India to date in this Unit.Since each legislation is passed by the respective state government and is a bulky document, here we will briefly describe the salient features of each legislation.

1.2 INTRODUCTION

Dr. S R Ranganathan worked tirelessly to draft the Model Public Library Act and put it into effect in Tamil Nadu.With his efforts, the first Public Library Act came into force in India in 1948 in the state of Tamil Nadu: Like these efforts, a few other efforts were made in India for public library legislation. Five Public Library Acts have been made in India. At present, 16 states in India have passed the Library Act in their respective states. (Till the year 2018).

1.3 LIBRARY LEGISLATION IN INDIA

The following 16 states of India have passed the Library Act in their respective states till 2018. The salient features of each are described briefly in the following paragraphs.

1. Madras Public Libraries Act, 1948
2. Andhra Pradesh Public Libraries Act, 1960
3. Karnataka Public Libraries Act, 1965
4. Maharashtra State Libraries Act, 1967
5. West Bengal Public Libraries Act, 1979
6. Manipur Public Libraries Act, 1988
7. Kerala Public Libraries Act, 1989
8. Haryana Public Libraries Act, 1989
9. Mizoram Public Libraries Act, 1993
10. Goa Public Libraries Act, 1994
11. Gujarat Public Libraries Act, 2001-2002
12. Orissa Public Libraries Act, 2001/2002
13. Uttarakhand (Uttaranchal) Public Libraries Act, 2005
14. Uttar Pradesh Public Libraries Act, 2006
15. The Rajasthan Public Libraries Act, 2006
16. Bihar Public Libraries Act, 2007

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1.3.1 Madras Public Libraries Act (1948)

Madras state was the first state in India to pass the Library Act in 1948.

(1) Establishment of a central library at the state level. Connemara Public Library will be the Central Library at State Level.

(2) In addition to the State Central Library, there are district libraries, municipal libraries, branch libraries, distribution centres in villages, hospital libraries, mobile libraries, and prison libraries.

(3) Library service is available to every person in the State of Madras.

(4) The people who live in the state pay an extra 3 paise per rupee on their property tax or house tax.

(5) The amount of money that is received from the public in the form of library cess is the same amount that is provided by the Madras Government.

(6) A provision has been made in the Act to levy a tax on the public which is unfair according to the sources and principles of library science. "Library service" is the right of the public to get it without any cost. Therefore, it will be considered a fault because no provision has been made to provide a free library service.

(7) wealth from the public is taken in the form of tax, and the government has made provision to give the same amount of money as is received from tax, which is wrong. More and more money should be given by the government. There should not be any such condition in this regard.

(8) Each publisher will submit to the State Government five copies of each of his publications.The four copies of such a publication will be for the State Central Library, Madras.

1.3.2 Andhra Pradesh Libraries Act (1960)

The following are the salient features of this Act:

(1) Arrangement and Administration: In this Act, a State Library Committee was constituted for the administration of libraries, in which there is no provision for library authority, but in its place, a 24-member State Library Committee was proposed to give recommendations regarding library services. The Act provides for a director to oversee the functions of the libraries. It also recommends the creation of a Department of Public Libraries.

(2) Library Network: The constitution of the public library system in the Andhra Pradesh Library Act is as follows: Regional Central Libraries (A) State Regional Libraries (B) District Central Libraries (C) District Central Libraries (D) Local Libraries (E) Distribution Center

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(3) Financial arrangement: The District Library Institute shall levy a cess on property tax and house tax of at least 4 paise per rupee and not more than 8 paise per rupee for the library.The government will provide a grant every year equal to the money received from the cess.

1.3.3 Karnataka Public Library Act (1965)

(1) Arrangement and Administration: This Act provides that a committee will be constituted for the library authority at the regional level, in which the education minister of the state and the librarian of the state will be the chairman and secretary of this committee, and 14 people will be its members. Apart from this, there is no provision for separate committees for the advice of the government at the regional level. The Act clearly states that it is the responsibility of the local library authority to provide library service to all.

(2) In the Finance Act, three sources related to money: cess, grant, and gift, have been given. The local library authority will levy a cess on houses, land, octroi, vehicles, businesses etc. The rate will be 3 paise per rupee. The government will provide 3% of total revenue in the form of a grant, allowing libraries to be operated at the state, city, district, branch, and so on.

(3) According to this Act, the following library network is established in Karnataka: Regional Central Library (A), City Central Library (B), District Central Library (C), Branch Library (D), Distribution Center (E).

1.3.4 Maharashtra Public Library Act (1967)

Under this act, there is a provision for a state library committee under the chairmanship of the education minister. This committee gives advice to the State Government about how to improve public libraries and carry out the rules of this Act.

The provisions of the Library Department to be established under the Director of Professional Libraries, the formation of a District Library Committee at the district level and the State Government would give at least Rs.25 lakhs per year for the development of libraries, without taking the rights of the library.

Thus, there is no provision for imposing library rights in this Act. Although the provision of funds under the Act is insufficient, the development of libraries in the state has become possible due to the passage of the Act.

1.3.5 West Bengal Public Libraries Act (1979)

The following are the main points in this Act:

(1) The Directorate of Libraries is established under the Director of Libraries.Under its in-charge will be the education minister, under whose chairmanship the State Library Council will be constituted, which will give necessary suggestions related to the development of libraries to the State Government from time to time.

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(2) There is also a provision in this Act that in every district, a library authority will be constituted under the chairmanship of the District Magistrate. There is a provision for the appointment of a District Library Officer in each district, a free copy of its publication by each publisher in the State Central Library, as well as a provision has been made to implement the amended form of the Press and Registration of Books Act, 1867.

1.3.6 Manipur Public Libraries Act (1988)

The Manipur Library Association was established in 1987 and this library association started the work of making the Act from that time, which was presented in the assembly in August 1988, which was also passed.

A provision was made that, from October 1, 1988, the state government would establish a separate directorate for public libraries and a director would be appointed thereto. A State Library Committee will be constituted under the chairmanship of the Education Minister of the State, and this committee will submit suggestions regarding the development of libraries by the State Government. There is a provision in the act that the State Library Association will have 9 members. District authorities will be appointed in each district. There is no provision for library tax in this act, but for the operation of the library, a provision has been made that the district library authority will establish a library fund, under which donations will be received voluntarily. Funds will be collected so that the libraries can be developed.

1.3.7 Kerala State Libraries Act (1989)

Under this Act, there is a provision for the constitution of the Kerala State Library Council. By electing the members, the Executive Committee elects the President, Vice-President, Secretary, and Co-Secretary, and it has also been provided in the Act that the tenure of the committee will be 3 years. Provision has been made to constitute a District Library Committee in each district, which looks after the work of their organisation and administration for the development of the library in the district. Under this Act, there is a provision to establish a library fund, in which the grants received from the state government and the central government and the money received from other means are collected.

"There is also a provision for library tax under section 48 of this act. There is a provision to collect this tax under building tax at the rate of 5 paise per rupee.

1.3.8 Haryana Public Libraries Act (1989)

The purpose of this Act is to provide library service in the entire state of Haryana, like other Acts.
A provision has been made in this Act that the Education Minister of the Haryana Government will be the Chairman and the Director of the Library will be its Secretary. The Advisory Committee will have 11 members, 8 of whom will be nominated by the Chairman.The function of this committee will be to provide suggestions for the development of libraries to the Directorate of Libraries. A director will be appointed by the State Government under the Directorate of Libraries. A State Central Library will be established, in-charge of which state? They will be called "State Librarians" and will be appointed by the

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State Government. In addition to this, district libraries will be set up in every district. In addition to this, city libraries in each city, development block libraries at the development block level,

In this Act, there is a provision to constitute a District Library Committee in each district and similarly constituted committees at other levels for the smooth arrangement of libraries. In this Act, provision has been made to levy a library cess on the building and property. Provision has also been made that library funds should be set up at the state, district, and city levels, under which funds received from the central government and other resources should be deposited for library development. With the passing of the Act, a new path has been paved for the development of libraries in the state of Haryana.

1.3.9 Goa State Libraries Act (1993)

There is a provision in this Act that a State Library Directorate should be established under the State Government, which will be headed by a Director who will be appointed by the Government of Goa. An Advisory Committee of eleven members, out of which eight members shall be nominated by the Director. There is a law in the state that says committees can be made at different levels to help with the development of libraries.

1. District Library
2. Taluka Granthalaya

The District Library will make rules and regulations for these libraries, and this committee will get permission from the District Library Committee. In this sequence, there is a provision to establish rural libraries in every village. There is a provision in this act that the state government will arrange funds for public libraries under its budget so that the entire state can get library service.

1.3.10 Mizoram Libraries Act (1993)

Like other acts, this also has a provision to set up a directorate under the state government and to appoint a director for it.

There is also a provision in this Act to constitute an 18-member committee, in which the term of each member is 3 years. The main responsibility of this committee will be to submit various types of suggestions related to libraries to the state government. In order to provide library services at different levels, public libraries have been divided into the following categories under this Act:

(1) A state library is established in the state's capital.
(2) A district library in each of the state's districts
(3) Sub Division Library
(4) Rural public library

All these types of libraries will be operated and arranged by the state government. A provision has also been made in this act that the state government will provide a grant for each library. There is no provision for levying any kind of tax in this Act.

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1.3.11 Gujarat Public Libraries Act (2001)

The Act has the following main recommendations:
1) Library services will be overseen by the Directorate of Public Libraries.
2) Council for the Development of State Libraries
3) Establishment of District and Taluka Libraries
4) Create a State Library Development Fund

1.3.12 Orissa Public Libraries Act (2001)

The main recommendations of the Act are:
1) The State Library Council will be headed by the Minister of Tourism and Culture.
2) Public Library Directorate
4) State and district/city libraries.
5) Library District Committee
6) The financial burden will be borne by the state government.

1.3.13Uttaranchal Public Libraries Act (2005)

The salient features of the Act are:

- state library committee.
- state government to provide a financial grant.
- A fee will be collected for providing the library services.
- The Education Department will have a Public Library Cell.
- The District Library Authority

1.3.14Rajasthan Public Libraries Act (2006)

Its salient features are mentioned below.

- Directorate of public libraries.
- Every below mentioned place will have a library.
  - District,
  - Divisiona,
  - Panchayat Samiti,

- The Library Advisory Committee
- State Libraries' Development Fund
- State Library Council.

1.3.15Uttar Pradesh Public Libraries Act (2006)

The salient features are:

1. To have two state-level libraries
2. Lucknow State Reference Library and.
3. State Central Library in Allahabad.
4. The State Library Council is chaired by the Minister of Secondary Education.
5. state to bear the financial requirements.

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6. Every district has a district library.
7. director of public libraries.

1.3.16 Bihar State Public Libraries and Information Centers Act (2008)

The main points of this act are as follows:

1. The director of public libraries or a representative may examine any library to determine how well it is operating.
2. Every publisher is required to send a copy of their work to the Sachidanand Library and Smt. Radhika Sinha Institute in Patna.
3. The Independent Directorate of Library and Information Centre
4. The library network will consist of: State Library, Divisional Library, District Library, Sub Divisional Library, Special Library, Block Library, Panchayat Library, Village Library, and Private Library.
5. The State Library and Information Centre Authority
6. State library fund.

IN-TEXT QUESTIONS

1. Madras Public Libraries Act was passed in:
(a) 1948 (b) 1960 (c) 1930 (d) 1947

2. Mizoram Public Library Act was passed in:
(a) 1965 (b) 1946 (c) 1993 (d) 1991

3. Which Public Library Act recommends grant of Rs 25 lakhs annually for Public Library development?
(a) Madras (b) Maharashtra (c) Karnataka (d) Andhra Pradesh

4. Which State Public Library Act recommends building Tax at the rate of 5 paise per rupee:
(a) Haryana (b) Manipur (c) Goa (d) Kerala

1.4 OTHER LIBRARY LEGISLATIONS

1.4.1 Press and Registration Act, 1867

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"The Bill was passed by the Legislature, and it appeared on the statute book as the Press and Registration of Books Act, 1867. The Press and Registration of Books Act, 1867, is the oldest Act still in use. The following are some extracts from it:

1. Though no licence or permission is required for starting and running a newspaper, no paper can be published without complying with the provisions of this Act. A declaration made in the prescribed manner before the District, Presidency, or Sub-divisional Magistrate and authenticated by him is necessary before the newspaper is published. Similarly, no printing press can be set up without making a relevant declaration.
2. The Act requires that the name of the printer, the place of printing, and the names of the publisher and place of publication must be legibly printed on every book or newspaper printed and published within India (Sec.3).
3. For having a press to print books or newspapers, a declaration must be made before the District Presidency or Sub-divisional Magistrate giving a description of its location.
4. When a press is moved to a new location, a new declaration is required.But, if the change of the place is for a period of less than 60 days, the new location also falls within the jurisdiction of the same magistrate, and the keeper of the press continues to be the same, no fresh declaration need be made. In that case, an intimation regarding the change of place sent within 24 hours will suffice.
5. Two conditions are necessary to be fulfilled for publishing a newspaper. One, the title of the editor must be clearly printed on every copy of the newspaper. Two, a declaration must be made before the District, Presidency or Sub-divisional Magistrate within whose jurisdiction the newspaper is to be published, stating the following facts: (a) the name of the printer and publisher; (b) premises where printing and publishing are conducted; (c) the title, language and periodicity of the newspaper. The declaration should be made by the printer and publisher, either in person or through an authorised agent. If the printer or publisher is not the owner of the paper, the declaration should specify the name of the owner. But making a declaration does not automatically pave the way for publishing a newspaper.
6. Publication can be started only after the said Magistrate authenticates the declaration.
7. Every time the title, language, or periodicity is changed, the declaration ceases to exist, and a fresh declaration must be made. Similarly, a new declaration is necessary as often as

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the ownership or the place of printing or publication of the newspaper is changed. However, only a statement furnished to the Magistrate will suffice if the change of place is for a period not exceeding 30 days. If the printer or publisher leaves India for more than 90 days, or if he is unable to perform his duties due to illness or other reasons, a new declaration must be made.

8. A person who does not ordinarily reside in India or a minor can file a declaration or edit a newspaper. If the declaration is made in accordance with the provisions of the law and if no other paper bearing the same or similar title is already in existence in the same language or the same state, then the Magistrate cannot refuse to authenticate the declaration. However, before authentication, he must inquire about the existence of such other paper with the Registrar of Newspapers for India (RNI).
9. The authentication is an administrative and not a judicial function, and the magistrate must perform it without exercising his personal discretion.
10. After authentication, the paper must be started within a specific period. The declaration in respect of a newspaper to be published once a week or more shall be void if it is not commenced within six weeks of the authentication. In the case of all other newspapers, the time limit for commencing publication is three months. This means that a daily, a weekly or a bi-weekly newspaper must commence publication within six weeks, and a fortnightly, a monthly or a quarterly can start publishing within three months after authentication.
11. The Magistrate can cancel the declaration and order the closure of a newspaper for irregular publication. If in any period of three months, a daily, a triweekly, a bi-weekly or a fortnightly newspaper publishes less than half the number of issues which it should have published in accordance with the declaration, the newspaper shall cease to publish. A fresh declaration must be filed before it can be started again. In the case of any other newspaper, the maximum period of non-publication must not exceed 12 months in order to keep the declaration alive.
12. Two copies of each issue of a newspaper and up to three copies of each book must be delivered in a prescribed manner to the government free of expense.
13. The declaration can be cancelled by the Magistrate after giving an opportunity to show cause to the person concerned, if the Magistrate is satisfied on the following counts:

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a) the newspaper is published in violation of the provisions of this Act or the rules established under it, or

b) the title of the newspaper is the same as or similar to that of any other newspaper published in the same language or state, or

c) the printer or publisher is no longer in business, or

d) the declaration was made on the basis of a false representation and concealment of any material fact.

14. The Magistrate's decision can be challenged in an appeal before the Pres and Registration Appellate Board. The Board comprises a Chairman and another member nominated by the Press Council of India.
15. If a newspaper (or a book) is printed or published without legibly printing the names of the printer and publisher as well as the name of the place of printing or publishing, the printer or publisher can be fined up to two thousand rupees or imprisoned up to six months or punished by both. The punishment can be awarded for keeping a press without making a declaration or for making a false statement or for editing, printing, or publishing a newspaper without conforming to the rules. In this last case, the Magistrate may, in addition to this punishment, also cancel the declaration in respect of the newspaper.
16. Noncompliance with the requirement regarding the delivery of copies of newspapers will invite a penalty of up to Rs. 30 for such a default. In the case of the publication of a book, the value of the copies of the book may be charged.
17. Registrar of Newspapers: There is a provision for the appointment of a Press Registrar by the Government of India for the whole of the country. The Press Registrar maintains a register containing the following particulars of each newspaper: title, language, periodicity, name of the editor, printer, and publisher; printing and publication location; average number of pages per week; number of days published per year; average number of copies printed, sold, and distributed free; retail selling price per copy; and names and addresses of owners
18. The Pres Registrar also issues a certificate of registration to the publisher of the newspaper. He does this on receipt of a copy of the declaration from the magistrate who has authenticated it.

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19. It is the duty of the publisher to furnish to the Press Registrar an annual statement of the above particulars about his newspaper. It is also his duty to publish such of the particulars in the newspaper as may be specified by the Press Registrar. The Rules require that the name, address, and nationality of the editor and publisher, as well as the names of all those owning one percent or more of the newspaper, be published in the first issue published after the last day of February each year.
20. The newspaper is also obliged to furnish returns, statistics, and other information as the Press Registrar may from time to time require. Noncompliance attracts a fine of five hundred rupees. The Press Registrar has a right of access to records and documents of the newspaper for the purpose of collection of any information about it."

1.4.2 Delivery of Books (Public Libraries) Act, 1954

This Act was passed in 1954 by the Parliament of India. It has the provision of supplying four copies free of cost of each publication by the publisher to four designated libraries in India. These four libraries are:

- Connemara Public Library, Chennai
- Delhi Public Library, Delhi
- The Central Library, Mumbai, and
- The National Library of India, Kolkata

The copy sent to the National Library should be of the highest quality and form.

The act is reproduced below in its original form.

"THE DELIVERY OF BOOKS 'AND NEWSPAPERS'
(PUBLIC LIBRARIES) ACT, 1954"

[The Delivery of Books (Public Libraries) Act, 1954: No. 27 of 1954, as amended by the Delivery of Books (Public Libraries) Amendment Act, 1956: No. 99 of 1956.]

An Act to provide for the delivery of books to the National Library, Calcutta, and other public libraries.

Be it enacted by Parliament in the Fifth Year of the Republic of India as follows :

1. Short title and extent -

(a) This Act may be called the "Delivery of Books and Newspapers" (Public Libraries) Act,

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1954.

(b) It extends to the whole of India.

2. In this Act, unless the context otherwise requires,

(a) "book" includes every volume, part or division of a volume and pamphlet, in any language, and every sheet of music, map, chart or plan separately printed or lithographed, but does not include a newspaper published in conformity with the provisions of Section 5 of the Press and Registration of Books Act, 1867; (aa) "newspaper" means any printed periodical work containing public news or comments on public news published in conformity with the provisions of Section 5 of the Press and Registration of Books Act, 1867;

(b) "public libraries" means the National Library at Calcutta and any three other libraries which may be specified by the Central Government in this behalf by notification in the Official Gazette."

3. Delivery of books to public libraries.-

(1) Subject to any rules that may be made under this Act but without prejudice to the provisions contained in Section 9 of the Press and Registration of Books Act, 1867 (XXV of 1867), the publisher of every book published in the territories to which this Act extends after the commencement of this Act shall, notwithstanding any agreement to the contrary, deliver at his own expense a copy of the book to the National Library at Calcutta and one such copy to each of the other three public libraries within thirty days from the date of its publication.

(2) The copy delivered to the National Library shall be a copy of the entire book, including all maps and illustrations, finished and coloured in the same manner as the best copies of the book, and bound, sewed or stitched together on the best paper on which any copy of the book is printed.

(3) The copy delivered to any other public library shall be on the paper on which the largest number of copies of the book are printed for sale, and shall be in the like condition as the books prepared for sale. "

3A. Delivery of newspapers to public libraries.-Subject to any rules that may be made under this Act but without prejudice to the provisions contained in the Press and Registration of Books Act, 1867, the publisher of every newspaper published in the territories to which this Act extends shall deliver at his own expense one copy of each issue of such newspaper as soon as it is published to each such public library as may be notified in this behalf by the

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Central Government in the Official Gazette.

(4) Nothing in sub-section (1) applies to any second or subsequent edition of a book in which no additions or alterations have been made in the letter-press or in the maps, book prints, or other engravings belonging to the book, and a copy of the first or some preceding edition of which book has been delivered under this Act.

4. Receipt for delivered books. -

The person in charge of a public library, whether they are called a librarian or something else, or anyone else they have given permission to receive a copy of a book under Section 3, must give a written receipt to the publisher.

5. Penalty: –

Any publisher who violates any provision of this Act or any rule made thereunder shall be punished with a fine of up to fifty rupees, and "if the contravention is in respect of a book, shall also be punished with a fine equivalent to" the value of the book, and the court trying the offence may direct that the whole or any part of the fine realised from him shall be paid, as compensation, to the public library to which the book was donated.

6. Cognizance of offences.-

(a) No court shall take cognizance of any offence punishable under this Act save on complaint made by an officer empowered in this behalf by the Central Government by a general or special Order.

(b) No offence punishable under this Act shall be tried in a court lower than that of a presidency magistrate or a magistrate of the first class.

7. Application of the Act to Government-published books and newspapers. -

"This Act shall also apply to books and newspapers published by or under the authority of the government but shall not apply to books meant for official use only."

8. - Rule-making authority.

"The Central Government may, by notification in the Official Gazette, make rules to carry out the purposes of this Act."

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IN-TEXT QUESTIONS

5. Delivery of Books and Newspaper Act was passed in:
(a) 1956 (b) 1954 (c) 1867 (d) 1958

6. Press and Registration Act, 1867 was passed in
(a) 1867 (b) 1967 (c) 1947 (d) 1847

1.5 SUMMARY

Public libraries are considered centres of lifelong education. India, being a very vast country, needs a good public library system for educating people living in remote areas. Illiterate people also need to be educated, and public libraries can be a good place to do this. But to have a good public library system, some legal framework is required. This will help public libraries get funds, human resources, etc.

The legal framework is created by enacting library legislation and public library acts. India has so far enacted public library acts in 16 states. These acts have some main features, which were discussed above. It is still required to get Public Library Acts in all the States and Union Territories. Even those where acts have been passed need proper implementation of the rules to provide proper public libraries.

The two pieces of legislation related to library services are also important to be discussed. These are the Press and Registration Act of 1867 and the Delivery of Books and Newspapers Act of 1954.

1.6 GLOSSARY

Library Cess : A surcharge which is collected on some state taxes for the development of libraries.

1.7 ANSWERS TO IN-TEXT QUESTIONS

1. 1948
2. 1993
3. Maharashtra

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4. Kerala
5. 1954
6. 1867

1.8 SELF-ASSESSMENT QUESTIONS

1. State salient features of the Andhra Pradesh Libraries Act.
2. Write a short note on the provision of Penalty in DB Act, 1954.
3. Compare the provision of administration in West Bengal Public Libraries Act and Maharashtra Public Libraries Act.
4. Compare the financial provisions of Manipur and Kerala Public Library Acts.
5. Self-Check Exercise
6. Write down the salient features of Goa Public Library Act.

1.9 REFERENCES

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1.10 SUGGESTED READINGS

1. Venktappaiah (V) and Madhusudhan (M).(2006). Public library legislation in thenew millennium.

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UNIT IV: INFORMATION AND COMMUNICATION

LESSON 1

Information: Characteristics, Nature, Value and Use of Information

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Characteristics of Information
- 1.3.1 Origin/Source
- 1.3.2 Message
- 1.3.3 Medium
- 1.3.4 Recipient

1.4 Nature of Information
- 1.4.1 Factors that Govern the Nature of Information
  - 1.4.1.1 Properties of Information
  - 1.4.1.2 Approaches to Information
  - 1.4.1.3 Nature based on User's Approach
  - 1.4.1.4 Commodity Approach

1.5 Value of Information
1.6 Need and Use of Information
- 1.6.1 Need of Information
- 1.6.2 Use of Information
  - 1.6.2.1 Use of Information in Research and Development
  - 1.6.2.2 Use of Information in Business and Industry
  - 1.6.2.3 Use of Information in Planning and Policy Making
  - 1.6.2.4 Use of Information in Management and Decision Making
  - 1.6.2.5 Use of Information in Modern Society
- 1.6.3 Steps in the Use of Information

1.7 Summary
1.8 Glossary
1.9 Answers to In-text Questions
1.10 Self-Assessment Questions
1.11 References

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1.12 Suggested Readings

1.1 LEARNING OBJECTIVES

In this Lesson, the students will be familiar with the Concept of Information and its Characteristics, Nature, Value, and Use of Information. The students will learn the importance and use of information and how to apply it in their daily lives and situations. Further, information helps in avoiding the duplication of research. Information stimulates the thinking process of the users, particularly the research scholars. The information helps scientists, engineers, and doctors, etc., get well informed with the latest advancements in their fields and keep them updated.

1.2 INTRODUCTION

What is Information?

It is a causative factor for the development of anything and everything in the universe. It is an input and output of research and development in all disciplines, i.e., science and technology, Humanities, and social sciences.

According to George Andela, Information is a resource as fundamental as energy or water, which affects all human activity and is indispensable, irreplaceable between intellectual and material activities. This concept leads to the conclusion that information must be at the service of the whole community.

Ching-Chichen (1982) defines information as all knowledge, facts, data, and imaginative works of mind which are communicated formally or informally in any formal.

According to Mc Garry: Information is not limited to facts in documents, but it covers a broad spectrum of issues, including emotions, factors, opinions, guidance, and persuasions. In similar terms, the processed data is information.

According to Shera, Information is that which is transmitted by the act or process of communication; it may be a message, a signal, or a stimulus; it assumes a response in the receiving organisms and process response potential; its motivation is inherently utilitarian. It is instrumental and usually communicated in an organized or formalized pattern, mainly because such formalization increases potential utility.

Information is data that has been retrieved, processed, or otherwise used for informative or interfering purposes, argument or as a basis for forecasting or decision-making. How the data of a message are structured is crucial to their effect is information.

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Information is a property of data resulting from or produced by a process that produced the data.

According to Ford, the structure of any text capable of changing a recipient's image structure is information.

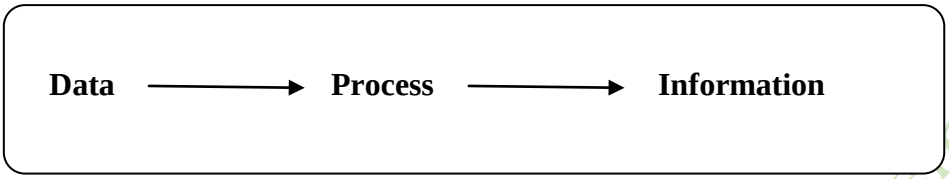

Fig 1: The Processed Data creates Information

1.3 Characteristics of Information

Information has an origin. It is communicated from the origin or from a 'source' where information is. The information to be communicated can be termed as 'message'. The message needs a 'medium' for communication. The message is aimed to be communicated to a 'recipient.' At each step, the information possesses specific characteristics.

1.3.1 Origin/Source:

The validity of information will depend upon the origin or source. Before information is communicated to a user, we should check the origin or source of information (or message). Also, it is not possible for us to always check the origin of the information. In such cases, we should check the source from when or where the information is received. When the informationrmation is received from a valid, authentic, and reliable source, it should only be considered for communication to the end user. Sources of informationrmation or evidence are often categorized as **primary, secondary, or tertiary material**. These classifications are based on the originality of the material and the proximity of the source or origin.

1.3.2 Message:

In modern society, information to be communicated should be checked whether it possesses the following characteristics:

i. **Accuracy:** The information to be communicated must be accurate, i.e., it must meet the exact requirements of the recipient. It should be precise and free from error.
ii. **Appropriateness:** The information must serve the purpose of the user. All the information relevant to the purpose of use should be collected, collated, and presented to him to satisfy his need.
iii. **Timeliness:** Information should be timely; the value of information depends on timeliness. Timely information saves losses and wastage, avoids duplication, and saves from going on unintended lines.

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iv. **Comprehensiveness:** The message must be understandable. It should include all the relevant information. It should be simple and understandable language.

v. **Explicitness:** It should be clearly and fully expressed. The message should not leave any doubt in the mind of the user as to its validity, comprehensiveness etc. The recipient must be able to receive the message in straight and unambiguous terms.

vi. **Availability and Accessibility:** The information must be available and accessible to the user. Otherwise, there will be no use in merely communicating about the existence of a particular piece of information.

vii. **Verifiability:** This has two implications. The message should be verified for its validity, accuracy, appropriateness, and comprehensiveness before it is communicated to the recipient; when the communication is not direct or from a known source, the recipient must be able to verify as his own the validity, etc. of the message.

viii. **Biasfree:** Information should be biasfree. It should not try to impose an opinion on the user or influence him. It should not have any slant to one among alternatives without any positive reason or based on a principle

1.3.3 Medium:

Communicability: An individual scientist receives information through numerous media. It may be oral, by speaking and listening; documentary, by reading and writing; visual, by displaying and observing. In order to increase the effectiveness of message, a combination of two or more media may be used for example, script and photographs, tables and graphs, etc.

1.3.4 Recipient:

From the point of view of the recipient, information should possess the following three characteristics:

i. **Adaptability:** Information should be adaptable for new use, need, situation, etc. It should be enabled to be used for a purpose or in a way different from what it was meant for.

ii. **Cost-effectiveness:** The information should improve the performance of a system at an acceptable cost or no cost or reduce the cost without any delay in efficiency and performance. It is desirable to define a unit cost of relevant influence found for the user since this considers the system's performance.

Cost tends to rise with the number of documents processed, particularly with the exhaustiveness of the search process. On the other hand, costs can be reduced by a more rigorous acquisition policy based on examining the distribution of sources among the retrieved references.

iii. **Currency:** Information should be available timely to the end user. It should not be obsolete as well. Timely information is of high value and cost-effective also.

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Currency should be regarded as one of the fundamental characteristics of information in Modern Society.

IN-TEXT QUESTIONS

1. The processed Data is _____.
2. The value of information depends on timeliness. True/False
3. The following are not the Characteristics of Information:
   a) Accuracy b) Explicitness
   c) Biasness d) Adaptability
4. Timely information is of _____ and _____also.
5. Information is not limited to_____ in documents.

1.4 Nature of Information

Information is a resource of immense economic and social value. It is vital to the proper functioning of a democratic society, a crucial tool is a productive economy and also for as effective government, a central part of the growth and well-being of individuals, " said the National Commission on libraries and information Science (UK).

1.4.1 Factors that Govern the Nature of Information

1.4.1.1 Properties of Information

Burt Nanun explains that information has peculiar properties, making it very difficult to generalize. For example:

(a) It is not homogeneous like electricity or grain but rather is highly heterogeneous with virtually infinite variation in response to individual conjunctions of the supplier, processor, user, and channel of communication.

(b) It is rarely of value in itself but requires a context, structure or model within which it can be interpreted.

(c) The demand of information is a function of such variables as age, perishability, convenience, reliability, source, etc., as well as more traditional economic variables such as cost quantity and availability of supply.

(d) The role of information in an organization is so central to its management and program that it must be viewed as a fundamental factor of production like money and manpower.

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(e) Both suppliers and users of information often need special protection utilizing government intervention such as copyright and patent laws, privacy legislation, and fraud statutes.

1.4.1.2 Approaches to Information

Information is a social process: Its Nature and value are closely related to information needs and approaches. Wersig and Neveling (1975) account the following approaches to information based on which nature of information can be assessed:

i. **Structural Approach:** In this approach, information is viewed as the structure of the world or static relations between physical objects which may be perceived or not.
ii. **Knowledge Approach:** This approach records knowledge built based on a perception of the structure of the world. However, the problem with this approach is that the term information may erroneously be used for the term knowledge.
iii. **Message Approach:** The mathematical theory of communication uses this approach. It is concerned with the transmission of symbols representing a message.
iv. **Meaning Approach:** In this approach, the semantic content of a message is accepted as information.

1.4.1.3 Nature based on User's Approach

The nature of information is closely related to the approach of the user based on time, purpose related to his work, same stage of his work, user's general interest, the amount of information already available, etc. There are mainly three types of user approaches to information which are:

(i) Current approach

(ii) Everyday approach

(iii) Exhaustive approach

1.4.1.4 Commodity Approach

Some scientists have correlated the nature of information with that of energy. According to Mc Carthy, 'The information is a commodity no less tangible than energy; if anything, it is more pervasive in human affairs.' According to Rathswol, there are four concepts of information which are:

i. **Commodity:** This concept refers to the empirical content of communication and knowledge. Information as a commodity represents something, e.g., some event, or some state of the world.

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ii. **Process:** This concept refers to communications and knowledge's structural and organizational aspects. Information as a process is represented by something, e.g., genetic structure.

iii. **State of Knowing:** This concept relates directly to the effect of information in terms of changes in human knowledge. Infor as a state of knowing relates directly to the structural-functional aspect of the human knowing activity.

iv. **Environment:** This concept refers to the man-machine and man-man system, command and central systems, within which particular idea-information transformation, etc.

IN-TEXT QUESTIONS

6. There are mainly three types of User's approaches to information which are Current approach, _____approach and _____approach.
7. Information is a social process. True/False.
8. Documentary information is 'information containing new factors or statements of _____ or _____character.

1.5 Value of Information

Repo has proposed a dual approach to the value of information in the context of practical value.

1. The exchange value of information products i.e., service, channel or system, should be studied using 'classical economics' methods. The value of information services needs special attention when the role of human intermediaries is fully explored.

2. The value in the use of information should also be studied using the cognitive approach, which considers the user, the use and the effects of the use of information. The essentiality in value of information is the perceived impact of information from an earlier to the changed situation. The measurement and monetary value of information are secondary.

The flow of information to the value of information can be correlated in the following diagram:

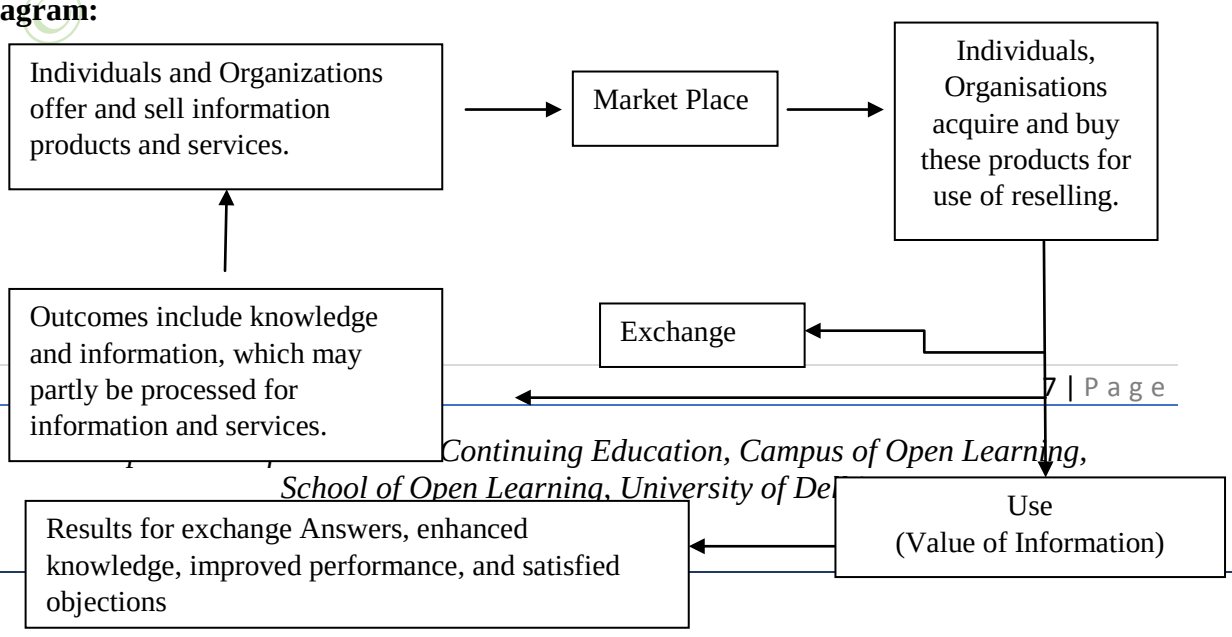

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Fig. 2: Information flow and value of information

1.6 Need and Use of Information

1.6.1 Need of Information

In today's society, there is a tremendous and urgent need for access to and availability of information. The information needed for various purposes is enumerated below as:

- Information is an asset in decision-making and policymaking needed by policymakers, decision-makers, managers, etc.
- Information will have a reinforcing/transforming effect on human beings receiving it. A great deal of change can be perceived in the human mind/attitudes on obtaining the information, as it increases the ability of personal knowledge of the recipient.
- Information generates new information. The current knowledge/information helps generate new knowledge, new theories, etc. Scientists and scholars avail or use the information to produce other document(s) like research reports, theses/dissertations books, general articles, seminar papers etc.
- The uses of various professions and vocations like doctors, engineers, scientists, scholars etc. acquire and apply information to do their jobs more efficiently and effectively, i.e., application of information for practical purposes.
- Information supports research in order to obtain adequate and fruitful results.
- The information helps in better management of (manpower, materials, production, finance, marketing etc.).
- The information helps in avoiding the duplication of research.
- Information stimulates the thought process of the users, notably the scholar.
- The information helps scientists, engineers, scholars, etc. to get well-informed with the current advancements in their subjects and to keep them up to date.

The over, all benefits of information can be summed up as it helps in :

1) Improved capability of a country by availing the existing knowledge and know-how achieved within and outside the country.

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2) Rationalization and systematization of a country's research and development efforts, with the help of the existing information / knowledge.

3) Problem-solving; based on the wider knowledge base.

4) In improved effectiveness and efficiency of technical /production oriented activities.

5) In better decision making in all sectors.

6) It keeps society well-informed and developed.

7) No progress of society can occur if the right information is not available at the right time.

8) A well-informed person is an asset to society.

1.6.2 Use of Information

The information can be used as raw material for elaborating and generating new information. The information is used for varied purposes based on the kind of information. The use of information can be broadly categorized into the following areas:

1.6.2.1 Use of Information in Research and Development

Information is lifeblood for research as new innovations and inventions largely depends upon the information. Many R&D organizations in India and worldwide have set up and established information centers to collect, gather, organize and provide access to information. For eg. NISCAIR, ICSSR, AGRIS, INIS etc.

1.6.2.2 Use of Information in Business and Industry

In business, the ten ways to get ahead with Information Technology are:

- **In Telemarketing**
- **Customer Service**
- **Training**
- **Sales**
- **Better Financial Management**
- **Product Development**
- **Market Intelligence**
- **New Business**
- **Locking-in Customers**
- **Selling Extra-Processing Power**

Information is vital for all industries ranging from rural handicrafts to large-scale heavy manufacturing. The medium and large-scale industries can afford to have their information units.

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1.6.2.3 Use of Information in Planning and Policy Making

The success of any organization, whether big or small, depends on their leaders implementing sound strategies and decisions according to a clear vision of the future, and a good understanding of the surrounding environment. The goals of any organization cannot be achieved without true leadership having sufficient and efficient information about the organization and its activities. Therefore, the ability to make reliable decisions and articulate, efficient strategies of managers and decision-makers depends on their awareness of various methods of collecting and analyzing the necessary information (Hijji et al., 2018, p.144).

1.6.2.4 Use of Information in Management and Decision Making

Information plays a central role in management and decision-making. Information and data are essential pillars of the decision-making process. Insufficient information may lead to poor decisions that may prevent the organization from achieving its objectives. There are specific information systems that help managers in the decision-making process. Some important among them are listed below:

i. **Data Base Management System (DBMS):** In DBMS, information is available in the form of unique data elements stored in tables. The processes of concern in a DBMS are: Storage and Retrieval of Data, Updating and Deletion of Data, Protection of Data from unintended use or misuse or transfer etc.
ii. **Management Information Systems (MIS):** A 'MIS' is a 'DBMS' tailored to the needs of managers. A management Information System (MIS) is a planned system where data is collected, stored, and disseminated in the form of information needed to carry out the managerial functions of the organization. The goals of an MIS are to implement the organizational structure and dynamics of the enterprise to manage the organization in a better way and capture the potential of the information system for future competitive advantage.
iii. **Decision Support Systems (DSS):** The DSS exists on a limited basis for narrow search ranges of the users employing databases in restricted subject areas. A decision support system (DSS) is a computerized system that gathers and analyzes data, synthesizing it to produce comprehensive information reports. Decision support systems allow for more informed decision-making, timely problem-solving, and improved efficiency in dealing with issues or operations, planning, and even management.

1.6.2.5 Use of Information in Modern Society

In this fast-changing world, information technology and information management will play an important role. The information has already been recognized as one of the basic resources for the socio-economic development of a country. The information has now rather acquired the status of the most sought-after resource of the resources.

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Human society has so far witnessed three significant reductions. These reduction has brought tremendous changes in man's physical, social, economic a political environment and behavior. These are :

Agricultural Revolution: From a Vagabond life, man developed a social life with settlement agriculture made man to settle at one place. This information made a revolution in human civilization because agriculture progressed with key information to have a primitive basis. In the agriculture field information man used skin of animals hunted, and leaves of trees to get protected from the harsh weather today, information mastered other activities like fishing, mining, manufacturing and so n.

Industrial revolution: With the help of information several geographical regions affected the location of settlements. Important are like water supply, natural resources, defense shelter trade rates, borders etc. which resettled in township development. This was industrialization which thoroughly transformed into Modern society as IInd Revolution. It is both technological as well as socio-economic cultural. It includes introductory materials, chiefly iron and steel, new machines like power loom, watermills, steam engine, floor with etc. and a new organisation of work K/a factory system emerged.

Information trade, shift in economic power from royalty to new industrial tycoons, emergence of a new pattern of authority a new system of education and training is role of information to modern society for creating modern technicians and engineer. New modes of transportation and communication increased efficiency.

Technical Revolution:

In the growing specialization of production, scientific discoveries were put to industrial application and mass production techniques were evolved. Information implemented new precision tools and techniques for development in various technology fields. With the help of info rmation nuclear energy being exploited to its fullest use. Automation resulted in faster production and caused information. Users of various professions and vocations like doctors, engineers, scientists, scholars etc. acquire and apply info. to do their work, job more efficiently and effectively. Inf. sup.research in order to obtain eff and fruitful result between manage of manpower, material, produc. finance, mark. etc. help in avoiding duplication of research. it stimulates the thought process of users, particularly the scholars, helps sc. eng. sch.etc.to get well info. withcurr adv. in their society to keep them into data.

1.6.3 Steps in the Use of Information

i. Awareness or identification of the problem.
ii. Definition of collection of relevant information.
iii. Development of Alternative Hypothesis.
iv. Evaluation of Alternatives.
v. Selection of optimum solution or alternatives

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vi. Implementation

vii. Review of the results or performance as a consequence of the implementation of the decision.

The actual use of information or value of information can only be determined retrospectively as Carter puts it in three stages:

- Before Information Seeking
- Before the Use of Information
- After the Consequences of use are examined.

1.7 SUMMARY

Good information is required for effective operation and decision making at all levels in today's information society. Information is scattered in a variety of formats all around us. Thus it cannot be captured into a consensual definition. Without knowledge, the information cannot be used efficiently and effectively as all knowledge is formed of it. The information multiplies as it is given or transferred to the others. Despite being the most used resource, the information will never get depleted. It has the longest history yet very short lifespan. It is the sole basis of progress of the human civilisation and yet it is subversive (Satija, 2013, p.133). Information as a value becomes one of the strongest regulators that influences the socio-cultural changes in today's modern society.

1.8 GLOSSARY

Approach: to begin to deal with a problem, a situation, etc.

Characteristic: a quality that is typical of somebody/something and that makes him/her/it different from other people or things.

Commodity: a product or material that can be bought and sold.

Information: knowledge or fact(s).

Value: how much something is worth compared with its price.

1.9 ANSWERS TO IN-TEXT QUESTIONS

1. Information	5. Facts
2. True	6. Everyday and Exhaustive Approach
3. Biasness	7. True
4. High Value and Cost-effective	8. Analytical and synthetic character.

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1.10 SELF-ASSESSMENT QUESTIONS

1. Define 'Information'. Elaborate the origin and use of the term in different regions.
2. Write an essay on the various Characteristics of Information.
3. What is the role of information in various areas of human activity?
4. Explain how the information act as a 'Resource'.
5. How is information regarded as a 'Commodity'? Explain briefly.

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UNIT IV: INFORMATION AND COMMUNICATION

LESSON 2

Conceptual Difference between Data, Information and Knowledge

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 What is Data?
1.3.1 Definitions
1.3.2 Characteristics of Data
1.4 What is Information?
1.4.1 Definitions
1.4.2 Characteristics of Information
1.4.2.1 Properties of Information
1.4.2.2 Approaches to Information
1.4.2.3 nature based on User's Approach
1.4.2.4 Commodity Approach
1.5 What is Knowledge?
1.5.1 Definitions
1.5.2 Characteristics of Knowledge
1.6 Conceptual Difference between Data, Information and Knowledge
1.7 Summary
1.8 Glossary
1.9 Answers to In-text Questions
1.10 Self-Assessment Questions
1.11 References
1.12 Suggested Readings

1.1 LEARNING OBJECTIVES

In this lesson, the students will study the conceptual difference between Data, Information, and Knowledge. After reading this chapter, the students will be able to relate the basic difference and relationship between Data, Information and Knowledge and how all the

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three are interdependent to produce useful information. The students will come to know that data does not depends on information, but information depends on data. This lesson will clearly demonstrate to the students that how the 'Data can lack context when looked at singularly', and it is the 'Information' which gives 'context to data' and further ' Knowledge brings depth in understanding' to such information.

1.2 INTRODUCTION

Data is collected from a study involving observation, experimentation, or survey. Data are those facts and figures that are not currently being used in a decision process i.e. they are unevaluated and unprocessed. Data are usually hanging facts that are un-contextual and have definite limits. The data must be stored and made available to the users in a processed way.

Data are the basic facts, whereas information is data with context and Knowledge is processed information with meaning. In this lesson, first, we will study what is Data, Information and Knowledge along with their meaning, definitions and characteristics. Further, this lesson will elaborate the basic conceptual difference between Data, Information and Knowledge and how they are interrelated.

1.3 What is Data?

1.3.1 Definitions

Data can be defined as the raw facts, figures or ideas collected as a result of observation, experimentation, or survey.

According to Kashyap 'data results from observation or measurement by the human brain in action. The indication or occurrence of a fact or an event or an attribute of something (concrete or conceptual) are also data. Any raw fact or all facts about something are data'. In other words, the representation of a fact, or a set of facts about an entity or value or a set of values of the attribute of an entity in a formalized manner which is suitable for communication, interpretation or processing by man or machine are data. Data is not subjective rather, it is biased.

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For Example, Let us take the data '2341984'. This data may be a date (23rd April, 1984), a telephone number, an account number of a person in bank, a roll number of any examination of any student etc.

Until and unless we know exactly what is this in actual form, a phone number or a birthday date, it is simply a data for us represented in numerical order. When we confirm what it actually is, it becomes a meaningful fact to us, which in turn is information to us and when we can retrieve it anytime from our mind, it becomes knowledge for us.

In addition, data can be numerically expressed and thus quantified, frequently repeated and is objective.

1.3.2 Characteristics of Data

1. Data can be numerically expressed i.e. quantified or objective;
2. Data is highly repetitive;
3. Data is raw statistical fact collected as a result of observation, experimentation; measurement, or survey;
4. Data is suitable for communication, interpretation and expression and
5. Data are recorded and filed.

1.4 What is Information?

Information is the 'output' produced as a result of 'the processing of data based on which some decisions can be taken. It is the data arranged in a logical order and form that is useful for the people who receive it. Information is used to enhance understanding and to achieve specific purposes. The conversion of some fact into any meaning is information which can be in the form of a message, signal or stimulus.

1.4.1 Definitions

In simple words, we can say that 'when data is put into some context or some process, then it becomes an information which has some meaning to us'.

Information is the causative factor for the development of anything and everything in the universe. It is both an input and output of research and development in all the disciplines, i.e., is science and technology, Humanities and social sciences.

According to George Andela, Information is as a resource, a resource as fundamental as energy or water, which affects all human activity and an indispensable, irreplaceable between

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intellectual and material activities. This concept leads to the conclusion that information must be at the service of the whole community.

Ching-Chih Chen (1982) defines information as all knowledge, facts, data and imaginative works of mind which are communicated formally or informally in any formal.

According to Mc Garry: Information is not limited to facts in documents, but it covers a broad spectrum of issues, including emotions, factors, opinions, guidance, and persuasions. In similar terms, the processed data is information.

According to Shera, information is transmitted by the act or process of communication; it may be a message, a signal, or a stimulus; it assumes a response in the receiving organisms and process response potential and its motivation is inherently utilitarian. It is instrumental and usually communicated in an organized or formalized pattern, mainly because such formalization increases potential utility.

Information is data that has been retrieved, processed or otherwise used for the informative or interfering purposes, arguments or as a basis for forecasting or decision-making. The way in which the data of a message are structured is crucial to the effectiveness of information.

Information is a property of data resulting from or produced by a process that produced the data.

According to Ford, the structure of any text capable of changing a recipient's image structure is information.

Above all, we can conclude that:

1) Information is the processed data.

2) It may be a message, a signal or a stimulus.

3) Information is meant for communication and can bring change in the recipient.

4) It helps in achieving a specific purpose.

5) Information involves the conversion of facts into some meaning.

1.4.2 Characteristics of Information

Information has an origin. It is communicated from the origin or from a 'source' where information is. The information to be communicated can be termed as 'message'. The message needs a 'medium' for communication. The message is aimed to be communicated to a 'recipient'. At each step, the information possesses specific characteristics.

1.4.2.1 Origin/Source

The validity of information will depend upon the origin or source. Before information is communicated to a user, we should check the origin or source of information (or message).

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Also, it is not possible for us to always check the origin of information. In such cases, we should check the source from when or where the information is received. When the information is received from a valid, authentic and reliable source, it should be considered for communication to the end user. Sources of information or evidence are often categorized as **primary, secondary, or tertiary material**. These classifications are based on the originality of the material and the proximity of the source or origin.

1.4.2.2 Message

In modern society information to be communicated should be checked as to whether it possesses the following characteristics or not.

i. **Accuracy:** The information to be communicated must be accurate i.e. it must meet the exact requirements of the recipient. It should be precise and free from error.
ii. **Appropriateness:** The information must serve the purpose of the user. All the information relevant to the purpose of use should be collected, collated and presented to him so that his just need are satisfied.
iii. **Timeliness:** Information should be timely; the value of information depends on timeliness. Timely information saves losses and wastage, avoids duplication, and saves from going on unintended lines.
iv. **Comprehensiveness:** The message must be understandable. It should include all the relevant information. It should be simple and understandable language.
v. **Explicitness:** It should be clearly and fully expressed. The message should not leave any doubt in the mind of the user as to its validity, comprehensiveness, etc. The recipient must be able to receive the message in straight and clear terms.
vi. **Availability and Accessibility:** The information must be available and accessible to the user. Otherwise, there will be no use in merely communicating about the existence of a particular piece of information.
vii. **Verifiability:** This has two implications. The message should be verified for its validity, accuracy, appropriateness, comprehensiveness, etc., before it is communicated to the recipient; when the communication is not direct or from a known source, the recipient must be able to verify as his own about the validity, etc. of the message.
viii. **Biasfree:** Information should be biasfree. It should not try to impose an opinion on the user or influence him. It should not have any slant to one among alternatives without any positive reason or based on a principle.

1.4.2.3 Medium

Communicability: An individual scientist receives information through numerous media. It may be oral, by speaking and listening; documentary, by reading and writing; visual, by displaying and observing. In order to increase the effectiveness of message a combination of two or more media may be used for example, script and photographs, tables and graphs etc.

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1.4.2.4 Recipient

From the point of view of the recipient, information should possess the following three characteristics:

i. **Adaptability:** Information should be adaptable for new used, need, situation, etc. It should be enabled to be used for a purpose or in a way different from what it was meant for.

ii. **Cost-effectiveness:** The information should improve the performance of a system at an acceptable cost or at no cost or should reduce the cost without any delay in efficiency and performance. It is desirable to define a unit cost of relevant influence found for the user, since this considers the system's performance.
Cost tends to rise with the number of documents processed, particularly with the exhaustiveness of the search process. On the other hand, costs can be reduced by a more rigorous acquisition policy based on examining the distribution of sources among the retrieved references.

iii. **Currency:** Information should be available timely to the end user. It should not be obsolete as well. Timely information is of high value and cost-effective also. Currency should be regarded as one of the basic characteristics of information in Modern Society.

In brief, the Characteristics of Information may be stated as below:

1) It is the data that has been retrieved and processed
2) Information may be a message, a signal, or a stimulus
3) It is always a new, current or recent element.
4) It is meant for communication, and it is capable of bringing a change in the recipient
5) It brings clarity to ideas
6) It helps in decision-making
7) It should emerge from a good source
8) It reduces uncertainty when used
9) It is not highly repetitive or quantified
10) It is characterized as narrative and subjective
11) It improves overall efficiency and effectiveness

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IN-TEXT QUESTIONS

1. Data can be_____expressed and thus quantified.
2. Data results from observation or measurement by the human brain in action. True/False
3. Information involves the_____into some meaning.
4. Information is the_____factor for the development of anything and everything in the universe.
5. Information may be a message, a signal or a _____.

1.5 What is Knowledge?

Knowledge is the information conserved by an individual at one extreme and humanity as a whole at the other extreme. Extracting Knowledge involves interpreting the volume of data and information to arrive at logical concepts and guidelines that can be documented, packaged and delivered to the users who need or require it.

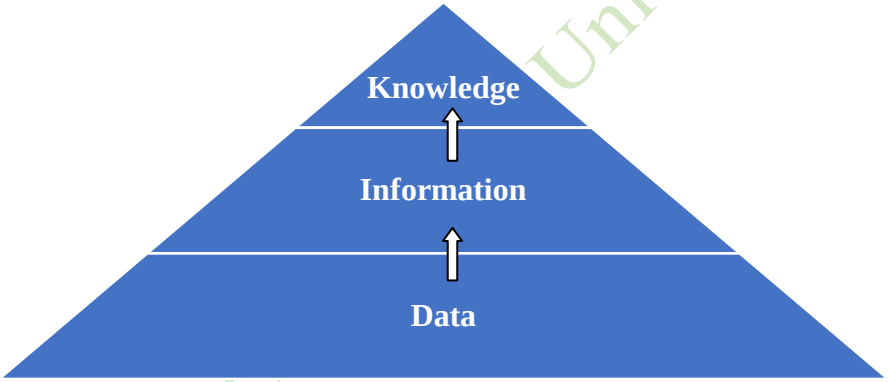

Fig. 1: The Knowledge Pyramid

The word 'knowledge' means an assured belief or that which is known. In the process of knowing, there are two parties (entities) : one man, the knower and the other the knowee i.e. things and concepts. Impact and interaction between the two gives birth to Knowledge.

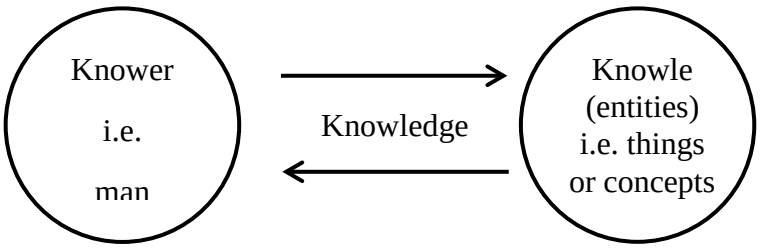

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Fig. 2. Relationship between Man and Entities

When man knows the entities, Knowledge is established. As man knows more and more about entities, more Knowledge grows. There are three factors involved in Knowledge—the subject which knows, the object which is known, and the process of knowing. There can be no knowledge without a knower.

For Example:

Knower (Man)	**Knowles (Entities)**	
↓	↓	
Aristotle	**Things**	**Concept**
Newton	Table	Democracy
Keats	Stars	Relativity
Queen Victoria	Plants	Ecology
Gandhi etc.	Book etc.	Non-Violence etc.

Man is the subject and the entities, i.e., things and concepts are the objects in Knowledge. Man can achieve knowledge only in certain directions. He can examine nature, the self and the society.

1.5.1 Definitions

Knowledge is the internalization of information, data and experience. Knowledge is the totality of the ideas unserved by humans. In this sense, Knowledge is = Universe of ideas.

Idea: Idea is the product of thinking, reflecting, imagining, etc., got by the intellect by integrating with the aid of logic, a selection from the apperception mass, and/or what is directly apprehended by the intuition and deposited in the memory.

Knowledge refers to what one knows and understands. It is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required I the bringing to mind of the appropriate information.

According to L.B. Heilprin Aptly, "Knowledge is subjective information which is not merely communicated, but compared and found identical by a group of scientists o scholars who share their concepts. It is a social product dependent upon agreement among a group of technical persons who perform the operations characteristics of this field.

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According to Martin H. Fischer, 'Knowledge is a process of piling up facts, wisdom lies in their simplification'.

Dictionary meaning is the fact or conditions' of Knowledge (a) something with a considerable degree of familiarity gained through experience or contact or association with the individual or thing so known', (b). Acquaintance with or theoretical or practical understanding of some branch of science, art, learning, or other area involving study, research, or practice and the acquisition of skills. Pundit of Springfield believes that 'Knowledge is the sum total of what is known: the whole body of truth, fact, information, Principles, or other objects of cognition acquired by mankind.

Ladd defines that in Knowledge, the knower appears to himself as an active and sensitive intellect. The knower feels sure of the existence of himself and of his object, the thing known above all, the knower is an intelligent will.

According to the most widely accepted definition, 'knowledge has justified the belief' with adequate evidence and observational foundation. Observation is the nature of interpretation.

According to Singh, 'Knowledge is that which makes a part of our intellect and we can retrieve it.

1.5.2 Characteristics of Knowledge

Knowledge is the result of experience, object, and understanding.

(1) It is expressed in language or in some other medium and expressed Knowledge is stored in memory.

(2) Knowledge can be gained by the knowee by the primary perception

(3) The knower is always a man and the knowee is made up of entities i.e. things or concepts.

Knowledge can be organized, collected, originated, stored, retrieved, interpreted, transmitted, transformed and utilized.

Look into any other dimension: due to this limitation of man, Knowledge is limited to three spheres. They are :

1) Man and nature → Natural science (things and concepts, therein).
2) Man and self →Humanities (Things and concepts therein).
3) Man and society → Social sciences (Things and concepts therein).

Knowledge is an organized set of a statement of fact or ideas presenting a reasoned judgment or an experimental result, which is transmitted through some communication medium in

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some systematic form. Knowledge consists of new judgements (research and scholarship) or presentation of older judgements as exemplified in text books, in teaching and learning, and collected a library and archival materials.

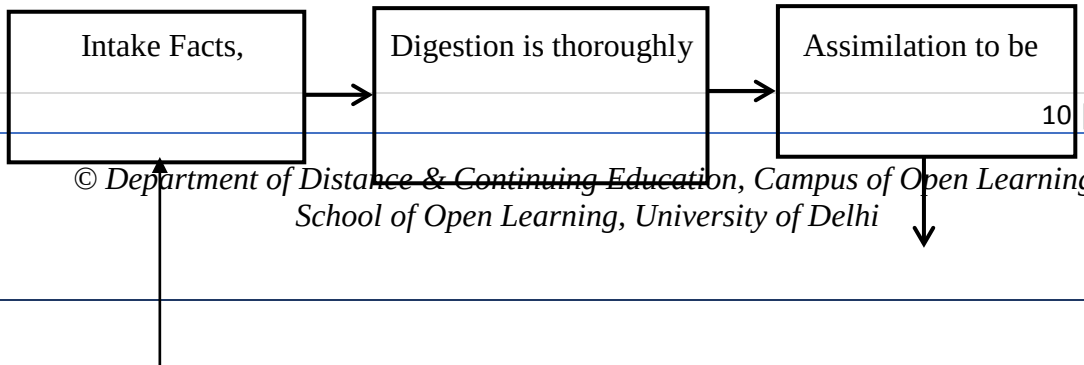
Information is building block of Knowledge. Knowledge is interpretation in content, (critical explanations and interpretation, especially of scriptures), relatedness and conceptualization, forms of argument. Knowledge results are theories, the efforts to establish relevant relationships or connections between facts, data, and other information in sort of a coherent entity comprehension and understanding result from the acquisition of information.

Fritz Machlup, the well-known scholar says Knowledge is a state or sense of knowing, an accumulated stock. According to him, the characteristics of Knowledge are that: Knowledge is entangled (that cannot be touched but only grasped him).

- It is structured, coherent and often of enduring significance.
- it is a stock, mainly resulting from the flow, and inputs of information;
- It may reflect the stock of Knowledge by adding, restructuring, or changing it in any way.

It is dynamic, ever-growing, and continuing, and no final word is said or will ever be said on any aspect of it. Today Knowledge have become powerful weapons for political and economic superiority among nations. Knowledge generation and its applications for various purposes have been the highest priority in recent decades, particularly among western industrialized societies. Developing countries naturally suffer from a no. of constraints in the acquisition, storage, processing, disseminating and making them available for use. Knowledge should be true, proven and examined before as incorrect Knowledge may influence or can change the final decision.

Knowledge is the ability to turn information and data into effective action (i.e. into some use that would not be possible w/o the Knowledge). Knowledge does not create anything new. Knowledge is used in the decision-making process. Knowledge is the perception of 'things', from direct experience.



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observations, discoveries, etc.	absorbed i.e., process systematically and to think over.	absorbed into the system.

Fig. 3. Model of Knowledge by Davidson

In brief, the basic characteristics of Knowledge are:

(1) It can be retrieved when needed or when in use.
(2) It is assimilatory, then digested and stored in memory.
(3) It is structured/coherent/general/long-lived/history.
(4) It is permanent and has a long-lasting significance.
(5) It goes on adding, restructuring and changing.

IN-TEXT QUESTIONS

6. There are three factors involved in Knowledge. The subject which knows, the object which is known and the process of knowing. True/False
7. Knowledge is that which makes a part of our _____an we are able to _____it.
8. Knowledge is a_____of many bits of information, which have been organized into some sort of coherent entity.

1.6 Conceptual Difference Between Data, Information and Knowledge

Data are recorded (captured and stored) symbols and signal readings.

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- Symbols include words (text and/or verbal), numbers, diagrams, and images (still &/or video), which are the building blocks of communication.
- Signals include sensor and/or sensory readings of light, sound, smell, taste, and touch.

As symbols, 'Data' is the storage of intrinsic meaning, a mere representation. The main purpose of data is to record activities or situations, to attempt to capture the true picture or real event. Thus, all data are historical, unless used for illustration purposes, such as forecasting.

Information is a message that contains relevant meaning, implication, or input for a decision and/or action. Information comes from both current (communication) and historical (processed data or 'reconstructed picture') sources. In simple words, the purpose of the information is to assist in decision-making and in problem-solving process, respectively.

Knowledge is cognizance, cognition, the fact or condition of knowing something with familiarity gained through experience or association. Knowledge can be either tacit or explicit. **Tacit Knowledge**, which is also known as implicit Knowledge, is the Knowledge that a person retains in their mind. It is relatively hard to transfer this Knowledge to others and disseminate it widely. **Explicit Knowledge**, which is also known as formal Knowledge, is Knowledge that has been codified and stored in various media, such as books, magazines, CD/DVDs, media tapes, etc., which is meant to be used by others, e.g. a reference library. This type of Knowledge is readily transferable to other media/sources and is capable of being readily disseminated.

With the above-given definitions for data, information, and Knowledge, the relationships between data and information, information and Knowledge, can be explored. Also, it can be studied why they are most often regarded as interchangeable and when they are not, the processes and their relevance to our intended application. The key to understanding the intricate relationship between data, information, and Knowledge lies at the source of data and information. The source of both is twofold: activities and situations. Both the activities and situations are responsible for generating the relevant information. (lost) (Liew, 2007).

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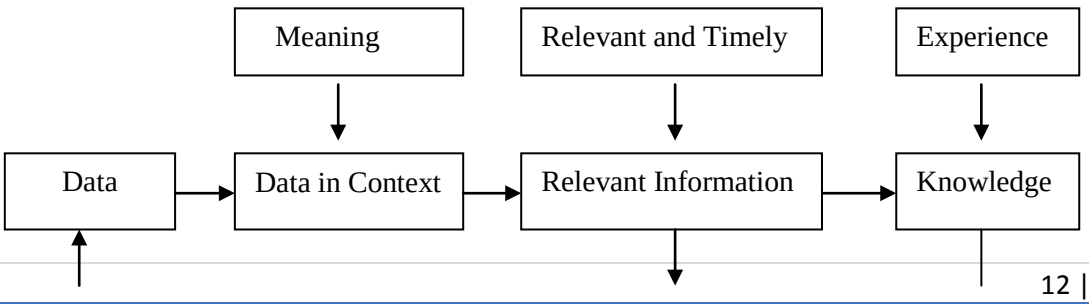

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Stored

Fig. 4. Relationship amongst the Data, Information and Knowledge

Data- 'in Context' and Information:

Data- 'in context' are individual facts which have meaning and are readily understood. They are actually raw facts encased with meaning, still they can not be considered as information.

Information is a set of 'data in context' with quality of relevance to one or more persons at an individual point in time or for a period of time. Information is an idea, a symbol or a set of symbols which has the potential for meaning.

The Machlup and Mansfield differentiated information and Knowledge in the following way:

i. Information is piecemeal, fragmented, particular; whereas on the other way knowledge is structural, coherent and universal;
ii. Information is timely, transitory, ephemeral whereas Knowledge is of enduring significance;
iii. Further, information is a flow of messages, whereas Knowledge is a stock that largely resulted from the flow of information.

According to Brooks, Knowledge is a summation of many bits of information that have been organized into some coherent entity. Once the new piece of information is added to the existing knowledge structure, it gets modified.

1.7 SUMMARY

The modern age is the age of information. The processed 'Data' produces 'Information' and Knowledge is produced as a result of understanding information. The key to understanding the relationship between information and Knowledge is knowing where the information resides. From the above definitions and characteristics of Data, Information and Knowledge it may be concluded that data is incomprehensible independently. However, the outcome of information is comprehension while the outcome of Knowledge is understanding. Data is meaningless without being compiled into a sensible structure, while information improves representation and Knowledge amplifies consciousness. Both the Data and Information alone are not sufficient enough to make any predictions, whereas the knowledge prediction is possible if the person possesses the necessary experience.

1.8 GLOSSARY

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Coherent: (ideas, thoughts, etc.) clear and easy to understand; logical.

Data: to begin with a problem, a situation, etc.

Enduring: something that is long-lasting and patient.

Ephemeral: something that lasts for a concise time.

Fact: something that actually exists.

Information: Information: knowledge or fact(s).

Knowledge: a product or material that can be bought and sold.

Explicit Knowledge: Knowledge, such as facts, that can be easily passed on to others.

Tacit Knowledge: Knowledge that is difficult to pass on to someone else, such as knowing how to do something.

Pyramid: a shape with a flat base and three or four sides in the shape of triangles.

1.9 ANSWERS TO IN-TEXT QUESTIONS

1. Numerically	5. Stimulus
2. True	6. True
3. Conversion of Facts	7. Intellect/ Retrieve
4. Causative	8. Summation

1.10 SELF-ASSESSMENT QUESTIONS

1. Differentiate between Data, Information and Knowledge.
2. Elaborate the conceptual difference or relationship between Data, Information and Knowledge.
3. What are the basic Characteristics of Data, Information and Knowledge? Explain briefly.

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Chapter 1

COMMUNICATION CHANNELS, MODELS AND BARRIERS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Communication
- 1.3.1 Categories of Communication
- 1.3.2 Elements of Communication
- 1.3.3 Importance of Communication
- 1.3.4 Types of Communication
- 1.3.5 Channels of Communication

1.4 Models of Communication
1.5 Barriers to Communication
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

In the present chapter, we aim to present detailed knowledge of the communication of information, and the different barriers involved in its communication. We will try to understand various models of information communication described by different persons. At the end of the chapter, the students will be able to define what is information communication and describe the major barriers to information communication in the present globalscenario.

1.2 INTRODUCTION

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The importance of information has naturally increased with the increasing importance of research and development work in the changed global scenario. The main reason for this is the need for information in research and development work. Information secures its place as an essential element in performing these functions. Research or development work without information is unimaginable. It became clear in the previous chapter that information is being produced at an explosive rate in today's world. In this situation, users have to face several difficulties in getting the information they need. Similar obstacles apply to the exchange of information.

As an information expert, you need to know what the world is and what limitations can come with editing it. Uninterrupted transmission of information helps to increase the speed and quality of all research and development work. The word 'communication' comes from the Greek "Communis" meaning "community" in English. Communication is primarily a means of transferring information from one place to another or from one person to another. The process by which messages, meanings, facts, ideas, advice, or feelings are exchanged between two people. That is, through communication or communication, a message is passed from one person to another, and action is taken so that the other person can understand and act on the message.

1.3 COMMUNICATION

Communication is the transfer of message from one place, person or group to another. Although seems to be simple, communication is a very complex subject. Many things can affect the transmission of messages from sender to receiver. This includes emotions, cultural contexts, means of communication, and even location. Because of its complexity, employers around the world try to develop good communication skills. Accurate, effective and clear communication is very difficult.

As is clear from this definition, communication is more than simply conveying information. The term calls for an element of success in conveying or conveying a message, such as information, idea, or emotion. Therefore, a message consists of three parts: the sender, the message, and the recipient. A sender typically "encodes" a message by mixing words and non-verbal communication. It is transmitted in any way (eg, oral or written) and "deciphered" by the recipient. Of course, there can be multiple recipients, each receiving a slightly different message due to the complexity of the communication. Two people can interpret very different things in word choice and/or body language. None of them may have the same understanding as the sender. In personal communication, the roles of senders and receivers are no different. The two roles pass back and forth between the two speaking people. Both parties communicate with each other, even in very subtle ways, such as eye contact (or absence) and shared body language. However, in written communication, there is a further distinction between the sender and the receiver.

1.3.1 Categories of Communication

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There are many ways in which we communicate and more than one may be used at any given time. Various communication categories include:

Face-to-face communications, conversational or oral communications, including telephone, radio or television and other media.

Nonverbal communication, includes gestures, body language, clothing or behaviour, standing position, and even smell. There are many subtle ways we communicate with others (perhaps unintentionally). For example, a tone of voice can indicate a mood or emotional state, while a gesture can complement a voice message.

Written Communications: Letters, emails, social networks, books, magazines, the Internet and other media. Until recently, a relatively small number of writers and publishers had a significant impact on conveying the character. Nowadays, we can all write and publish ideas online, which has led to an explosion of information and communication opportunities.

Visualizations: Graphs and charts, maps, logos, and other visualizations can convey a message.

The process of interpersonal communication cannot be viewed simply as a "happening" phenomenon. Instead, it should be viewed as a process that involves participants consciously or unconsciously negotiating roles with each other. A message is sent by a sender to one or more recipients over a communication channel. The sender must encode the message (the information to be transmitted) into a format suitable for the communication channel, and the receiver must decode the message to understand its meaning and meaning. Misunderstandings can occur at any stage in the communication process. Effective communication involves minimizing potential misunderstandings and overcoming communication barriers at every stage of the communication process.

1.3.2 Elements of Communication

1. Sender A person who initiates communication/ creates the message.

2. Message An idea, information, point of view, fact, feeling, etc. originated by the sender for communication.

3. Encoding Messages by the sender are symbolically encoded in the form of words, images, gestures, etc. before being sent to a recipient.

4. Media A method of transmitting messages.Messages can be sent orally or in writing. Communication methods include telephone, Internet, postal mail, fax, and e-mail, and the sender decides the transmission method.

5. Decoding The process of converting the encoded message to the original status at the receiver end.

6. Recipient Itis the last person in the communication process. The goal of communication is reached only when the recipient receives the message.

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7. Feedback The communication process is complete when the receiver confirms to the sender that he has received the message properly.

8. Noise Any interference during the communication process such as poor phone connection, poor coding, incorrect decoding, careless recipients, poor understanding of messages due to bias or inappropriate gestures, etc.

13.3 Importance of Communication

1. Basics of Coordination Communication helps in better coordination in an organization. Authority defines the goals of the organization, which are communicated to the employees. This ensures proper working of the organisation.

2. Decision-making base Proper communication assist in making proper decision-making. Without information, no decision can be made.

4. Increase management efficiency. The manager communicates goals, gives directions, and distributes tasks to subordinates.

5. Strengthen cooperation and organizational peace. The process of two-way communication promotes cooperation and understanding between workers and management. The result is less friction, resulting in a quieter and more efficient operation of the organisation.

6. Increases employee morale An effective communication system allows management to motivate, influence, and satisfy subordinates, which in turn boosts and motivates employees.

1.3.4 Types of Communication

1. FORMAL COMMUNICATION

Formal Communication refers to organisational communication that occurs through legal means. This type of interaction occurs between managers or employees of the same class, or between high and low and vice versa. It may be verbal or written, but the organisation maintains a thorough record of all communications.

Formal communication can be further divided into vertical communication and horizontal communication.

Vertical communication flows vertically up or down a formal channel. In Upward communication, the message moves from subordinates to their superiors and in downward communication, the flow is from superiors to their subordinates. For example, an employee applying for leave is an example of upward communication. Sending notifications for meetings is an example of downward communication.

Horizontal Communication occurs between two persons of the same rank. For example, a production manager communicates with HR.

2. INFORMAL COMMUNICATION

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Informal Communication: It is defined as any communication that takes place outside of the official channels of communication. Informal communication is commonly referred to as the "vine" since it spreads across the organisation and to all parties, regardless of their position of authority.

Informal communication can be effective since they deliver information rapidly, which can be advantageous sometimes.

Managers also use informal channels to convey information to comprehend the responses of their employees.

Grapevine Network: In this network, each person communicates with others in a specific order.

Gossip Network: In this type of network, each person communicates indiscriminatelywith everyone.

Probabilistic Networks: In this network, people randomly communicate with each other.

Cluster Network: In this network, people only communicate with people they trust.

Of these four types of networks, cluster networks are the most used by organizations.

1.3.5 Channel of Communication

Channel ofCommunication is a term for how we communicate. Therefore, it is a method used to deliver a message to a recipient or to receive a message from another person. Today we have access to many communication channels. This includes personal conversations, phone calls, text messages, email, the Internet (including social media such as Facebook and Twitter), radio and television, written letters, brochures and reports. Choosing the right communication channel is important for effective communication. Each communication channel has its pros and cons. For example, communicating the news of an upcoming event through a written letter can make your message clear to one or two people. However, this is not a time- or cost-effective way to get your message across to many people. On the other hand, complex technical information is easier to communicate through printed documents than verbal messages. Recipients can absorb information at their own pace and review content they don't fully understand. Written communication is also useful as a way to record what is said, such as taking minutes. All messages must be encoded in a format that can be transmitted over the communication channel selected for the message. We all do this every day, translating abstract thoughts into oral or written form. However, different communication channels require different forms of coding. Text written for a report will not work well when broadcast over the radio, and short, abbreviated text used in text messages is not suitable for writing or speaking. Complex data is best represented using graphs, charts, or other visualizations. Effective communicators code their messages in a way that suits both the channel and the target audience. They use appropriate language while conveying information simply and clearly. They also anticipate and eliminate possible causes of confusion and misunderstanding. In general, they know the experience of the recipient in

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decrypting such messages. Successfully coding a message for your audience and channel is an essential skill for effective communication.

Upon receipt, the recipient must decrypt the message. Successful decoding is also an important communication skill. People will interpret and understand the message differently. This will depend on your experience and understanding of the context of the message, how well you know the sender, your psychological state and well-being, and the time and place of receiving it. They may also be affected by communication barriers that may exist. So many factors affect decoding and understanding. Successful communicators understand how messages are deciphered and anticipate and eliminate as many potential sources of misunderstanding as possible. The last part of the Feedback message is feedback. The receiver informs the sender that he or she has received and understood the message.

Message recipients are more likely to provide feedback on how they understood the message through verbal and non-verbal responses. Effective communicators pay close attention to this feedback because it is the only way to assess whether the message is understood as intended and correct any confusion. The amount and format of feedback depend on the communication channel.

Feedback during personal or phone conversations is immediate and direct, whereas feedback on messages broadcast on television or radio is indirect and may be delayed or transmitted over other media such as the Internet. Effective communicators pay close attention to this feedback because it is the only way to assess whether the message is understood as intended and correct any confusion.

IN-TEXT QUESTIONS

1. The term communication came from which language?
   (A) Greek (B) Latin (C) German(D)French
2. Messages should convey something of value to the receiver in the light of his ..... and .....
3. Formal communication may be further classified as --------- communication and ----------communication.

1.4 MODELS OF COMMUNICATION

The communication model is a systematic representation of a process that helps to understand how communication can take place. The model presents the process metaphorically and symbolically. By decomposing communication from complex to simple and maintaining the order of its components, it forms a holistic view of communication. Communication models sometimes promote traditional thinking and stereotypes but may fail to take into account some important aspects of human communication. Before choosing a specific communication model, you should consider the communication method and channel to be used and the purpose of the communication. Models are used by businesses and other

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companies to improve communication, explore options, and evaluate their circumstances. It is also used to understand how the recipient interprets the message.

There are three main types of communication models into which all other communication models fall by default.

Linear Communication Model

The linear communication model is a simple one-way communication model. Messages travel in a straight line from sender to recipient. There is no concept of feedback. The recipient's only action here is to receive the message. Following are various communication models that fall in the linear communication model category:

Lasswell Model

Aristotle Model

Shannon Weaver Model

Berlo S-M-C-R Model

Shannon-Weaver Model:

Shannon and Weaver developed a communication model known as the Shannon-Weaver model. This involves dividing the information system into subsystems to evaluate the effectiveness of various communication channels and codes. They suggest that all communications should include six elements.

Source

Encoder

Channel

Message

Decoder

Destination

This model is often referred to as the "information model" of communication. The downside is that the model treats communication as a one-way process. This is eliminated by adding a feedback loop. Noise refers to factors that interfere with or influence a message as it is transmitted.

Transactional Communication Model

In the transactional model, the sender and receiver are known as communicators, and both play equally important roles in communication. The transactional model relates communication with social reality, cultural upbringing and relational context (relationships). Non-verbal feedback like gestures, and body language, is also considered as feedback in this

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model. Different models that follow the transactional model of communication are: Barnlund's Transactional Model

Helical Model

Becker's Mosaic Model

Interactive Model of Communication

The interactive model or convergence model is similar to the transactional model as they are both two-way communication models. But, an interactive model is mostly used for new media like the internet. Here, people can respond to any mass communications like videos, news, etc, People can exchange opinions and ideas.

Other Communication Models

Dance's Spiral Spiral Communication Model

In 1967 Dance created a spiral-based communication model known as the Spiral Model. He explains how a child learns to communicate and how the child grows and continues to communicate. Communication depends on the speaker's previous experiences and activities according to this model. Westley and McLean's Conceptual Model The Westley and McLean model explains the difference between interpersonal and mass communication with feedback. Feedback can be direct in interpersonal communication and indirect in public communication. According to this model, communication begins with the environment, not the moment a message is said or shown.

1.5 BARRIERS TO COMMUNICATION

Communication barriers can interfere with communication or convey misunderstandings, which can lead to misunderstandings. Therefore, managers need to identify these barriers and take appropriate steps to overcome them. Barriers to communication in organizations can be broadly grouped as follows:

1. Semantic barrier

It involves problems and obstacles in the process of encoding and decoding messages into words or impressions. Typically, these barriers arise from the use of incorrect words, incorrect translations, different interpretations, etc. For example, managers need to communicate with staff who do not speak English, on the other hand, they do not speak English. well. Hindi. The language here is a communication barrier as managers may not be able to communicate well with workers.

2. Psychological barriers

Emotional or psychological factors also act as barriers to communication. The state of mind of the sender and recipient of a message is reflected in effective communication.

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Worried people can't communicate properly, and angry recipients don't understand the message. Therefore, when communicating, both the sender and the receiver must be psychologically healthy. We also need to trust each other. If you don't trust each other, you won't be able to understand each other's messages in their original meaning.

3. Organizational barriers

Factors related to organizational structure, rules and regulations, and relationships between authorities can act as barriers to effective communication. In a highly centralized organization, people may not be encouraged to communicate freely. Strict rules, regulations, and cumbersome procedures can also become obstacles to communication.

4. Personal Barriers

Personal factors, both sender and receiver, can act as barriers to effective communication. If your boss believes that certain messages could negatively affect his authority, he can ban them. Also, a boss may not seek advice from a subordinate if he is not confident in his or her abilities. Subordinates may be reluctant to make useful suggestions in situations where there is no reward or appreciation for good suggestions.

IN-TEXT QUESTIONS

4. ..... model introduced the concept of 'Noise'.
5. A linear model of communication is a simple one-way communication model. True/False
6. The Shannon-Weaver Model has proposed ---- elements
   (A) Six (B) One (C) Seven (D) Two

1.6 SUMMARY

In this lesson, we learned about information communication in the context of information dissemination. Describes the contribution of information communication to the transfer of information. Describes the differences between the various formal and informal means of information transmission. In the context of information transfer, we discussed in detail the models presented by various scientists. At the end of the lesson, we detailed the main barriers to information transfer. To transmit information from creators or organizers to users, it is necessary to understand the various means of these communications. At the same time, it is necessary to make an effort to understand the barriers to communication. By doing this, we will not only be able to communicate information dynamically but will also be able to easily identify and overcome obstacles in this

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communication.

1.7 GLOSSARY

Communication: The process of sending and receiving the message.

Barriers to Communication: Factors that create hurdles in the process of communication.

Communication Process: It is a process by which a sender sends a message to the receiver.

Formal Communication: Transmission of the information in the formal organisational structure.

Grapevine: An informal communication network in an organisation that bypasses the formal channels of communication.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Greek
2. Needs and Interest
3. Horizontal and Vertical
4. Shannon-Weaver Model
5. True
6. Six

1.9 SELF-ASSESSMENT QUESTIONS

1. What are the main barriers to communication? How can you remove these barriers?
2. Define Communication. Discuss different typesof Communication

1.10 REFERENCES

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UNIT IV

National Knowledge Commission and Information Policy

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1.1 Learning Objectives
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1.4 Information Policy
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1.5 Summary
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After reading this lesson, learners will be able to:

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- Understand the need of National Knowlwdge Commission
- Describe key features of National Knowledge Commission in Indian Context and its official report
- Know about the activities being laid down by the National Knowledge Commission in recent times
- Define the concept of Information Policy
- Distinguish between National and International Information Policies

Knowledge is considered as a network of integrated information that allows us to process further information and set it in a broader picture. Due to its network forming capabilities, knowledge is considered as the most important and prime factor of development and prosperity in 21st century. If a nation wants to become globally competent and progressive then it has to be largely dependent on the knowledge and intellectual capabilities resides in the nation. This requires to set up a structured knowledge base as well as a coherent network of knowledge infrastructure within the country across many sectors such as education, health care, agriculture, infrastructure and industry. This knowledge infrastructure demands to have clear-cut policies, rules and guidelines for application, collaboration and dissemination of knowledge in these sectors for overall development. Formation of National Knowledge Commission is one such intervention by the Government of India with an aim to foster applied knowledge in multiple sectors for better connectivity and growth. Now a natural question comes to the mind, what are the significances of having a country level National Knowledge Commission?

We shall discuss in detail in this chapter, the role National Knowledge Commission (NKC) plays in fostering academic and research ecosystem through an organized system in order to attain social, economic and intellectual growth. We shall specifically discuss the manifestations of the NKC by discussing key recommendations made in its report. We shall also be discussing information policies in detail particularly how National Policy on Information and Libraries paved a way forward for library movement in India.

Thus, by describing both the NKC and the Information Policy this chapter will provide a holistic view of Governmental interventions and initiatives to establish countrywide library and information consciousness both in academia and research.

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The National Knowledge Commission (NKC) was established on June 13, 2005 by Dr. Manmohan Singh, the country's then-prime minister and Mr. Sam Pitroda, being the Chairman of the commission. The goal was to develop a roadmap for the reform of our knowledge-based institutions and infrastructure that would enable India to meet the challenges of the future. On the question of what exactly this commission is composed for, the NKC Chairman Pitroda sates following:

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"The National Knowledge Commission was set up by Prime Minister Manmohan Singh to prepare a blueprint to tap into the enormous reservoir of India's knowledge base so that Indian people can confidently face challenges of the 21st century".

While explaining the importance of the commission, Dr. Manmohan Singh, then Prime Minister of India and an expert global economist said that,

"The time has come to create a second wave of institution building and of excellence in the field of education, research and capability building so that we are better prepared for the 21st century."

1.3.1 Nature of National Knowledge Commission:

The National Knowledge Commission (NKC) was basically a high-level advisory body to the Prime Minister of India which was established with an aim to transform the Indian Society in to what we call the Knowledge Society. The NKC was established for an initial period of three years *i.e.,* from 2005 to 2008 with a directive for giving policy guidelines in vast areas such as Academia & Research Excellence for coping up with the challenges of 21st century knowledge systems, Capacity building in Science & Technology, e-Governance implementation for effective transparency and easy access to citizens services, Improved and well managed learning institutions related to Intellectual Property Rights, Industry sectors, improving scientific knowledge dissemination system in primary sectors such as Agriculture and allied sectors *etc*. During its three and a half year of time span, the National Knowledge Commission drafted and put before the Prime Minister, almost 300 recommendations in 27 focus areas among some of which mentioned above. This was an enormous effort to change the nation's knowledge landscape.

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1.3.2 Core Concerns of the National Knowledge Commission

- **Creation and Preservation of Knowledge System:** This concern mainly deals with how knowledge can be created and preserved for transformation to the next generation. The commission took the keen interest in preserving knowledge systems, however very less attention was paid on preserving indigenous knowledge systems.

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This was also termed as the knowledge organization which means the representation of real objects (knowledge) arranged into useful structures (organization).

- **Easy Access to Knowledge:** This concern mainly deals with the knowledge management aspect focuses on easy and efficient access at the time of productive need.
- **Dissemination of Knowledge:** Focuses on disseminative channels and means to the mass and next generation for optimum utilization.
- **Improved Knowledge Services:** With the use of emerging ICTs, focuse was given to strengthen information and knowledge services to the end users and citizens in order to make citizen services more accountable and functional.

1.3.3 Organizational Structure of NKC

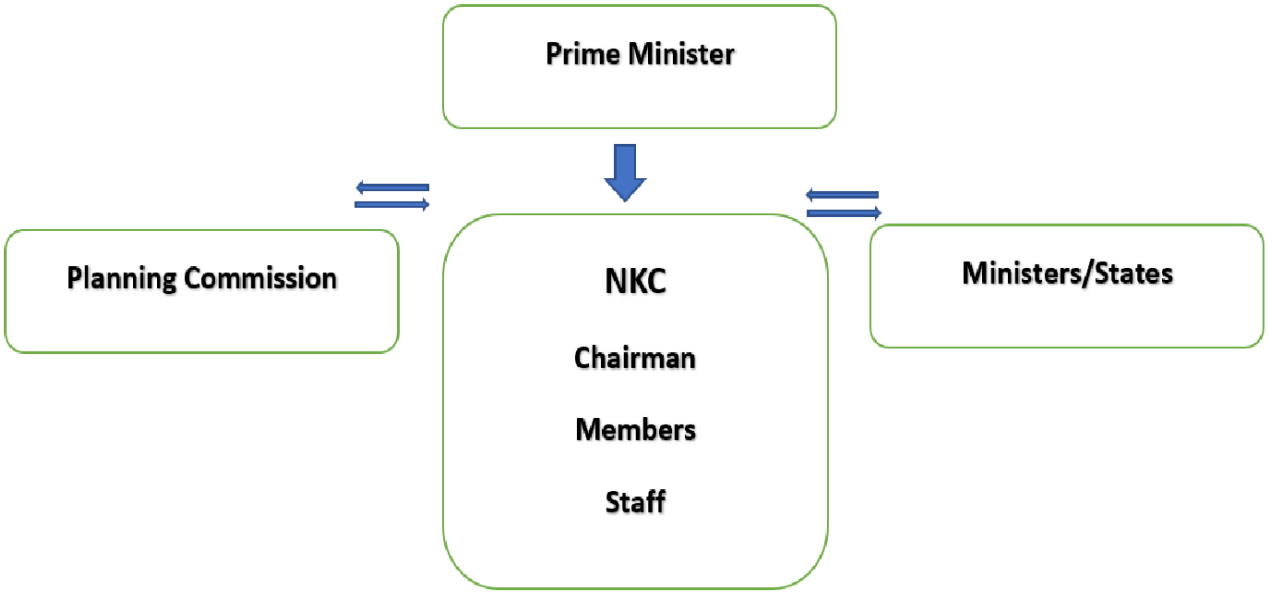

Fig. 1.1: Organizational structure of National Knowledge Commission

The NKC consists of the Prime Minister and seven members group, including the Chairman. All members perform their duties on a part-time basis and do not claim any remuneration. A small Technical Support Staff headed by an Executive Director rank officer assisted the members in their day-to-day duties. The Commission is also free to hire professionals to help with task management. The Planning Commission serves as the NKC's focal point for planning, budgeting, and processing submissions to or reactions from the Parliament.

A brief description of members of the NKC is as follows:

- **Sam Pitroda (Chairman):** Known as pioneer of India's Telecommunication and IT infrastructure, was also the advisor to the former Prime Minister Rajiv Gandhi.
- **Dr. Ashok Ganguly:** A technologist, economist and was a member of science advisory council of Prime Minister of India during (1985-1989).

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- **Prof. P. Balram: Padma Shri** Ex. Director and Professor of Molecular Biophysics at Indian Institute of Science, Bengaluru.
- **Dr. Jayati Ghosh:** She was a Professor of Economics and Chairperson of the Centre for Economic Studies and Planning, at Jawahar Lal Nehru University, JNU, new Delhi.
- **Dr. Deepak Nayyar:** A Professor of Economics at Jawaharlal Nehru University, and former Vice-Chancellor of the University of Delhi from 2000 to 2005. He was also Economic Adviser in the Ministry of Commerce, Chief Economic Adviser to the Government of India and Secretary in the Ministry of Finance.
- **Mr. Nandan Nilekani:** One of the founders of Infosys Technologies Ltd. and among the pioneer of UID-AADHAR identification system.
- **Dr. Sujatha Ramdorai:** Sujatha Ramdorai was associated with School of Mathematics, Tata Institute of Fundamental Research (TIFR) and Chennai Mathematical Institute as a Professor.

1.3.4 Term of References of NKC

Based on the notification of the Government of India issued in 2005, the following were some of the terms of reference of National Knowledge Commission (NKC) as depicted in figure 1.2.

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Figure 1.2: Terms of references of NKC

These Terms of concers paved the way for NKC to complete its PDCA cycle i.e. Planning, Doing, Checking and Acting the four part long recommednations submitted to Prime Minister of India.

1.3.5 Objectives of National Knowledge Commission

The focus of the National Knowledge Commission was to enable the development of a vibrant knowledge-based society. This entails both a radical improvement in existing systems of knowledge, and creating avenues for generating new forms of knowledge. Larger participation and more equitable access to knowledge across all sections of society are of vital importance in achieving these goals.

In view of the above, the NKC sought to develop appropriate institutional frameworks to:

- 'Strengthen the education system, promote domestic research and innovation, facilitate knowledge application in sectors like health, agriculture, and industry.
- Leverage information and communication technologies to enhance governance and improve connectivity.
- Devise mechanisms for exchange and interaction between knowledge systems in the global arena.
- Improve connectedness and governance by utilising information and communication technologies.
- Create systems for communication and collaboration among knowledge systems in a global setting'.

1.3.6 Methodologies used by NKC

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The National Knowledge Commission used mixed method approach to assess various issues and based on these deliberations, recommendations were formed and submitted to the Government. Following figure depicting methodologies used by the NKC where various steps involved in final dissemination and following up of recommendations after implementation.

The simple 10 steps methodologies have been depicted in figure 1.3 below where each next step is synchronised with its previous steps to establish a coherent workflow of knowledge. After formation of NKC working groups were formed for tackling various issues. These working groups were formed in the areas such as, Libraries, Language, Agriculture, Health Information Network, Undergraduate Education, Medical Education, Legal Education, Management Education, Engineering Education, Traditional Health Systems, More Students in Maths and Science, Open and Distance Education.

Apart from constitutiong working groups, workshops seminars were also conducted in the areas such as, Literacy, Translation, Networks, School Education, Muslim Education, Vocational Education, Open and Distance Education, Intellectual Property Rights, Science and Technology, Agriculture, Open Education Resources. For the topics like Innovation, Health Information Network, Traditional Health Systems, and Entrepreneurship Survey method was used.

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Figure 1.3: Steps involved in NKC procedures

1.3.7 NKC recommendations

The Knowledge pentagon: The NKC deliberations was focused on five important aspects of the knowledge paradigm which together known as the knowledge pentagon. (Figure 1.3 below) These were –

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1) Access to knowledge

2) Knowledge Concepts

3) Knowledge Creation

4) Knowledge Application, and

5) Development of better knowledge services.

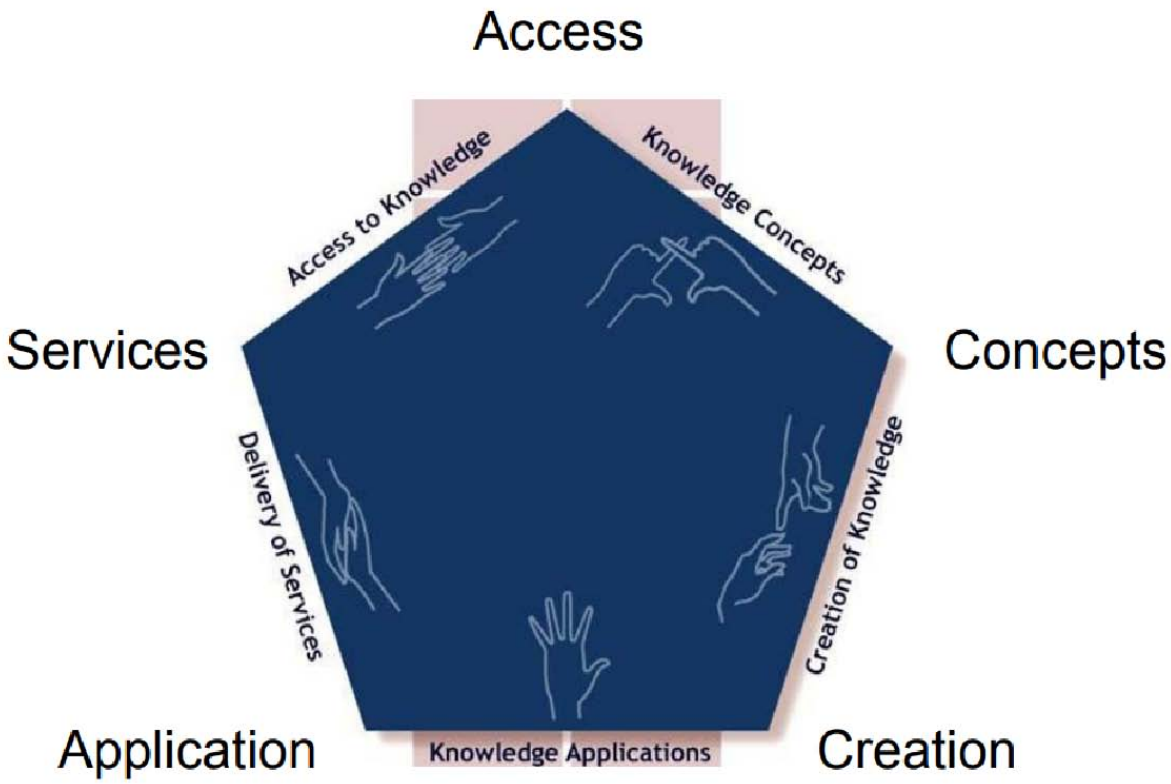

Figure 1.3: The Knowledge pentagon (Source: Knowledge-Commission-Report-20071.pdf)

1) **Access to knowledge:** The most basic strategy for expanding people's opportunities and effectiveness is to increase access to knowledge. Resulting, there must be ways for those who have the capacity to receive and understand knowledge to easily obtain it. This also entails providing the general public with accurate information about the state and its operations. The National Knowledge Commission looked into the following topics in this context: Right to education, Language, Translation, Libraries, Networks, and Portals.

2) **Knowledge Concepts:** The knowledge concepts broadly focus on the Education System. For better decision making in any aspect of life, education plays a vital role for which organized education system is required. Through this education system

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only knowledge concepts are organized, distributed and transmitted. Education system is also essential in a way to bring gradual socio-economic change and development. The National Knowledge Commission in this regard identified many areas to strengthen these education systems and thus smoothening of dissemination of knowledge concepts. These areas were School Education, Vocational Education, Higher Education, Medical Education, Legal Education, Management Education, Engineering Education, Open and Distance Education, Open Educational Resources, Interest making towards Maths and Science, Producing more qualitative doctoral degrees.

3) **Creation of Knowledge:** The commission narrated that any country can can develop by using only two ways. First either it uses its existing resources efficiently or it creates new resources with its own capabilities. Now both this ways involves creation of knowledge. Thus, it became essential to pay attention on all the activities involving either producing new knowledge or activities involving protection of already existing knowledge. Therefore, the commission felt that India should take in to consideration the following areas from where creation of knowledge can be achieved. These were: Science and Technology, Legal Framework for Public Funded Research, Intellectual Property Rights (IPRs), Innovation, and Entrepreneurship. All these domains involved directly or indirectly in knowledge creation.

4) **Knowledge Application:** Technological change and the reliable and regular flow of information can both be facilitated by knowledge when applied productively. This requires targeted approach for investment in R&D. Thus, Knowledge application have become important in areas such as: Agriculture, Traditional Knowledge and betterment of Quality of Life (QoL) parameters.

5) **Delivery of Services:** Delivery of services mainly talks about the better governance using technological interventions. Traditionally the Government to Citizen (G to C) communication was manual and time consuming resulting poor information flow and unawareness of the government schemes were common. Now, due to advent of Information and Communication Technology means the delivery of public services have become easier and citizen centric. The Commission felt the need to implement knowledge application via technology means for efficient and smooth delivery of public services within the country.

The NKC Recommendations were submitted in four parts. In first part the recommendations were submitted in the year 2006 comprising nine area such as :

1. Libraries (As Gateway of Knowledge)
2. Translation
3. English Language Teaching
4. National Knowledge Network

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5. Right to Education
6. Vocational Education & Training
7. Higher Education
8. National Science and Social Science Foundation
9. E-governance

while second part of the recommendations were submitted in the next year 2007 with eleven subject areas comprising mainly,

1. Health Information Network
2. Portals
3. Open Educational Courseware
4. Legal Education
5. Medical Education
6. Management Education
7. Open and Distance Education
8. Intellectual Property Rights
9. Innovation
10. Traditional Health Systems
11. Legal Framework for Public Funded Research

The third part of recommendations were submitted in the year 2008 with five subjects as the discussion source were,

1. School Education
2. Engineering Education
3. More talented students in Maths and Science
4. More Qualitative Ph.Ds.
5. Entrepreneurship

The fourth part of the recommendations were submitted in the year 2009 with two subjects' issues were discussed. They were

1. Knowledge application in Agriculture, and
2. Enhancing Quality of Life

1.3.8 National Knowledge Commission recommendations on Libraries

Describing the importance of Library and Information Science services in the country NKC stated as ;

Although crucial, formal and informal education systems are not the only essential elements of a knowledge society, its horizon is far reaching and extends beyond fostering excellence in our educational system and encompasses a number of vital areas that support a knowledge-based society and economy.

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Domains such as Library and Information Services that enable access to knowledge are essential for this. To enable this NKC has suggested reforms for revitalizing the entire library and information services (LIS) sector in the country. India has a vast network of libraries in the public and private domains. However, they often lie in various stages of disuse. Libraries can be revitalized, not merely as repositories of texts, but as dynamic centres for the sharing and dissemination of knowledge.

NKC recommendations highlighted many limitations in existing Library ecosystem in the country. Some of them as the lack of a comprehensive census of libraries in the country. The commission felt that automation and other modern tools must be implemented for public library management so that larger participation from the communities can be ensured. Focus was also given on creating models for public private partnerships in LIS development. Implementation of Information and Communication Technologies in house-keeping activities as well as technical processing activities of the libraries such as cataloguing, document digitization, repository creation and creation of e-journals portals *etc.* was also discussed.

In order to make the LIS sector sustainable, the NKC recommended the constitution of an independent and autonomous National Commission on Libraries which would be responsible for undertaking a host of measures and streamlining all initiatives for the development of the Library and Information Sector.

Some of the **key recommendations** made for revitalizing and resurgence of Library and Information Science Sectors. They were:

1. **Setting up a National Commission on Libraries:** The Commission recommended that, to satisfy the informational and educational needs of Indian citizens, the Central Government should establish a statutory body known as the National Commission on Libraries which will be permanent, independent, and financially autonomous body. The commission also recommended to set up National Mission on Libraries for a time duration of three years in order to pace up the procedures.

2. **Prepare a National Census of all Libraries:** In its recommendations the commission stated as a nationwide survey should be conducted in order to create a national census of all libraries. Census information on libraries would give a foundation for planning. Commission further recommended that for this purpose, a Task Force should be established by the Department of Culture which receive financial and administrative support for timely completion of this task (within one year). The Nationwide Sample Survey should include regular national surveys of user demands and reading habits. The staff should be properly trained and collections must be organised to make libraries relevant to fulfil the information needs of the reading communities.

3. **Revamp Library Information Science (LIS) Education, Training and Research Facilities:** NKC recommended that commission must assess the requirements for having trained LIS teachers, researchers and manpower foe effective management of libraries. Assessment of current research scenario in the field of LIS should also be

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analysed and for better training a national level institute equipped with all technologies and sate of the art facilities must be established.

4. **Re-assess staffing of libraries:** The Commission paid attention towards assessment of staff qualifications, designations, pay scale, promotion criteria and eligibility related issues in order to meet the changing challenges from ICT driven learning resources.

5. **Set up a Central Library Fund:** The commission clearly stated to grant a specified percentage of education budget of central and state to be fixed for libraries. Also, central libraries have to upgrade themselves from their allocated central library fund within 3-5 years of period. The commission took a keen interest in private philanthropy and suggested that it should be added with initial grant of central government of Rs. 1000 crore for libraries.

6. **Modernize library management:** In order to become up breast with the modern library management software solutions, the NKC recommended to implement modern library solutions not only to upgrade a library but also to create a synergy and collaboration among different library systems through amalgamation of their collections, resources and expertise. The commission also recommend to form a national charter for libraries and to form a national repository of bibliographic records through networking of various library systems.

7. **Encourage greater community participation in library management:** The management decision-making process in India must involve a variety of stakeholders and collections that need to be identified, documented, and kept for future use. For libraries, however, Local self-government must manage public libraries through committees made up of library customers. These committees should guarantee local community involvement and be independent enough to make choices on their own to carry out community-based programmes that are both cultural and educational. To create a community-based information system, libraries should collaborate with any nearby knowledge-based initiatives. Village libraries or Community Knowledge Centres must be the responsibility of the Panchayats in the rural sector. This ought to be put in place near or on the grounds of schools. Here, the NKC paid attention to involve local users and made them to involves others by the support of local administration and LIS professionals.

8. **Promote Information and Communication Technology (ICT) applications in all libraries:** The commission recommended that all libraries' catalogues should be visible on regional, national, and local websites with the suitable links. This will allow for the networking of various libraries, the creation of a National Repository of Bibliographic Records, and a centrally located, collaborative, online system for addressing inquiries using the most recent ICT tools and techniques.

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9. **Facilitate donation and maintenance of private collections:** In this recommendation the commission felt that there is a pivotal requirement of involving different community stakeholders, philanthropists and doners. There are many financial capable private institutions and individuals who can contribute to this noble cause. This asks a serious effort to be made to involve a variety of stakeholders and collections that need to be identified, documented, and kept for future use. The commission felt to establish 10 regional canters across the country with defined mandates for setting up private collections under headship of any eminent scholar of the community.

10. **Encourage Public Private Partnerships in LIS development:** By providing fiscal incentives and other financial support many philanthropists, industry sectors and private firms can be motivated to support libraries by upgrading existing libraries and forming new libraries. The commission recommended a public private partnership model for sustainable development of libraries across the nation.

Information Policy is a complex subject covering wide range of concepts and understanding from multiple domains. In Indian context, there is nothing called a National Information Policy but many corelated and surrogative policies like National Policy on Information Technolgy (NPIT, 2012), National Policy on Library and Information Science, 1985 *etc.* were formed which provide some important insights to have a coherent, structured and formalized national information policy.

These policies collectively are very difficult to define but on defining saparatly they come to form a common agenda *i.e.* Laws and procedures governing the production, use, preservation, and dissemination of data and information must be included in any definition of information policy.

Information policies differ greatly, are rarely explicitly expressed, and varies significantly by location in a digital world where data and information can be shared globally. There is also no common expectation or legal protection. The ensuing discrepancy has an impact on information access, literacy, digital rights, and data privacy. Information specialists are frequently in a position to create and administer information policies.

1.4.1 Definitions of Information Policy

Borek et al. (2013) defined Information Policy as

'A broad declaration that explains why information management is essential to the organization's mission and how it fits within a more comprehensive organisational expression of (organisational) goals. The operationalization of the policy is described in the implementation strategy.'

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UNISIST 11- Main Working Document defined National Information Policy as: "A National Information Policy is a set of decisions taken by a government, through appropriate laws and regulations, to orient the harmonious development of information transfer activities in order to satisfy the information needs of the country. A National Information Policy needs provision of necessary means or instruments such as financial, personnel, institutional, for concrete implementation."

The concept of a National Information Policy as defined by UNESCO is "A hierarchy of Levels of Steps viz. Goals, Strategy and Programme is seen as a series of compatible steps for devising a framework for formulating a National Information Policy for Information."

Information Policy has been a field of study which can be viewed from the different perspectives and disciplinary angle. Different disciplines defined it differently. Information Policy, according to library and information professionals, deals with issues relating to the contents of documents that contain all types of information, including text, images, sound, microforms, electronic, and digital information, as well as institutional and organisational mechanisms to gather, store, distribute, and offer products and services in accordance with user needs.

The perception of information policy, according to the research and academic communities, relates to the data and information produced, disseminated, and communicated by them in various contexts and forms, as well as the information support resources, they seek out to carry out their respective research and development activities.

In this context, School of Library and Information Science, University of North Carolina, defines Information Policy as: The set of rules, formal and informal, that directly restrict, encourage, or otherwise shape flows of information. Information policy includes:

- literacy
- privatization and distribution of government information
- freedom of information access
- protection of personal privacy
- intellectual property rights

From the perspective of Information Technology and Computer Science discipline, Information Policy is something which is related to policies adhering software and hardware dependencies as well as terms of use, preservation, sharing and security aspect of these dependencies. From the journalism and mass communication point of view it is more or less laws, formal statements and planned document for knowing, collecting and analysing news, updates and public views for dissemination of information.

1.4.2 Concept of Policy

Policy on the other hand is merely treated as ‘statements of guidelines for a specific plan of action’. Policy provides any statement or guideline a legal basis through which various terms and conditions of any organizations can be drawn. A practical policy must be flexible in nature in order to modify it as and when required based on social, political, economic and organizational observations.

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1.4.3 Need to have a National Information Policy

As Information is treated as an economic resource, its timely availability and access not only for now but for the coming generations becomes pivotal. Thus, preserving these data and information assets demands for a well-defined national policy. The value of knowledge and information, which are the fundamental building blocks for converting raw materials into added-value tangible goods, is examined to assess the necessity for and purpose of a national information policy.

Users and their information needs, information resources, information technology, human resources, finances, international exchange, cooperation, and coordination, among other topics, are pertinent to developing a national information policy. The development of a National Information Policy is explored by various professional organisations in India to get the government's attention.

We need to have National Information Policy because:

- It will pave the way of socio-economic development of a nation by providing easy access to information and knowledge through organized ecosystem of information and knowledge centres
- It safeguards nation's intellectual and other resources
- It provides a legal basis to any guidelines related to information creation, collection, processing, dissemination, sharing, use and preservation and privacy
- It enables any organization to concretely implement its guidelines related to information sharing
- It enables two or more than two organizations to collaborate in a more secure and trusty way
- It reflects nation's future projections in terms of global sustainable technology transfer
- It will define a periphery of security breaching to that will identify potential cyber security issues and other technologically enabled internal security
- In a way it will also protect individual's constitutional rights
- It will further lead identify major research fronts in information domain
- It will help in enhancing Quality of Life of individuals in a country

1.4.4 National Policy on Library and Information System (October, 1985)

Prof. D.P. Chattopadhyay, Chairman, Committee on National Policy on Library & Information System provided some key insights from his recommendations which established a nationwide consciousness for constitution of libraries and information centres, however, these recommendations were only limited to the domain of library and information science but it has started a line of thought for the coming years to form an organized national information policy. Some of the key recommendations came out from this Policy which are:

- Constitution of National Commission on Libraries
- Creation of All India Library Services
- Active role of Central Government in Public Library Development in State

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- Public Library Development has also to be supported by agencies involved in education, social and rural development
- National Library of India, Calcutta should be strengthened
- Development of system of national libraries

Role of Libraries and Information Centres amid Information Policy

- Creation of a new understanding of libraries as important actors in the knowledge and information policy.
- Fulfilling the library mission through the guidance of information policy, specially the "Electronic information policy for library users".
- Development of analytical tools to assess the efficiency and impacts of library activities.
- Establishment of communication mechanism among libraries and their stakeholders, partners and communities.

Various Acts related to Information Policy having multidisciplinary approach

- National Book Policy 1986,
- Scientific Policy Resolution 1958,
- Technology Policy 1983,
- National Knowledge Commission, 2005
- National Digital Communication Policy, 2018

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In this chapter, the formation, function and activities of National Knowledge commission has been discussed. We witnessed the efforts made by the NKC towards upgradation of libraries across the country and how its recommendations paving the way for quality implementation of knowledge systems and ICTs in the domain of Library and Information Science discipline. So far, in many institutions most of the recommendations as

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outlined by working group and NKC have already been implemented but due to various reasons it is still need to implemented by majority of the institutions of higher learning. We have also discussed the role of NKC in recommending quality professional training and establishing a premiere institute of higher learning in library and information science fully equipped with state of the art technologies. We have further discussed the concept of Information Policy and its definitions from different disciplinary point of view. We have outlined what are the plausible benefits of haing a defined national information policy. We have also seen some of the existing policies in accordance to the national information policy.

Commission: A group of people entrusted by a government or other official body with authority to do something.

Gateway: A kind of opening or entrance, through something can pass

Library Management: Management of all routine and technical activities of a library by the means of automation and ICT employment.

Pentagon: A figure or shape with five sides.

Policy: A legalised statement of guidelines in a more concrete form.

Recommendation: a suggestion or proposal as to the best course of action, especially one put forward by an authoritative body.

1. Sam Pitroda 2. False 3. 27 focuces 4. 2005 5. True 6. Dr. D. P. Chattopadhyay 7. Public Library	8. Privatization and Distribution.

1. Explain the concept of NKC. Discuss factors that triggered the formation of NKC.
2. Discuss key recommendations of NKC on Libraries.
3. Why do we need to have national information policy? Explain.

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UNIT IV

Information Intermediaries

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1.1 Learning Objectives
1.2 Introduction
1.3 Information Intermediaries: Concepts and Definitions
1.3.1 Information Intermediaries as provider of Value Added Information
1.3.2 Characteristics of Information Intermediaries
1.3.3 Functions of Information Intermediaries
1.4 Types of Information Intermediaries
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

After reading thic chapter, learners will be able to :

- Understand the concept of Information Intermediaries
- know what roles do these information intermediaries play in information ecosystem
- know the different types and functions of Information Intermediaries
- Know the relevance of information intermediaries in complex information environment

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We all are aware that we are living in the Information age, just as there have been ages of stone where hundting and gathering were primarily means of living, and then advent of Agricultural age paved the way of growng crops & grians for survival, and then industrial age in the preceeding centuries and millennia being the major driving force of economic prosperity and livelihood. Information shape our lives and our surroundings in many ways.

In the domain of Library and Information Science, the research on information seeking behaviors tells about how different individuals seek, approach and access information. It also reflects that due to abundance of information on a topic in different formats, different file sizes, different medias, it becomes very difficult for an end user to decide what and how he/she can access those information. Say for example, if we want to know how India performed in the atheletics in last Olympic macthes, we must have clear idea where we can find them from. Now we have multiple options ahead of us, we can simply Google it, or search in archives of old newspapers or we will visit the official website of sports ministry of India or consult any sport magazine or any other source. The question is here will be timely, quick and authentication of the information and reliablility on true facts. These problems are common and is occurring to the information overloading caused by development of Information and Communication Technologies (ICT) in recent past. To overcome the problem of information overloading and to provide best searched, filtered, relevant and usable information to the use communities, a human mediated system is required, which is known as Information Intermediaries. As it is evident from the name, Intermediaries is something that lies in the 'middle of something' and can act as a 'bridge' or a 'link' between two destinations. Likewise, Information Intermediaries acts as a linkage between information (filtered, relevant, processed and repackeged) and those who seeks for that relevant information. Just like the middlewares acts as a link between the fruit producer of a farm and taking it to the market for buyers to buy, information intermediaries acts a middle partners for providing best possible information support to the ones who need it most.

Although during beginning of post-industrial societies and in early information age these activites were performed earlier by reference librarians, and other information professionals, now it has been carried out by newly emerged groups popularly called as information gatekeepers, information brokers, consultants, information advisors, provate vendors, information suppliers *etc.* This chapter is devoted to know about these information intermediaries and understand their roles, types and functions and relevance in todays rapidly changing complex information ecosystem.

As we have discussed in the introduction part that information intermediaries are some kind of linkage between relevant information and the users. Intermediary always offers something

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more as a third party which would otherwise not be possible when two parties will directly deal with each other. This 'something more' is generally called as 'vaule addition' to existing information or repackaging of information. To get a broad picture lets accumulate some of the widely used definitons and try to understand it from root.

- From Economics point of view it is:

"institutions that mediate between buyers and sellers."

However many economists argued that the aspect of intermediation is not limited to the activity of buying and selling in the same market- intermediaries provide matching services and, in addition, a multitude of value-adding services closely conncected to their findamental activities.

Thus, Intermediaries in this sense, perform functions that can overcome market insecurities and increase market efficiency.

- Information Intermediaries as Profit-Making Agencies:

Rose (1999) in this context defined it as profit-making information intermediaries. According to Rose,

"An information intermediary is an independent, profit maximizing economic information processing system performing its activities (information acquisition, processing, and dissemination) on behalf of other agents' information needs."

Thus, we can say that an information intermediary can be defined as any system that mediates between the producers and consumers of information.

- According to Oxford Reference.com:

"Individuals and groups who obtain, analyse, and interpret information, communicating their findings to others. An example is the analyst who uses the financial statements and other information relating to a company to advise clients whether to buy, hold, or sell the company's shares."

Therefore, the intermediary will select and organize information according to the needs of the users (i.e., client group), and distribute information and set access fees in a manner that is determined by the client group, subject to the intermediary's organizational form. Sometimes it is non-chargeable also. (For Example, Public Libraries).

Information Intermediaries can be found in any form such as: Libraries, Museums, Internet and Web, Professional Societies, Corporations, Archives, Government Agencies, Computer Networks, Publishers, Individuals, Organizations, and Advertising Companies, Experts Systems and Decision Support Systems, Journals Finders Portals etc.

While on the other hands, users, customers, buyers or audience could consist of anyone with an interest in information searching with a defined or undefined information need, including

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all primary school kids, faculty and students at a university, employees of a company, local residents, or any other specific group.

1.3.1 Information Intermediaries as provider of Value Added Information

An information intermediaries can affect the value of information in any of the aspects such as: storage, processing, distribution, and presentation aspects through collecting, archiving, organizing, and otherwise enhancing the ease of use of the information (Moshowitz, 1992).

According to Dertouzos (1997), highly personalised information is likely to be of limited use to anybody besides its intended recipient. On the other hand, knowledge becomes more valuable to a broad audience as it becomes more abstract and codified. While this raises the information's overall value to society, it also makes copying and appropriation easier, making it more challenging for the information's creator to obtain financial rewards (Boisot,1998). Because of these factors, it is commonly acknowledged that knowledge that is valuable and applicable to all people has a higher social return than it does a private return.

Due to these factors, information whose production results in a social return greater than its private return has certain qualities of a public good and should be supported by the government (Spar, 1999; Stiglitz, 1999).

An interesting finding by Baumol and Ordover from 1976 is that a public good can be any benefit whose costs are largely fixed. They see the financing of commodities whose production entails scale economies as having a particular exception for information transfer. We will apply these justifications to the situation of information intermediaries.

A number of studies and reviews have been written about the economics of libraries and whether the information services they provide can be considered public goods as a result of the "fee-or-free" controversy, which in the library community is the debate over charging to cover the costs of library services.

McCain (1988) argues that public libraries, even if they are not pure public goods, may be justified due to the high transaction costs of registering and invoicing every possible user of the service. McCain emphasises the significance of transactions costs and property rights in information. In this way, libraries act like a club that elects not to charge a membership fee to restrict access to its services.

It is relatively affordable to redistribute information once it has been collected and organised by the information intermediaries. The cost of physically distributing information is very low and tends to go down as more electronic networks and new communication technologies become accessible.

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1.3.2 Characteristics of Information Intermediaries

Looking at the nature of work they perform, information intermediaries can have following characteristics:

- They collect the information and disseminate it to its defined audience
- As, users can always opt for primary producers such as publishers, direct search from websites, farmers, *etc*. therefore, intermediary must provide some added value (value addition can be in the form of higher quality information, more complete information, more easily accessible information, better-organized information, cheaper information, or a number of other factors) in order for the client to choose the intermediary's services.
  to Prepare information by evaluations, collaborative filtering, and consultations from experts
- By making agreements, they try to satisfy the requirements of both the producers and clients
- They market the key features of information product or service so that users can use it
- They possess necessary negotiating skills
- If intermediaries are individuals, they usually informed about both nature of information and end users seeking behaviors
- They usually represent information services or products in a more structured and coherent manner so that end users can easily navigate through information portals.

1.3.3 Functions of Information Intermediaries

Some of the key functions along with the basic function of an information intermediary has been depicting below in point and in figure 1.1. The key activities performed by an information intermediary are:

- *Acquisition of information*
- *Processing of information, and*
- *Dissemination of information*

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- **Information searching and collecting:** One of the key functions of information intermediaries is searching and collecting relevant information from both print and digital sources for effective information organization and dissemination.

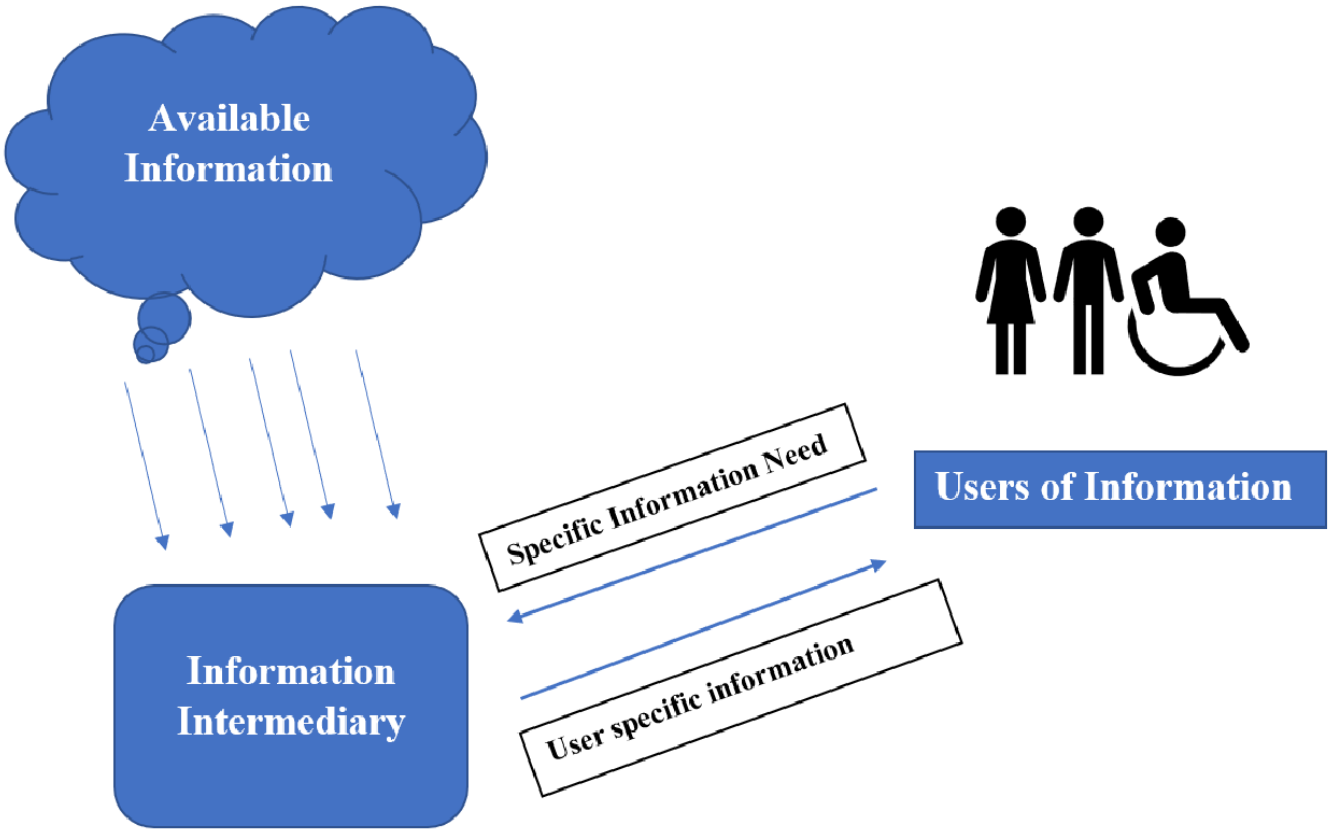

Figure 1.1: Basic function of information intermediary

- **Assessing economics of collected information:** An important function of intermediary is to exploit economies of scale in information gathering and organization.

- **Identifying customer's information needs:** In order to supply relevant information to end users, it is essential to apply Information Need Anlaysis (INA) methodologies to identify users information needs.

- **Evaluating searched information and applying cognition to make it presentable:** Collecting merely raw information will not serve the purpose for better value addition in processed information. Critical evaluation is a must before sharing to end users. Intermediaries who performed these activies are known as Knowlegde Engineers, Knowledge Managers *etc.*

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- **Performing Information Analysis:** Intermediaries by apply various research methodologies such as content analysis, case studies, focus group study, interviewing and reviewing previous studies, information consolidation perform analysis of information and prepare abstracts of information to be supplied.

- **Preparing varieties of state-of-the-art reports and other publications:** Based on the market requirement intermediaries prepare varieties of reports and documents for ready reference of the users.

- **Producing new information and not knowledge:** What should be stressed here, the functions of information intermediaries do not produce new knowledge but he intermediary's processing of information can bring out new information.

- **Reducing end-user's search cost:** Information intermediaries reduces end-user's searching costs by minimizing cost of communication, cost of contact, evaluation costs, and most importantly cost of time.

- **Serving as an economic agent:** Information intermediaries are economic agents supporting the production, exchange and utilization of information in order to increase the value of the information for its end-user or to reduce the cost of information acquisition.

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There are mainly three broad categories of information intermedearies;

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1. **Profit-making information intermediaries:** The first type of intermediaries are generally broker type who always intended to make profit.

1.1 The broker: They visits to small businesses and residences to get orders from clients for information in order to give communication and information services to the residents of his or her town. The broker then goes back to a nearby telecenter to complete the information requests. Following completion of the customer's order, the broker sends the necessary details or communication straight to the client's residence or place of business in return tey charge money in the form of commission or fees and make profits. Such intermediaries are called profit making information intermediaries.

Customers, businesses organisations, *etc.* who don't have access to their own library to rely on for information when needed, are typically the customers of information brokers. Since the brokers serve as an effective conduit between the information producers and the consumers, they approach these brokers invariably for any information that might be helpful to the users. As a result, they serve as information clearinghouses, gathering information from many sources and providing it to consumers in need.

1.2 Information Consultants: An information consultant could be a team of people or a company that also employs one or more information brokers or experts in subjects relating to information. Information consultants, in Katz's words, "not only validate but also analyse the information." As information consultants, the professionals do a variety of tasks, but their primary role is that of a consultant. In that position, they provide the clients with advice regarding the best course of action based on the best information sources.

The general trend is that more independent information consultants with backgrounds in various related fields than librarianship are becoming available. Librarians are "native" to the wide and diverse population of professionals who are scarcely categorised as information professionals since they belong to a variety of occupational groupings and organisations. The possible fields shared by the information professions for their activity are numerous.

Prospective clients often do not know that there are experts who may offer services for their specific problem. This underlines the importance of visibility and marketing activities on the part of information consultants.

1.3 Online Vendors: Online vendors are basically provate players who do not work in anticipation rather after respond after receiving order from organizations. Such online vendors generally create their own website to showcase their products and services. They generally came under subscription basis or perpetual accessibility of their products or any software services.

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Examples of Online Vendors: J-Gate, Indianjournals.com, OCLC, NIPA *etc*.

2. **Non-profit making information intermediaries:** The second type of intermediaries manly functions for the users community of their prent body or institution. Some of the most known non-profit information intermediaries are as follows:

2.1 Technological Gatekeepers: According to APA dictionary of Psychology,

"an organizational or group role that involves channeling information about technological innovations into the organization from the outside. People occupying this role communicate with professionals inside and outside the organization, serving as the conduit for acquiring, translating, and disseminating new technical information."

The idea of the "technology gatekeeper" has been created in studies as a person who plays a crucial role in the spread of scientific and technical knowledge from the environment into the R&D organisation. In businesses that operate in quickly evolving technological settings, gatekeepers have been observed.

They carry out the work of :

a. **acquisition information** from other sources. They search the outside world for new scientific and technological advancements that are pertinent to the work of their organization's researchers.
b.**Translation:** Information from the outside is translated by technological gatekeepers. It entails providing outside information in a way that ensures the organization's or R&D group's researchers will utilise it. To put it another way, they translate technical knowledge into a language that researchers are familiar with in order to make it intelligible and pertinent to their research efforts.
c**. Dissemination:** Internal information dissemination is handled by gatekeepers.

Technological Gatekeepers' function as a contemporary information middleman has always expanded to support scientific and technological research. In the modern era of the Internet, it has developed further. According to Whelan et al., in light of current developments in Internet technology, the idea and function of technological gatekeepers need to be reexamined.
The current increase of information, which has taken many different forms due to, among other things, diversification, has made technical and innovation management very popular.

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2.2 Invisible College: This is another type of information middleman that does not charge a fee for its services and from which information is gathered by researchers and scientists working in various sectors.

It has been said that the "Invisible College" was a forerunner organisation to the Royal Society of London, made up of a number of natural philosophers who would exchange ideas among themselves, therefore according to Kronick, the notion is not particularly new. He claims that the idea was also employed in letters written in seventeenth-century Europe.

According to rumors, Diana Crane first introduced the idea of a "invisible college" in the sociology of science in 1972, drawing inspiration from Derek J. de Solla Price's research on citation networks.

Therefore, such types of formal and informal social groups where participants exchange ideas, knowledge, and information are known as invisible colleges. In order to share helpful knowledge on the topics that concern them with others, they take on the role of helpful information mediators.

3. **Government information intermediaries:** These intermediaries work on government-funded or supported grants.

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Thus, in this write up we have discussed various dimensions associated with the concept of information intermediaries where we have discussed concept, definition, characteristics, functionalities and types of information intermediaries. Profit and non-profit intermediaries were two primarily intermediaries. These intermediaries major functions is to assess user's information need and provide processed information with value addition. Further readings can be performed from the reading list in order to explore more about information intermediaries.

Acquisition: Collection or procurement of resources through purchase or other means

Consultation: A group or individual to whom managers consult for taking information and for better decision makings

Evaluation: critically testing anything based on standard parameters

Information Dissemination: sharing or sending any set of information**.**

Intermediaries: a linkage between client and server, a bridge or a negotiator.

Vendors: Private middlewares that supply producers products to end-users

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1. Consumer 2. True 3. public goods 4. Value addition 5. consumer or end-user 6. True 7. Acquisition, Translation, Dissemination of Information 8. A journal official web page	9. Information Consultants 10. Diana Crane

1. Explain the concept of information Intermediaries. Discuss various functions of intermediaries in detail.
2. What are non-profit information intermediaries? Discuss their relevance in providing value-added information support to the target users.

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LESSON 1

PROFESSIONAL SKILLS AND COMPETENCIES

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Definitions
1.4 Characteristics of a Profession
1.5 Difference between Profession, Occupation and Vocation
1.6 Library Information Science Profession
    1.6.1 What is Library Science or librarianship as a profession?
    1.6.2 Changing role of LIS professionals
1.7 Skills and Competencies required for LIS Professionals
    1.7.1 Skills
    1.7.2 Competencies
1.8 Professional competency
    1.8.1 Library Information Centres (LIC)
    1.8.2 Information Resources
    1.8.3 Information Services
    1.8.4 Application of ICT
    1.8.5 Resources sharing, collaborating and networking
    1.8.6 Management Skills
    1.8.7 Research Skills
1.9 Personal Competency
    1.9.1 Communication Skills
    1.9.2 Generic Skills
1.10 LIS Profession in India And Dr. Ranganathan's Contribution to it
1.11 Suggestion and Recommendations
1.12 Conclusion
1.13 Summary
1.14 Glossary & Abbreviations

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1.15 Answers to In-text Questions
1.16 Self-Assessment Questions
1.17 References and Suggested Readings
1.18 Suggested Readings

1.1 LEARNING OBJECTIVES

There are many types of professions. The two most important are for profit and not for profit professions. The Library and Information Science (LIS) is a service and not for profit profession. This BLIS Programme is for the students who want to work for this profession and serve the society. For serving any profession and especially a service or noble profession a person need to be aware of the professional characteristics, functions, duties as well as obligations of the same. It supports and helps the young, new professionals in performing effectively.

This Unit explains the profession, its characteristics, the difference between concepts of 'occupation', 'vocation' and 'profession'. The Unit also briefly explains the Library Information Science as a profession as well as librarianship as a profession, changing roles of librarians, the skills and competencies required, personal, professional competencies and the profession scenario in India.

1.2 INTRODUCTION

All the professions have technical skills and specialised knowledge. Library Information Science is also a profession. They work in the service environment as they fulfil the information needs of the public by providing the relevant information or facilitating access to the information. For every profession there are many professional associations. These associations guide the progress of the profession. It is important for working professionals to know the characteristics of this profession, duties and functions. It is important for the professionals of any field to know about its concepts, characteristics. One must be aware why the library information science field is also a profession. As members of other professions possess specialised knowledge and skills which they apply for the benefit of the society. In the same way the LIS professionals also have specialised skills to serve the information needs of the public. LIS professional associations exist to guide the progress of the profession in the right direction. There are other agencies also involved in its growth and development.

As already stated a profession is a set of activities for which a person gets paid. It is a specialised vocation needing specialised training to be applied for the benefit of the society and to serve it. Classically or traditionally there used to be three professions 'Divinity', 'Law' and 'Medicine'. The word profession used to mean acknowledgement or a pledge

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taken by a monk (Divinity), the oath taken by a physician (Medicine) and Barrister (Law). (Butler, 1951). Other than these classic professions, with time new professions were recognised like Engineering, Architecture, Teaching, Dentistry, Librarianship etc. Many new disciplines including librarianship were recognised as a profession.

The traditional libraries have changed beyond recognition due to revolutionary changes in information communication technology (ICT). The methods of communication have changed; the print libraries have expanded in virtual spaces. The explosive growth of smart devices (like tablets, mobile phones etc), their easy access, and proliferation of social media, varied mobile applications have collectively altered the traditional academic library beyond recognition. The ICT has significantly made an impact on the skill and knowledge and requirements for library and information science (LIS) professionals. The practising library information science professionals need to have to update their professional skills and competencies in the present digital environment. All professions need sanctions from the society or communities. Which help them in their recognition and also accord some privileges and powers. This is done when the people working in that particular field have specialised knowledge and expertise and make it beneficial for the society.

1.3 DEFINITIONS

There are various definitions of professions. A competency is more than just skills and knowledge. It entails the capacity to utilise psychological resources (including skills and attitudes) in a specific setting to meet complicated demands. Some of them are as follows:

The New College Encyclopaedia defines a profession as “a vocation based on long, specialised educational training that enables a particular service to be rendered, representing a high degree of thought, and is distinguished from vocations calling for technical skill alone”.

Dictionary of the Social Sciences states that “The term profession denotes occupations which demand a highly specialised knowledge and skill acquired at least in part by courses of a more or less theoretical nature and not by practice alone, tested by some form of examination either at a university or some other authorised institution, and conveying to the persons who possess them considerable authority in relation to ‘clients’. The definition again differentiates a profession from an occupation by mentioning that a professional possesses theoretical knowledge acquired during a specialised programme conducted at a higher level. Sound theoretical knowledge forms the basis of the practice. It helps the individual to practice with confidence, update and evolve with changing time.

Merriam-Webster Online Dictionary defines a profession as “a calling requiring specialised knowledge and often long and intensive academic preparation”. The definition mentions that appropriate education needs to be imparted for preparing professionals. It further stresses that the education should be in-depth and comprehensive. A thorough

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preparation of the professional would enable her/ him to serve the society. To sum up a profession may be defined as:-

- A specialised body of scholarly and scientific theoretical knowledge;
- Skills need to be acquired through Intensive training to put the knowledge to work;
- A social code or ethics or a set of principles as the motto is to serve the society;
- An association to bind all the members together for collective thinking, consented opinion, and achieve high standards.

Professionalism differs from amateur as it involves a professional character, spirit or methods and standard practices. The professionals need to have full expertise and commitment for who receive services from them. Professionalism is the behaviour of an individual and it commands respect. It is about excellence, delivering services or working to standards that meet the needs and expectations of their clients. So it requires a focused approach towards a particular goal. A professional needs to be competent, confident, motivated, accountable, responsible and committed to the profession.

Knowledge and skills of LIS as a profession has been categorised into three categories by (Orme, 2008, p. 627–628).

- Discipline-specific knowledge (specifically to the LIS profession);
- Generic skills applicable to all disciplines (e.g. Computer skills, information literacy) and;
- Personal competencies (values, attitudes, and personal traits). Effective communication, interpersonal skills, critical thinking, problem solving and teamwork are some of the Generic skills. These allow individuals to function not only in disciplinary or subject domains but also in employment and social situations.

1.4 CHARACTERISTICS OF A PROFESSION

On closer observation the following elements have been identified by researchers as the characteristics of a profession. (Martin et al, 2000) described that a profession must have the following attributes:

- Specialised complex knowledge;
- Vital knowledge to the society or client based on practice;
- Respect of the practitioner for her/his competence by the Society;
- Organised profession must have professional associations and have the right to test the knowledge and its application;
- Enforceable formal code of ethics;

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- Formal education or training in the specialised body of knowledge identified with the profession;
- The interest of the society, clients and the public must be over and above the interests of the professional;
- The professional must be paid directly for the services;
- Admission to the practice and the right to continue in the profession must be the concern of, and in direct control of the society.

As per (Greenwood, 1981) the following are specific elements to constitute a profession.

- A systematic theory supporting and delineating the skills characterising the profession;
- A level of authority which comes from extensive education in the systematic theory;
- By granting the profession with powers like accreditation, the creation of performance standards, and the formation of regulations for entry into the profession, the community has given this authority its blessing and support;
- Relations of professionals with clients, colleagues and society are regulated by the code of ethics;
- The culture of the professionals is sustained by formal professional associations and it consists of values, symbols and norms at its center;
- A service orientation.

(Bhatttacharya, 1978) defined the term profession with the following attributes:

- It upholds high standards of achievement and conduct through organisation or concerted opinion;
- It frequently requires specialised knowledge and extensive preparation, including learning of skills and methods as well as the scientific, historical, or scholarly principles underpinning such skills and methods;
- A profession is committed to continue study and do work for rendering public service. The following is how a profession shows its self-consciousness:
    - Dissatisfaction with the profession's training and education options;
    - Efforts to standardise practise and introduce theoretical analysis of work;
    - Concern over low standards, shoddy work, and careless client treatment;
    - Attempts to establish coordination and cooperation among practitioners;
    - Protests against the profession's lack of recognition;
    - Belief in the emergence of a novel discipline with broad application.

We can sum up by saying that a profession has a philosophy and a theory that provide it a strong academic foundation. The body of knowledge in the field should be continuously

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expanded by research. The critical mass of specialised knowledge should serve as the foundation for professional activity. Anyone who wants to call themselves a professional must have completed a demanding curriculum at the university level. Society should come first for the professional, and knowledge and abilities should be employed to serve that. It gives professionals in the society status and recognition. Another crucial component of every career is ethics, which professionals must uphold in order to provide unselfish service. A profession should have a group that supports it in growing and maintaining ties to society.

IN-TEXT QUESTIONS

1. The term profession denotes occupations which demand a highly specialised ---------- and ---------.
2. A professional must have completed a demanding ---------- at the university level.
3. ---------- regulates the relations of professionals with clients, colleagues and society.
4. A profession may be defined as specialised body of ---------- and ---------- theoretical knowledge.
5. Traditionally there used to be three professions ----------, ---------- and ----------.

1.5 DIFFERENCE BETWEENPROFESSION, OCCUPATION & VOCATION

The above three are synonyms of each other and have certain different characteristics. Profession is synonymously used for occupation, job, business, or vocation etc. but it has distinct and different attributes. The profession requires theoretical as well as practical skills. While occupation is one's source of livelihood; vocation is an occupation needing practical skills. So occupation is the lowest in the table or pyramid. In fact the Library information science profession earlier was considered as a vocation and still, being believed like that. Therefore, the terminology is further described here to provide clarification and to support the professional standing of the Library Information Science profession. Let's have a look at some phrases that are similarly related yet have different meanings.

As per Merriam - Webster Online Dictionary: - "**occupation** is an activity in which one engages principally for life and needs more education and experience", while **vocation** has been defined as the work in which a person is regularly employed. It involves a routine activity of some kind and needs some certain or no skills. These two are interchangeable.

Profession is generally considered related to the higher educated positions like Engineering, Law and medicine etc. The profession differs from a vocation as it is mainly service based and not job based, the skills are acquired by virtue of intellectual training and

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not on job training. It must have associations at national and state level which a vocation does not have.

1.6 LIBRARY INFORMATIONSCIENCE PROFESSION

We have already described characteristics of a profession. A profession is having a specialised body of knowledge and long and intensive preparation including instructions in skills and method, high standard of achievement, conduct and Committing professionals to continue study with the Prime purpose of serving the society.

In today's society, librarianship is a unique and prestigious job. It performs public service and contributes significantly to the advancement of the country. Since the definition of librarianship has altered to reflect the shifting information needs of society, librarianship is now referred to as the "Library and Information Profession." Scientists have different opinions about librarianship as a profession. Some are in agreement while some of them are not agreeing.

A librarian preserves humanity's cultural and intellectual history and works as a communication facilitator from the moment of information creation to its utilisation. Their assistance is crucial to the cycle of information flow. Many social and information scientists like (Leigh, 1952; Butler, 1951 & Greenwood, 1981) tried to prove that librarianship is a profession as it has many characteristics of a profession. The major characteristics of Library Science Profession are as follows (Debnath, 2015):

- A Profession is known for its specialised knowledge and Technical skills. Without doubt librarianship is also a profession.
- A Profession requires formal structured organisation to bind members, for efficient and smooth functioning of the profession, work towards a common goal, serve as a forum for matters of professional concerns. The Librarianship also requires the same and has varied associations and organisations working for the profession and its development.
- A profession requires formal code of conduct to serve its clients and society. The librarianship also has a standard ethical code of conduct laid down by different library associations.
- A profession aims to render public services; it works not for monetary gain but for the services to the community. The librarianship is also a service profession. But it does not need a licence to practice like medicine or law. They need not register themselves, but need to be trained in professional schools, associated with universities.
- Middle and higher levels of librarianship are taught for two years at the postgraduate level. Its status as a profession is supported by the teaching of many theoretical topics and intense skill development.

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By creating standard nomenclature, theoretical principles, LIS education ranging from certificate to research level, and introducing specialisation and standardised methods, Dr. S.R. Ranganathan made a significant contribution to the growth of the library profession in India. In India, the library profession owes a great deal to his services. To quote Dr. S.R. Ranganathan "Librarianship is a noble profession. A librarian derives joy by seeing the dawn of joy in the face of the readers who were helped in their search for the right information at the right time."

IN-TEXT QUESTIONS

6. ----------, ---------- and ---------- are synonyms of each other and have certain different ----------.
7. The profession requires ---------- as well as ---------- skills.
8. Vocation is an ---------- needing ---------- skills.
9. Assistance of LIS professionals is crucial to the ---------- flow.
10. Librarianship is a ---------- profession.

1.6.1 What is Library Science or librarianship as a profession?

The library serves as a conduit for communication, and the librarian acts as the mediator. The profession of a librarian has evolved into both a science (body of knowledge) and an art (the skills). The LIS industry's credo is "meeting the needs and demands of users." However, the types of sources are shifting from print to digital, and online access services are replacing traditional reference services with internet-based ones. Today, librarianship has an even more important role to play in raising societal awareness and assisting people in adjusting to changes in the information environment.

The invention of writing and other mediums for preserving collected knowledge made it possible to store recorded information for future reference regardless of distance and time. Larger potential in this field was made possible by the development of paper and printing. Many new occupations emerged during the twentieth century, and librarianship is one of them. The library has effectively institutionalised the mechanisms of informal contact through invisible colleges, print, nonprint, and electronic media.

The primary purpose of the Library Information Science profession is to service its clients and in turn the society. In essence it is the science and art of managing libraries. Harrods's Librarians' Glossary (Fifth edition) defines library science as: "A generic term for the study of libraries and information units, the role they play in society, their various component routines and processes, and their history and future development. Library science is used in the United States in preference to the British term librarianship". (Mittal, 2007) described librarianship as a profession encouraging all types of education and reading. It is a noble and service oriented profession.

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According to (Danton, 1934) the study of graphic and printed materials, including their identification, collection, organisation, preservation, and use, is known as librarianship.The librarianship may also be defined as the area of human knowledge that deals with the creation, preservation, and application of recorded human knowledge.

While as per (Sills, 1968) the librarianship as a profession has not been included in the International Encyclopaedia of Social Science. (Lancour, 1962) also does not consider it as a profession as there is no community sanction, services are not indispensable and library staff does not serve the society as needed to get the reputation of the profession. They do not have any real authority with their users.

1.6.2 Changing role of LIS professionals

Traditionally library meant library resources like books, periodicals, other publications and e-resources etc. But in the information age the human sources are also very important, which means library professional staff. Information Technology has drastically changed the working culture and it has had an impact on collection building, processing, consolidation, storage, packaging, retrieval and dissemination etc. it helps in delivery of right information to the right user at the right time. The informational professionals have to adopt this changing information technology environment and they all require the professional competencies to cope up with rapid changes.

Basically the information professionals manage information in a systematic way, analyse it, consolidate and disseminate as per the aims and objectives of their organisation. They need to provide information services using the World Wide Web, Internet, Search engines and other web 2.0 tools etc. Some information services related to information technology are;

- Web based e-resources: e-books, e-journals, online databases, electronic thesis and dissertation, e-courseware, e-newspapers, and institutional repositories etc.
- Internet access: e-Mail, Instant Messaging chats, social networking sites, conferencing etc.
- Digital libraries: also known as electronic libraries or virtual libraries. These facilitate access to web based e-resources. Nowadays information technology is being used in libraries for information management and these have been named as library information centres.
- Some of the IT based information services are Virtual reference service, Ask the librarian, Social networking, online forms, electronic document delivery, electronic cataloguing and access to e-resources etc.

The new information technologies have changed the way library information professionals have to work. Now they not only have to perform traditional roles but also optimise the usage of information technology, which will lead to designing of new information services and provide access to e-resources. The pandemic has also changed the role of library professionals. During this time they helped in maximising the remote access and usage of e-resources. Now the information professionals have to work as content

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managers, knowledge managers, evaluators of e-resources, educators, information experts, consultants etc. Some more challenging roles are information technologist, information retrieval analyst, community informatics and information policy specialist.

IN-TEXT QUESTIONS

11. The library serves as a conduit for ----------, and the librarian acts as the ----------.
12. The primary purpose of the LIS profession is to serve its ---------- and ----------.
13. The librarianship is a ---------- encouraging all types of ---------- and reading.
14. The ICTs have changed the way LIS ---------- have to work.
15. The ---------- has changed the role of library professionals.

1.7 SKILLS AND COMPETENCIES FOR LIS PROFESSIONALS

1.7.1 Skills

A person needs skill in order to plan and carry out an activity that is intended to attain a specific goal or complete a specific task. Skill is an ability or expertise in execution or performing a task successfully (Debnath, 2015). One should be capable of overcoming the difficulties that come in a profession due to social, economic, educational, and technical developments. Consequently, in order to handle the constantly evolving LIS profession, one also needs to be skilled in that profession. The modern fully automated and digital libraries need a LIS professional to have technological skills and these needs to be updated continuously to face the challenges of rapidly advancing information communication technologies. The quality of the services depends on the skills of the library professionals.

Some core skills of this profession may be categorised as:

- Information handling skills
- Training and facilitating skills
- Evaluation skills.

1.7.2 Competencies

Today we are in the 21st century and due to revolutionary changes in Information Communication Technologies (ICT) the role of library and library professionals have changed. The transformation of traditional libraries into a library 2.0 or digital library with the implementation of Information Communication Technology or web 2.0 tools has transformed the role of library professionals also. They now have to play a big role in content

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management in the digital environment. Various web 2.0 tools are being used to facilitate many interactive information services. The interactive technologies like Blogs, Podcasts, Wikis, RSS, and Social networking sites are flourishing tremendously by leaps and bounds. These interactive technologies have changed the face of the libraries and will continue to influence the future library and information services.

'Association of College and Research Libraries' (ACRL) has explored the roles of new web technologies in the transforming library environment. The use of social information tools that users prefer, the development of personalised, participatory library services motivated by user needs, an embrace of radical trust, the shift toward bringing the library to users, and the rapid change mobilised by assessment are some of the guiding principles of "Library 2.0.". This re-envisioning of library services includes use of web 2.0 tools for social outreach, research and teaching learning process.

Now due to rapid advancement of ICTs the various positions in this profession are growing viz. Context developers, web services librarians, metadata librarians and Digital repository services librarians. Libraries are recognizing the need to keep them updated and facilitate remote access to the resources. Now the library professionals are getting many opportunities to work outside libraries. But all of this needs high level teachings in library information science courses. (Debnath, 2015) explained that the library and information professionals need to gain varied competencies to face the changing scenario due to IT. It includes cultural, social, legal, economic, educational, organisational and technological.

Some of them are as follows:

- Provision of information by proactive approach
- To know how knowledge is produced
- Evaluated, compare, identify, authenticate and validate the different information resources,
- Adapting to both quantitative and qualitative research
- Information technology literacy and to critically evaluate it.
- Assess the information needs of actual and potential patrons.
- Understanding the statutory and legal obligations of holding and disseminating information

Library Information Science professionals need to have two main categories of competencies, one is professional and other is personal.

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IN-TEXT QUESTIONS

16. Skill is an ability or ---------- in execution or performing a task ----------.
17. LIS professionals need to update continuously to face the ---------- of rapidly advancing ICTs.
18. Some core skills of LIS profession are ---------- handling skills, training and facilitating skills and ---------- skills.
19. Re-envisioning of library services include use of ---------- tools for social outreach, --------- and teaching learning process
20. Assessing the information needs of -------- and --------- patrons is ne of the competency of LIS professionals.

1.8 PROFESSIONAL COMPETENCY

Professional understanding of information resources, technological access, management, and research are all part of professional competences. To effectively provide library and information services, LIS personnel need to be able to draw from a wider range of knowledge. They must analyse information, and in order to do this, they must be adequately knowledgeable about the pertinent resources in the relevant fields. They ought to be knowledgeable in their chosen field and be prepared to help their clients out. To determine whether users are satisfied with and in need of the information services, a survey of users must be conducted. To build library products and information services for specific clientele, they must be competent in using the most recent information technology. In order to meet the users' more complex and changing needs, they must continuously improve their services (Baruah and Sarma, 2015).LIS professionals need to have professional competencies to manage:

1.8.1 Library Information Centres (LIC):

Proper planning is needed to manage Library Information centres. For this the professionals must have:

- Good knowledge of parent organisation
- Long and short goals need to be established
- Operational system, procedures should be in place with effective management system
- Professional working staff team to innovate, maintain and deliver quality information services
- Adopt and adapt the fast changing technologies and development
- Create strong connections both inside and outside the organisation

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- Analyse the impact of your library investment, both positive and negative

1.8.2 Information Resources:

Selecting, evaluating, securing and facilitating access to relevant resources. So the LIS professionals need to have skills for;

- Good collection development policies to build digital collection
- Collection development and management
- Specialised Reference Materials,
- Dynamic collection of resources to be evaluated and acquired
- Management of information cycles
- Negotiation of prices
- Taking care of licensing
- Copyrights and authentication etc.
- Information Sources Archiving

1.8.3 Information Services:

LIS professionals need to design, create, develop, maintain, market, repackage traditional services and also deliver innovative information services.

- Provide information services as needed by their patron
- Customised information products and services for their patrons
- Preservation of information sources
- Selective dissemination of information through e-alerts
- Virtual reference service
- Measure usage of e-resources
- Organising and delivering
- Classification and cataloguing
- Documentation Skills
- Indexing language skill
- Information searching technology
- Database Management and
- Information storage and retrieval

1.8.4 Application of ICT:

Provision of best products and services to the patrons by using rapidly advancing Information Technology needs the following skills:

- Web designing and hosting
- Networking tools
- Content management
- Web 2.0 and library 2.0
- Social networking tools
- Reference management tools
- Maintaining emerging technologies

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- Computing skills
- Operating system software
- Application software
- Library management software
- Telecommunication & Networking
- Database management system
- Information retrieval
- System analysis and designing
- Digitization
- Online searching & Retrieval
- Data mining
- Web 2.0 tools etc.

1.8.5 Resources sharing, collaborating and networking:

- Building subject portals
- Databases
- Resource guides etc.
- Knowledge about State, National and International consortia and networks.
- Creating Union Catalogues for resource sharing and
- Electronic document delivery system

1.8.6 Management Skills:

Some of the set of skills required for management of LIS professionals to manage library information centres are as follows;

- Leadership
- Team work
- Time management
- Decision making ability
- Personal management & development
- Supervisory & Motivational skills
- Marketing and Budgeting etc.

1.8.7 Research Skills:

- Qualitative and quantitative techniques
- Application of metrics technique
- Statistical
- operational research
- Analytical and Evaluation skills
- User study techniques
- Observation methods and
- Literature analysis skills are needed for a LIS professional to be successful achieve the aims and objectives of Library Information Centres

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1.9 PERSONAL COMPETENCY

A librarian offers leadership. They must acquire knowledge of it, develop the traits of a good leader, and understand when and how to conduct leadership. Diagnose skills and a broad, adaptable variety of behaviours are required for leadership. Influence is a component of leadership. It entails exerting influence over a team of people working toward a common goal. The strengths and shortcomings of the team members' individual contributions are more obvious to an effective leader than they are to a less effective one. An effective leader considers tasks and activities rather than outcomes and goals.

A set of attitudes, abilities, and beliefs known as personal competences are those that are appropriately used and benefit the parent organisation, patrons, and profession. The LIS professional must be competent to:

1.9.1 Communication Skills:

- Oral, written communication skills
- Presentation
- Technical communication & writing skills
- Report writing and editing skills
- User instruction and orientation skills
- Interpretation skills
- Communicate effectively, collaborate, negotiate persuasively and confidently.
- Seek out new opportunities, capitalise and face the new challenges
- Create a culture of trust and respect between staff, patrons and authorities, employ a team approach
- Innovation, creativity, plan the priorities and focus on what is critical
- Professional networking and professional growth
- In the changing times be flexible and positive
- Celebrate achievements of self and others
- Show courage, take calculated risk and perseverance in the face of difficulty

1.9.2 Generic Skills:

- Soft spoken,
- Ready to learn,
- Interpersonal skills,
- Professional attitude,
- Behavioural characteristics,
- Achieving professional goals, Negotiation skills,
- Making judgements, and
- Aptitudes of solving problems etc. are some generic skills.

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To sum up, LIS professionals need to be analytical, creative, technical, flexible, enthusiastic, motivated, research minded, critical thinking, leadership, communication and information literate. Library and information science profession like other professions has been affected by the rapid advancements in ICT. The professionals are also trying to adopt and adapt ICT skills. They also need to develop marketing skills, evaluation skills and strategies for new technologies. New communication, collaboration and negotiation skills are to be taught to the students. Apart from knowledge, teaching should focus on decision making abilities, Meta cognitive skills, and environmental changes etc. in this cyber age. With rapid advancement in ICT the professionals in library information science need to be aware of new emerging technologies and also be capable of using them in the creation, management and use of information for dissemination. The focus is also on communication skills in the electronic information environment. They need to act as educators and intermediaries. They also need to have increased teaching and communication skills.

IN-TEXT QUESTIONS

21. Professional understanding of ----------, technological access, ----------, and research are all part of professional competences.
22. LIS Professional must have working staff team to ----------, maintain and --------- quality information services
23. Report writing and ---------- are part of communication skills.
24. Achieving professional goals and Negotiation skills are part of ----------skills.
25. LIS professionals need to be capable of using ICTs in the ----------, management and use of information for ----------.

1.10 Dr. RANGANATHAN'S CONTRIBUTION IN LIS PROFESSION

Earlier some special libraries were established in India (viz. Indian Institute of Science and Geological Survey of India), and these were being taken care of by the part time librarians. Later on during the early twentieth century librarianship started professionally. Special training for librarianship was initiated in 1911 by An American trained librarian W.A.Borden with the support of Maharaja SayajiraoGaekwad at Baroda started the special training of librarianship. The king Maharaja SayajiraoGaekwad was instrumental in the development of the library system in the princely state of Baroda. He supported the training of librarians to manage the libraries. In 1916 another American Dickinson started a training programme for Indian librarians with the help of Punjab Library Primer.

After independence a large number of colleges, universities and autonomous research organisations were established in India. Along with these new libraries were also established which led to increased job opportunities to a great extent. Dr.S.R.Ranganathan was

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instrumental in this. He helped in securing the status of librarianship as a profession. Because of Ranganathan's services and lifelong endeavour, Indian librarianship has gained the status of a profession.Ranganathan's contribution to Indian LIS profession: It is due to the competent leadership of Dr.S.R.Ranganathan and his contributions, LIS profession and librarianship is recognised in India and abroad. The development of the profession is closely associated with the development of the subject as a science with a unique body of knowledge.

The development of the librarianship as a profession in India is due to the Five Laws of Library Science, Canons and Principles for Classification and Cataloguing i.e dynamic theory for knowledge organisation and introduction of specialisations and special services. These are the contributions of Dr.S.R.Ranganathan and brought the librarianship and LIS as a profession where it stands today in India. BLSc, MLSc and PhD programmes in library information science were the initiative of Dr.S.R.Ranganathan. His primary contribution has been the development of education in library science in India. He also formulated the research programmes, inspired the formation of associations at national and state level, organised seminars, and championed the need for library cooperation. He served as the primary impetus behind the foundation of the Indian National Science Documentation Center (INSDOC), which is today known as the National Institute of Science Communication and Information Resources (NISCAIR) and the Documentation Research and Training Center (DRTC) also. Over the years, the library and information profession has gained prominence for its service orientation and status of honour as a provider of knowledge and information, having first had the strong impact of Ranganathan to be endowed with recognition and respectability.

Library and information staff today enjoys salaries, benefits, and other perks on par with academics and scientists thanks to the qualifications, abilities, and expertise needed by them. In general, the industry is thriving and developing. Society is aware of its contribution and role. Dr.S.R.Ranganathan has been honoured as the father of Indian Library Science.

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IN-TEXT QUESTIONS

26. Special training for ---------- was initiated in 1911 by An American trained librarian W.A.Borden.
27. The king Maharaja SayajiraoGaekwad was ---------- in the development of the library system in the princely state of ----------.
28. ---------- was instrumental in securing the status of librarianship as a profession in India.
29. --------, ------- and ------- programmes in library information science were the initiative of Dr.S.R.Ranganathan.
30. Dr.S.R.Ranganathan was the primary impetus behind the foundation of the INSDOC which is today known as ----------.

1.11 SUGGESTION AND RECOMMENDATIONS

Some of the suggestions and recommendation as per the above discussions are as follows:

- The LIS profession is a challenging profession. They need to face the upcoming challenges of the information society by updating themselves.
- Mandatory short-term/long-term courses and training for library and information professionals on how to apply information communication technology to the collections, products, and services of library information centres
- Concerned state/central government organisations/ Institutions should set up refresher training for different kinds of professionals on how to handle and use various information communication technologies and devices.
- Knowledge of various online databases (National as well as International)
- Participation of professionals in seminars/ Conferences/ Workshops to update themselves, acquire latest knowledge and new developments in their subjects. They need to continue their education.
- Give professionals the chance to visit computerised libraries so they may learn how current automated libraries operate.
- Senior professionals' roles and duties must be more focused on adopting ICT for library automation and networking. They must give equal importance to every type (permanent, contractual, or temporary) of staff of their team.

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- New technologies like radio frequency identification (RFID), barcode, QR code, Mobile libraries and Near field Communicator (NFC) need to be implemented.
- The capabilities made possible by a networked environment should be the emphasis of library professionals rather than the difficulties posed by the complexity of networked-based information resources and services

1.12 CONCLUSION

During the past few years Information Communication technologies have revolutionised the methods of handling information activities. Present age society is known as information society. It needs implementation of varied ICTs to be used in information processing, repackaging, and disseminating it and libraries need to be providing diversified services. Library professionals need to redefine themselves by acquiring knowledge and skills of a different kind for 21st century libraries. It is essential for them to acquire knowledge about emerging technologies and also improve and develop various professional skills. A continuous professional development must be an essential part of LIS curricula. The library professionals with better competencies will be in demand in modern libraries. A set of foundation and operational competencies for every level of professionals have been clarified in this unit.

Personal competencies are to be possessed by each individual and operational competencies are to be possessed by all the professionals. The professionals must have enough knowledge of the contextual variables and technical skills to tackle the environment due to changes in Information communication technologies. They also need to be well aware of the vision, mission, aims and objectives of their institution or organisation and job responsibilities in their library information centre. The LIS professionals need to have adequate knowledge of emerging new technologies everyday. Apart from this they must have knowledge of collection building. Management is also a very important part of professional competencies as they need to be equipped for planning, decision making, supervision, evaluation, communication as well as financial management.

1.13 SUMMARY

It can be summarised that compared to other well-established professions like medical, law, etc., librarianship is a relatively new one. The use of specialised knowledge in a particular field for the good of society is what defines a profession. To put it another way, the professional activity entails systematic knowledge, competency, and its societal application. There are very minor differences between "occupation," referring to employment or a job, "vocation," referring to a certain level of skill in carrying out a job and is learned through on-the-job training, and "profession," as it calls for specialised knowledge and skills

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to manage a specialised field of study. Some of the characteristics of a profession are as follows:

a) A professional possesses the necessary information and abilities as a result of extensive and comprehensive training in a higher education institution, in addition to self-learning and self-practice;

b) The knowledge should include the academic, historical, and scientific foundations for the abilities used. The professional should be able to respond to the "what," "why," and "how" of the practise with the help of this expertise;

c) The profession should ensure that its members remain constantly aware of updated in the latest developments in knowledge and skills; and

d) High standards of performance

e) Dedicated public service to the society based on acquired knowledge and skills.

(Chopra et al, 1998) have listed some essential characteristics of a profession. Some of them are Specialised knowledge and skill; Research and continuous updation and education; Intellectual activity; Serving society, Social necessity and status in the society; Standard terminology; professional organisations; Code of ethics; Autonomy and authority of the professionals. Librarianship as a profession handles the universe of knowledge. This knowledge is available inprint and nonprint resources. The goal of any profession's fundamental discipline is social. Goal of the legal profession is ‘Justice for all, Medical professional's goal is ‘health for everyone’ while it is ‘Information for everyone’ for library professionals. The librarianship as a profession has struggled a lot to come to this stage. Earlier it started as **occupation**, then vocation and transformed to profession over centuries.

As opposed to being a bookkeeper or custodian of a book, a librarian now builds the collection and keeps track of their usage. However, after the two World Wars specialised libraries were developed for business and academic study. Following the birth of the profession of documentalist, which aims to provide specialised services to specialised consumers, came the post of information scientist, which serves users by exploiting information communication technologies.

In the modern era the rapid advancements in information communication technologies have brought the transformation of traditional libraries into digital and virtual libraries. These are interconnected globally through the internet and have digital or electronic collections while presently most of the libraries in India are hybrid libraries as they have collection of print resources and also have access to e-resources. Pandemic has taught librarians as well as patrons the importance of e-resources and web based information services. However, it wasn't until India attained independence that the library profession

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began to truly expand. Since the library profession has a lengthy history of development, it went through a number of stages before becoming a fully fledged profession.

1.14 GLOSSARY AND ABBREVIATIONS

Profession : A calling requiring specialised knowledge and often long and intensive academic preparation

Competency : Capacity to utilise psychological resources (including skills and attitudes) in a specific setting to meet complicated demands.

Vocation : The work in which a person is regularly employed

Occupation : An activity in which one engages principally for life and needs more education and experience

Skill : Ability or expertise in execution or performing a task successfully.

LIS : Library Information Science

ICT : Information Communication Technology

BLSc : Bachelors in Library Science

MLSc : Masters in Library Science

Ph.D : Doctor of Philosophy

1.15 ANSWERS TO IN-TEXT QUESTIONS

1. Knowledge, Skill
2. Curriculum
3. Code of Ethics
4. Scholarly, Scientific
5. Divinity, Law, Medicine
6. Profession, Occupation, Vocation
7. Theoretical, Practical
8. Profession, Practical
9. Cycle of information
10. Noble
11. Communication, Mediator
12. Clients, Society
13. Profession, Education
14. Professionals
15. Pandemic
16. Expertise, Successfully
17. Challenges
18. Information handling, Evaluation
19. Web 2.0, Research
20. Actual, Potential
21. Information resources, Management
22. Innovate, Deliver
23. Editing
24. Generic
25. Creation, Dissemination
26. Librarianship
27. Instrumental, Baroda
28. Dr. Ranganathan
29. BLSc, MLSc, PhD
30. NISCAIR

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1.16 SELF- ASSESMENT QUESTIONS

1. Explain a profession with its characteristics and also explain Library Information Science as a profession?
2. Define the changing role of LIS professionals.
3. Explain some skills and competencies required for a LIS professional.
4. Define Dr.Ranganathan's Contribution to the LIS profession in India.

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LESSON 2

PROFESSIONAL ETHICS

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STRUCTURE

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1.1 LEARNING OBJECTIVES

Professional ethics is a subject of great importance to establish, maintain, and decide upon acceptable standards in professional performance. Human knowledge is stored in libraries. Libraries' work cultures have altered as a result of the development of information communication technologies and the rapid changes in it. Since the development of information and communication technology has altered how people interact with one another and their surroundings has also altered. There has been an increase in interest in workplace professional ethics in recent years.

The fact that the profession of library science includes an ethics code that governs how professionals interact with clients and coworkers is one of its distinguishing features. This Unit explains the concept of ethics, professional ethics, their need, ethics of LIS professionals and code of ethics. The Unit also briefly explains the code of ethics for Library Information Science professionals.

1.2 INTRODUCTION

In unit V the concept of a profession has been introduced to you. That unit explains the characteristics of a profession as well as librarianship as a profession. A profession cannot be referred to as a profession without the presence of certain essential notions, regulations, or principles. Professionals operate in a variety of fields, including education, business, public service, science, and medical. In several disciplines, formal codes of ethics have been established to outline the standards of conduct for professionals. A professional is someone who belongs to a profession and is required to follow a set of regulations. In order to preserve the legitimacy of the profession, the licencing authority has explicitly specified these rules.

Every profession has an ethics code. Ethics and code of ethics regulate the interpersonal relations among professionals as well as with clients and colleagues. The secret to providing ethical service is selfless service that prioritises the needs of the user. It's crucial to practise routines with objectivity. Professionals should strive to provide service without bias. To ensure that clients are completely satisfied with the services provided by professionals, professional performances should adhere to ethical norms. For a profession to control and direct its behaviour in professional activities, a code of ethics is required. The science of moral behaviour and character is the foundation of professional ethics. Moral principles that are deemed to be good and worthwhile for the overall welfare of society are the foundation of ethical issues.

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1.3 ETHICS

The Latin term "ethicus," meaning the character, custom, or attitude of people or the society, is the root of the English word "ethic." Morality is synonymous with ethics. In simple words it is morality or moral philosophy. It focuses on behaviour, attitude, and character of a professional. It discusses what is good or terrible, or what is right or wrong. A person's professional conduct, behaviour, morals, values, dedication, and obligation to the community/profession are all governed by ethics. A 'code of ethics' focused on fairness, deciding what is right and wrong, and creating the traditions and rules that encourage responsible behaviour among people and within communities. It is the research of moral standards of conduct.

Webster's International Dictionary defines Ethics as:

1) "The discipline dealing with what is good and bad or right and wrong with moral duty and obligation;

2) A group of moral principles or set of values; a particular theory or system or moral values; the principles of conduct governing an individual or a profession; standards of behaviour;

3) The adjective 'Ethical' connotes conformity to professionally endorsed principles and practice or a system/philosophy of conduct and principles practiced by a person or group.

There appears to be no single, universal definition of "ethics". The term means different things to different people and reflects different perspectives. But there are common themes among all the definitions, including right and wrong, virtue and vice, and morality, which are purportedly expressed in systems, standards of law, or individually held morals. Both ethical theory and moral practice initially refer to human conduct, but from an ethical standpoint, one needs knowledge in order to act morally (in this activity). The factual situation is represented by this information, along with a normative assessment of the facts. It is important to remember that knowledge is a vital prerequisite for morality and ethics.

The following features clarifies the nature of Ethics:

- Ethics lays out standards for conduct in both personal and professional settings.
- Existing laws and judgments may provide valuable information, but ethics compels us to assess them in the context of higher ideals.

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- It is not based on feelings of approval or disapproval, but rather on a critical evaluation of the world as it is. Principles, not feelings, produce ethics.
- It's not the law. even though many moral standards are enshrined in law. In an effort to give more perfect norms for daily behaviour, ethics challenges law and tradition. The law may permit actions that are unethical. Not all ethical principles are covered by law, custom, or popular opinion.
- What is considered moral behaviour in one group might not be in another.
- Every aspect of human activity or endeavour needs ethics.

Now the question arises of the difference between 'Morality', 'Values' and 'Ethics'. Morality refers to one's own beliefs about what is right and wrong and is more general in nature. These change over time within a society with societal changes. Values are our fundamental beliefs, used to define what is right, just and good. It only provides guidance. The moral guidelines of a profession give its members a set of guidelines and a level playing field.

The mission statement directs how the profession views ethics. The guidance a person receives from their profession regarding what is right and wrong is known as ethics. A person's morality can be seen in their behaviour reflecting their values and ideals, coming from within are influenced by one's family and society. When someone must act in a way that goes against their morals, it hurts and makes them uncomfortable. Despite being intrinsically sound, morality can evolve along with a person's ideas. The study of moral norms in an individual or a society is another definition of ethics.

Ethics instruct the professionals on appropriate behaviour and the professional principles. Ethics are crucial in case of clash of ideals. A profession's ethics reflect its character. Long-established professions had a solid ethical foundation. The source of ethics is outside of an individual; one must abide by them to be a member of the community and may face consequences for not doing so. Since the beginning of human history, ethics has been a topic of philosophical study and inquiry. There are three philosophical perspectives on ethical inquiry: pluralistic, relativistic, and monistic. In India Moral behaviour is directly linked to religious ideas and practises. All of these concepts, notions, and theories contribute to various elements of research into ethics, particularly in contemporary society. Some of these studies deal with business, personal, organisational, and professional ethics, which frequently cause disputes in real-world situations. Here the study is about professional ethics.

1.4 PROFESSIONAL ETHICS

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Professional ethics are a reflection of a profession's spirit, culture, and practises. It ought to embody or be founded on all the core principles of the profession, define what it is, and convey how its practitioners view themselves and their place in society. It ought to highlight what makes the group unique. They should provide services of a calibre that distinguishes them from the competition. When we talk about a person's work being very professional, we mean that their performance, intellectual and/or technical knowledge, sense of responsibility, and dedication to their clients are all nearly faultless.Professional ethics are a reflection of a profession's spirit, culture, and practises. It ought to embody or be founded on all the core principles of the profession, define what it is, and convey how its practitioners view themselves and their place in society. It ought to highlight what makes the group unique. They should provide services of a calibre that distinguishes them from the competition. When we talk about a person's work being very professional, we mean that their performance, intellectual and/or technical knowledge, sense of responsibility, and dedication to their clients are all nearly faultless.

Almost all professions work to develop a set of standards for professional conduct to serve as a guide for practitioners in order to maintain societal respect and to perform at their best. There has always been interest in the moral conduct of professions, frequently codified and known as ethical codes. The contemporary codes of behaviour were developed in the nineteenth century, despite the fact that there have been moral guidelines for centuries. The motto of professional ethics in library information science is to provide dedicated service; maintain neutrality; build up the knowledge base of the professional; uphold the freedoms of study, press, speech, thought, dissemination of information; and voice the convictions relating to library legislation, censorship etc.

For instance legal professionals interpret the laws and defend the public from unfair acts. The bar ensures that people's fundamental rights are safeguarded. The bench and bar are made up of, as it were, men and women of integrity who follow a set of ethical principles when doing their jobs.Even the press, which is thought of as the public's eyes and conscience, performs the three fundamental functions of observation, interpretation, and correlation. Many individuals think that the press can easily be misused if it acts without constraint because of its enormous influence on influencing public opinion. Media professionals must follow a set of ethical guidelines in order to tell the truth, uphold the principles of fair play and balance, and verify any information they receive.

Medical professionals have the unique duty of saving lives while interacting with people of all ages, sexes, and socioeconomic level. They rely on their education and depth of expertise to diagnose illnesses, prescribe, and administer medications to patients in order to promote healing. In the daily execution of their professional duties they are guided and strictly adhere to their professional code of conduct in their relationship with patients and in other matters.

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IN-TEXT QUESTIONS

1. Morality is synonymous with 'Ethics'
   a) True b) False c) Can't say
2. Root of the word 'Ethics is the Greek word 'Ethicus'
   a) True b) False c) Can't say
3. Code of ethics does not regulate the interpersonal relations among professionals
   a) True b) False c) Can't say
4. The science of moral behaviour and character is the foundation of professional ethics.
   a) True b) False c) Can't say

1.5 NEED OF ETHICS IN LIS PROFESSION

Different occupations emerged as civilization advanced. It was believed that these professions needed a code of conduct, or an ethical way of living. A professional is someone with particular knowledge or abilities who can make decisions and judgments under circumstances that a layperson cannot. A professional's code of ethics is a set of rules they must abide by while performing their tasks. It also requires being mindful of the behaviour to be used when putting the profession's principles into practice.

It is not possible to create a uniform, universal set of rules because they are subject to change and might eventually become obsolete for all professions. Due to the widespread social and cultural differences, it is necessary to develop a set of ethical standards that are meaningful and applicable for a specific profession with both a concise long version outlining universal core values and a detailed short version outlining how they are interpreted in various nations. Before being authorised, ethical norms are carefully considered, stated, discussed, and disputed. If and when necessary, they can be later updated or enlarged. Ethics need to be established and monitored regularly with clearly laid out guidelines. The librarians should be able to handle queries of their patrons in a justified way. They need to optimize the value of recorded information (print as well as digital) for the society. They need to anticipate the need and demand of their patrons, behave in an appropriate exemplary manner.

A code is always ambiguously defined to allow for future interpretation when circumstances change. Every professional member has a responsibility to uphold compliance with reading, comprehending, and adhering to the code of ethical behaviour, as well as to introduce new members and persuade subordinates to do the same. When this code of ethics

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is broken, disciplinary action is taken. This can take the form of a warning, a reprimand, professional sanctions, or even dismissal/expulsion from their professional order. Self-awareness and a commitment to living according to the rules are essential because they cannot be legally enforced unless the situation calls for them.

1.6 PROFESSIONAL ETHICS FOR LIS PROFESSIONALS

Ethics is a moral principle or belief about what is right and wrong. A key measure is the prescription, adaptation, monitoring and enforcement of ethical codes. The group of people can be a community, an organizational firm or a professional body. These principles guide individuals‟ actions in the group and in their dealings with other individuals within and outside the group. They provide basis for judgment in any situation. Ethics in a profession refers to guidelines and rules that members must follow in order to uphold the industry's acceptable standards. A compendium of rules for moral conduct is known as a code of ethics. Every profession has its own set of ethical standards that serve to both instruct members in how to conduct themselves in a way that upholds the profession's reputation and benefits society as a whole.

Librarianship plays a crucial role in gathering, preserving, and sharing knowledge in society. Professionals in the field of library and information science (LIS) have to interact with customers, employees, colleagues, and members of the book and information trade.The practise of ethics is crucial to the field of librarianship. The LIS professionals must meet a variety of expectations from various groups at various times. There are specific moral principles or ethical rules that must be followed in order to address these complications when practising the profession.

Through time and evolution, the profession of librarianship has added values to the values upheld throughout the long history of human civilization. It has experienced some transformation. The concepts of gathering, organising, utilising, and ultimately disseminating knowledge are demonstrated by the modern professional librarian. The moral, intellectual, and professional characteristics of the librarian are all indistinguishable from the principles of library service, the ethics of librarianship, and the librarian's creed. (Mukherjee, 1966)

Because of how modern technology has affected how people interact with one another and their surroundings, (Jonas, 1984) remarked that there is increased interest in the subject of workplace ethics.As per IFLA, professional ethics mean “A collection of professional guidelines for librarians and other library employees adopted by national library or librarians associations or implemented by government agencies”.

Ethical standards are essential, highly valued and respected by group members that it is simple to identify a professional group member only by brief interactions or associations.

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Ethical codes include the group's goals, dos and don'ts, and are frequently accompanied with a logo. The collection of codes bearing the trademark is periodically rebranded to meet the shifting demands of the industry, its customers, and society at large. The fact that librarianship is included is intriguing. In the midst of multiple ethical dilemmas while performing their professional tasks, librarians are not without ethical rules.(Igbeka & Okoroma, 2013)

The ethical standards for librarians have been changed numerous times since 1934. The American Library Association's (ALA) and International Federation of Library Associations and Institutions' (IFLA) codes of conduct are the most significant (IFLA). A code of ethics for librarians and other information professionals cannot be a meaningless declaration created to appease the general public or library boards. It must focus on the way we do our work and whether or not we perform in a way that can honestly be called professional.

Ethics in librarianship must be made clear, concrete, and brief enough for every librarian to remember and comprehend. Ethical concerns have existed throughout the library profession from the very beginning. Early ethical concerns centred on a librarian's obligation to their employer or client; later, the discussion turned to concerns about professional identity, organisational culture, and social duties. The information age and the current rapid technological development are prompting the library profession to reconsider its goals and obligations.

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IN-TEXT QUESTIONS

5. Code of ethics is not the research of moral standards of conduct.
   a) True b) False c) Can't say
6. Knowledge is a vital prerequisite for morality and ethics.
   a) True b) False c) Can't say
7. Every aspect of human activity or endeavour does not need ethics.
   a) True b) False c) Can't say
8. Which one of the following is philosophical perspectives on ethical inquiry.
   a) Pluralistic b) Relativistic c) Monistic, d) All of the above
9. Ethics does not instruct the professionals on appropriate behaviour.
   a) True b) False c) Can't say

1.7 CODE OF ETHICS IN LIBRARY INFORMATION SCIENCE

A code of conduct is established for each profession to guide ethical behaviour within that profession and is known as code of ethics. The function of codes of ethics can be

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described as encouraging reflection on principles on which professionals form policies, handle dilemmas, provide transparency to their client, users and society in general as well as improving professional self-awareness.A code of conduct must be formed since it is a prerequisite for any profession and essential to the growth of that field. Examining and reexamining enduring principles and defining professional boundaries aid in identifying what is significant, relevant, and deserving of inclusion in the future. By describing what is significant and how the profession has evolved, it has a duty to the current and upcoming generations of professionals. As they outline how a professional member is supposed to behave, the ethical guidelines oblige participating members of professional organisations to uphold the code.

It serves as a guide for making moral decisions since it promotes constructive interactions and guards against exploitation. By defining professional responsibility within society, it clarifies society as a whole and shields the public from the impacts and ramifications of a professional choice on society. The code prevents bad legal outcomes and acts as a guideline in cases of moral conflict or transgression. Additionally, it stops discrimination and harassment, allowing for effective collective group response to professional abuse. In addition to aiding in self-respect and self-affirmation, it also represents the prominence of the LIS profession in society. For the LIS profession to be seen as worthwhile, respectable, valuable, and professional, as well as for the professionalisation of librarianship, a code of ethics becomes extremely crucial.

Some advantages of implementing a code of conduct in LIS are enhancement in the reputation of the organisation using it and also supporting a variety of viewpoints, emphasizing the principles of professional groups, improvement in self-awareness, promotes moral behaviour by requiring members to adhere to group rules, protects the reputation of the professionals and attests to personal integrity. The founding of the American Library Association marked the start of the first constructive work (ALA)

The production of library and information science professionals who are well versed in the ethics of information providing will increase if information ethics is treated as an important component in library school curriculum. Ethics in librarianship should be taught in library schools and upheld. Additionally, concerns about penalties and upholding ethical standards must be properly handled. If ethical standards are there but are unknown to the intended audience, they are effectively nonexistent. Sanctions for violating the ethical standards of librarianship are to be expected. It is important to hold dishonest librarians accountable for their behaviour (Igbeka & Okoroma, 2013). Some of the Code of ethics in Library Information Science profession are as follows:

1.7.1 American Library Association Code of Ethics

The American Library Association has recognised the significance of codifying and disseminating to the public and the profession the principles that serve as a framework for

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librarianship since 1939. These principles are periodically updated to reflect changes in the profession's makeup as well as the social and institutional context in which it operates. When ideals clash, the ethical principles are helpful. Let's examine the list of librarianship ethics that the ALA Council adopted on June 28, 1997 and revised on January 22, 2008.

The relationships covered by the ALA's code of conduct for library professionals are the governing authority; their constituency; their profession; their fellow employees within the library and society. The statements of code provide a framework and cannot dictate conduct to cover particular situations.

- "We provide the highest level of service to all library users through appropriate and usefully organised resources; equitable service policies; equitable access; and accurate, unbiased, and courteous responses to all requests."
- "We uphold the principles of intellectual freedom and resist all efforts to censor library resources."
- "We protect each library user's right to privacy and confidentiality with respect to information sought or received and resources consulted, borrowed, acquired or transmitted."
- "We respect intellectual property rights and advocate balance between the interests of information users and rights holders."
- "We treat co-workers and other colleagues with respect, fairness, and good faith, and advocate conditions of employment that safeguard the rights and welfare of all employees of our institutions."
- "We do not advance private interests at the expense of library users, colleagues, or our employing institutions."
- "We distinguish between our personal convictions and professional duties and do not allow our personal beliefs to interfere with fair representation of the aims of our institutions or the provision of access to their information resources."
- "We strive for excellence in the profession by maintaining and enhancing our own knowledge and skills, by encouraging the professional development of co-workers, and by fostering the aspirations of potential members of the profession."

In the first ethical statement the measurement of "highest level of service..." is not quantifiable. Ethical rules ought to be expressed in quantifiable terms. If a professional ethical statement is not quantifiable, it is infeasible and the members will not value it. In addition to the issue of practicability, there appears to be another factor contributing to the discrepancy between the existence of the codes and their application among librarians: inadequate understanding of the codes' professional ethical standards.

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1.7.2 Library Association Code of Professional Conduct

In 1978, the UK's Library Association established a working party on professional ethics. The expectations for member behaviour are laid out in the Association's Code of Conduct. It outlines, broadly speaking, the obligations and standards that a professional should uphold. When dealing with disciplinary actions taken against members, this might be utilised as a point of reference. The profession, particular practitioners, and their clients are all expected to be protected by this. Some of the Code's key features include:

- "Members of the Association must conduct themselves in such a way that their conduct would not be reasonably regarded by their professional colleagues within the field of librarianship (including the provision of information services) as serious professional misconduct or as professional misconduct. It is by this overall test that the conduct will be judged."
- "Members must comply with the Charter and Bye-laws of the Association and the provisions of this Code of Conduct".
- "Failure to comply with the requirements set out in paragraph 2, if proved before the Disciplinary Committee, be regarded as serious professional misconduct and, the member concerned is liable to be expelled or suspended."

1.7.3 IFLA Code of Ethics for Librarians and other Information Workers

International Federation of Library Associations (IFLA) was founded in 1927, but an international code of ethics was outlined only in the year 2012 with a full and shorter version.It is a list of ethical guidelines for librarians and other information professionals to follow, as well as for library and information associations to take into account when developing or updating their own codes. Codes of ethics serve a number of purposes, including promoting contemplation on the values upon which librarians and other information professionals might base policy and resolve conflicts, raising professional self-awareness, and fostering transparency with customers and society at large.

This code is not meant to take the place of already existing codes or to absolve professional associations of the responsibility to create their own codes through a process of investigation, collaboration, and cooperative drafting. Complete adherence to this code is not anticipated. This code is being provided on the grounds that:

- "Librarianship is, in its very essence, an ethical activity embodying a value-rich approach to professional work with information."
- "The need to share ideas and information has grown more important with the increasing complexity of society in recent centuries and this provides a rationale for libraries and the practice of librarianship."

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- "The role of information institutions and professionals, including libraries and librarians, in modern society is to support the optimisation of the recording and representation of information and to provide access to it."
- "Information service in the interest of social, cultural and economic well-being is at the heart of librarianship and therefore librarians have social responsibility."
- "Furthermore, this belief in the human necessity of sharing information and ideas implies the recognition of information rights. The idea of human rights, particularly as expressed in the United Nations Universal Declaration of Human Rights (1948), requires us all to recognise and acknowledge the humanity of others and to respect their rights."

The key points of IFLA code of ethics include Access to information, Responsibilities towards individuals and society, Privacy, secrecy, and transparency, Open access and intellectual property, Neutrality, personal integrity, and professional skills, Colleague and employer/employee relationship.

IN-TEXT QUESTIONS

10. Professional ethics are a reflection of a profession's:
    a) Spirit, Culture, Practises; b) Culture, Practises; c) Spririt and Practises; d) None of the above
11. Professional ethics in library information science provide:
    a) Dedicated service; maintain neutrality; b) Build up the knowledge base; dissemination of information; c) Uphold the freedom of study, press, speech, thought; d) All of the above
12. Medical professionals do not rely on their education and depth of expertise to diagnose illnesses, prescribe, and administer medications.
    a) True b) False c) Can't say
13. A professional's code of ethics is a set of rules for professionals to abide bywhile performing their tasks
    a) True b) False c) Can't say
14. It is possible to create a uniform, universal set of rules for all professions
    a) True b) False c) Can't say

1.8CODE OF ETHICS FOR LIS PROFESSIONALS IN INDIA

Hindu philosophy has always included ethics, or neeti-shastra; it is passed down or demonstrated by example. Instead of being portrayed as an explicit ethical code that had to be prepared or recorded in order to be passed down the generations, it has also been practised since ancient times and is widely accepted in Indian society. Since the beginning of time,

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Indian philosophers, sages, and seers have vigorously debated and discussed the subject of ethics. Under virtue, morality, fairness, good, correct action, etc., complex ethical notions like Dharma were studied and explained. In Hinduism, these were never mandated but rather actively followed. All of these well-known texts—the Vedas, Upanishads, Manu-Samhita, and Bhagavad Gita—discuss not only the what, when, how, and why of leading a virtuous life and exercising various religious virtues, but also the karmic repercussions that extend into the afterlife, ensuring unwavering devotion and practise in order to reach nirvana.

The other given reason was that ethical code was not needed, as the Five Laws of Library Science proposed by Dr. S.R. Ranganathan in 1931 were informally accepted as an ethical code:

1. Books are for use.
2. Every reader his/her book.
3. Every book its reader.
4. Save the time of the reader.
5. A library is a growing organism.

In India and throughout the world, librarians adhere to these five laws, which are the cornerstone of librarianship. In the course of their work, LIS professionals deal with a variety of moral conundrums. No matter their official rank, gender, or level of education or experience, all working library staff members are considered LIS professionals in this context. The function of LIS experts is not only confined to archiving but involves a wide range of tasks employing modern information and communication technologies, tools, and devices due to the rising complexity of transmitting and sharing information in contemporary society. There is a lot of worry about how LIS professionals' roles are evolving and whether librarianship can even survive in the age of the internet, social media and mobile apps increasingly used for accessing information.

Despite this, LIS professionals have always stood out and demonstrated that they are relevant in all eras and contexts. This is likely due to a written or perceived code of ethics for librarianship, as well as the fact that their willingness to adapt to constantly shifting circumstances has given them the necessary survival skills. In order to help LIS professionals navigate moral ambiguity, self-reflection, and self-awareness, the code of ethics and professional conduct provides principles and propositions. The ethical obligations of LIS professionals in India must be addressed in their code of ethics and professional conduct. These are the five LIS laws, Oneself, One's place of employment (institution and library), Library personnel, Patrons and customers, Other libraries, Peers and professional

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organisations, Using Internet, Social Media and Mobile Apps., Data and Resources, Publication and the public.

Most significantly, it must ensure that future generations recognise Dr. S. R. Ranganathan's contributions to the various dimensions of librarianship in addition to upholding the Five Laws he proposed. Besides ethics for libraries by ALA and IFLA, the International Council of Archives (ICA) and International Council of Museums (ICOM) have also developed international codes of ethics for archives and museums, respectively. There are approximately 62 National Codes of Ethics for Librarians by Country listed by IFLA as well as translated IFLA Code of Ethics for Librarians and other Information Workers in 20 languages in long and short versions. Though there are 196 countries in the world including Taiwan, only 62 countries have their ethical codes. The remaining 134 countries, including India are yet to propose a code of ethics for LIS professionals in their countries. (Mughal, 2018)

An ethical code for India should be finalised by the national LIS associations. They should also start the process of unifying the other associations. An attempt needs to be made with the fixed agenda of establishing and publishing a code of ethics and professional conduct for LIS professionals in India. According to (Mittal, 2007) the ethical principles to be followed by LIS professionals are their duty to books, readers, profession, staff and themselves.

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IN-TEXT QUESTIONS

15. Breakin the code of ethics may lead to disciplinary action
    a) True b) False c) Can't say
16. Practise of ethics is crucial to the field of librarianship
    a) True b) False c) Can't say
17. Advantages of implementing a code of conduct in LIS are
    a) Supporting a variety of viewpoints; b) Improvement in self-awareness; c) Promoting moral behaviour d) All of the above
18. "Members must comply with the Charter and Bye-laws of the Association and the provisions of this Code of Conduct" is one of the key feature of Library Association code.
    a) True b) False c) Can't say
19. Information service in the interest of social, cultural and economic well-being is not at the heart of librarianship and therefore librarians have no social responsibility.
    a) True b) False c) Can't say

1.9 CODE OF ETHICS IN DIGITAL ERA

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Information communication technologies have an impact on the modern information environment. We now have 24/7 access to worldwide knowledge through networks like the internet, electronic collections, and network-based services (24x7). It is the duty of libraries to offer users fair access to knowledge and well-rounded services. It is difficult for libraries to provide quality information since there are issues with the veracity of material on the internet. They are also faced with privacy concerns as a result of the accessibility of digital material outside of the walls of libraries. Now, the agreement is to obtain a licence with a number of terms and conditions for privacy rather than to buy or subscribe. Additionally, libraries now have access to other people's intellectual property in both a free and fee-based environment in addition to the copyrighted documents they previously had.

The unpredictable economy, coupled with a continued advancement in technology and fierce competition led to stringent measures and robust innovation to keep alive. The challenging environment has caused many industries and commercial ventures to become distressed and disintegrate suddenly. As a result they indulged in doing certain things which are unbecoming of them in order to outshine and survive. To avoid these anomalies and yet remain relevant, organizations are putting strict measures in place.

The information age and the current rapid technological development are prompting the library profession to reconsider its goals and obligations. In order to avoid what Hauptman (1990) called "dubious professional commitment to supply information," issues of confidentiality should also be clearly stated in the ethical code (that is when a librarian or information professional disseminates information to their clients not minding the social implications). Although maintaining secrecy is important, it should be done with care. Consider the case of someone asking the library staff for books about suicide. In situations like this, information resources shouldn't just be handed away without more inquiry into the client's motivations for seeking the information. There should be a well defined code that allows an information professional to refuse access to specific material with justification.

The librarian has a duty to ensure that information is accurate, to preserve people's privacy, to provide all people with equal access to information and services without regard to their caste, creed, gender, class, or social status, and to close the digital divide. In the digital age accuracy and timeliness, privacy, authenticity/validity, accessibility and intellectual property are the most crucial issues.

As a result, the libraries' dedication to management, information security and access, and commitment to society at large in bridging the digital divide has expanded. Users are now referred to as customers. Ethical issues therefore play a major role in the present revolutionary digital era. Some of the issues and challenges in the present era are:

- Are librarians fully aware of their ethics?

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- What are the measures used to enhance the awareness and practicability of librarianship ethics?
- Are ethics feasible?
- Are they utilizing these codes in their day to day library management?

The results of a study by (Igbeka & Okoroma, 2013*) showed there are few people who are aware of ethical principles, many ethical rules are hotly debated, and there haven't been any instances of confrontation or punishment for ethical transgressions. According to the study, establishing an implementation committee to handle ethical issues, proper and consistent supervision of on-duty librarians by the professional body and libraries' sectional heads, enlightenment and awareness programmes through workshops, seminars, and conferences, a review and articulation of the ethical codes in measurable behavioural statements, as well as appropriate training, are all required to ensure the practicability and thorough awareness.

It illustrated the need for increasing awareness of ethical standards in librarianship because many librarians are not aware of the guidelines that should guide their behaviour and how they should carry out their professional responsibilities. Since many ethical norms are not very useful, many librarians discharge their professional duties without regard to any ethical principles. This shows that a code of conduct for librarians and information professionals shouldn't be a hollow commitment made to placate users or library boards. The claims and content of the codes must be reviewed. Ethics must also be covered in librarianship programmes. According to the report, a large majority of librarians do not treat their employees and fellow professionals with respect, fairness, and good faith. Therefore, it is crucial to support employment policies that safeguard the rights and welfare of all employees. The topic of respect and relationships between librarians and their coworkers, bosses, and subordinates at work also has to be addressed. Mentoring and leading by example are essential in this regard.

1.10ISSUES AND PROBLEMS

There are numerous more problems and issues with professional ethics that arise in addition to the challenges of creating an acceptable ethical code for professionals. Among them are:

- The public perception of the library and information profession;
- Multiple professional organisations;
- Implementation authority with guidelines for disciplinary action in the event of transgression of the ethical standards set out by ethical rules;

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- The profession's expanding horizons;
- The profession's consequent ambiguous status;
- Professionalism of the work;
- Immigrants who are experts in various fields and occupations.

1.10.1 Professional Image

Due to the fact that library and information work is seen as an adjunct to other endeavours like research, education, economic development, and industrial advancement, the profession of the librarian is not given a highly positive reputation in Indian society. Due to the fact that librarians and information workers are considered a group of professionals within their separate parental organisations, the public does not properly value their independence. Only a small percentage of customers benefit from excellent library and information services and value the assistance provided to them in their endeavours. Such a constrained appreciation does little to improve the profession's standing in society at large.There has never been a noteworthy performance or accomplishment that has improved the reputation of Indian public libraries as professionals in the eyes of the nation.

1.10.2 Professional Bodies

There may not be any significant disputes between the multiple professional bodies that exist in various nations, but each one may have different goals and objectives. According to the top American expert (Bekker, 1976):

- There should only be one national occupational organisation;
- One basic national code of ethics for efficient disciplinary action in cases of violation of ethical rules.
- Membership approval or renewal should be subject to subscriptions to the code;
- The requirement for obtaining a practise licence should be membership in the professional association;
- There needs to be just one national committee on workplace behaviour.

Despite the fact that the basic approach to designing professional codes described above is desirable, it is not practical to have a single central authority. Instead, since everyone is a librarian or member of the information profession, coordination and cooperation among the various professional bodies is crucial.

1.10.3 Authority in Implementation

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Even in the case of a single professional authority, it is not always practicable to punish potential offenders of professional ethics. These moral guidelines have no legal standing. Conforming to ethical standards is almost always a more voluntary individual effort motivated by a sense of moral obligation.

1.10.4 Expanding Dimensions

In the final part of the 20th century, professional activity's dimensions increased in an unprecedented way. The standard and customary functions of a library have changed significantly. Working in libraries and with information requires new talents, and these professionals must come from outside the industry. As a result, professional education and training have been in transition in this evolving environment. Numerous issues arise as a result of this, especially when newcomers have a different perspective on professional work and activities.

This is not only a librarian-specific oddity. Similar issues also affect other professions, such as the medical field. But unlike the library profession, which has issues, the medical profession enjoys a positive public perception. What kind of status might librarians have in the future? At this point of change, it is difficult to foresee, but it will undoubtedly differ from both the present and the past.

1.10.5 Professional Quality

The current emphasis on quality assurance has been a significant worry for everyone involved in human activity. Consumer groups have long argued that they have a right to high quality in every purchase they make and have sought legal protection in consumer courts to defend that right. As pricing for library and information services is on the horizon, library and information products and services will eventually have to deal with this issue as well.

1.10.6 New Entrants

Activities related to libraries and information are drawing people from a range of educational and professional backgrounds and qualifications: People with all levels of professional expertise are moving into the library and information sectors with a variety of political, religious, and philosophical perspectives. All of these have an impact on professional behaviour and conduct.

In the end, it's critical to remember that professional behaviour and conduct are mostly determined by personal belief, involvement, commitment, and faith in library and information services.

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IN-TEXT QUESTIONS

20. Laws of library science formulated by Dr. S.R. Ranganathan are not informally accepted as an ethical code:
    a) True b) False c) Can't say
21. The following are issues of implementing the code of ethics
    a) Professional bodies; b) Expanding dimensions c) Professional quality d) All of the above
22. Conforming to ethical standards is almost always a more voluntary individual effort motivated by a sense of moral obligation.
    a) True b) False c) Can't say
23. The public perception of the library and information profession is one of the important issue in challenges for the code of ethics.
    a) True b) False c) Can't say
24. The ALA (USA) code of ethics, published in 1938, does not serve as the foundation for the global development of the code.
    a) True b) False c) Can't say

1.11 SUMMARY

Ethics is the study of morality. The word is a translation of the Latin word ethicus. In order to control and direct the behaviour of its members during professional activity, a profession needs to have a set of moral standards. The science of morals concerned with the fundamentals of ethical behaviour is the broad definition of ethics. However, given that librarianship is a profession, we are more focused on professional ethics. Nearly every profession makes an effort to develop a code of professional behaviour to serve as a guide for practitioners in order to maintain societal recognition and to deliver their best. To ensure that clients are completely satisfied with the services provided by professionals, professional performances should adhere to ethical norms.

Although it began as a hobby, librarianship quickly evolved into a career requiring a specialised body of knowledge and specialised abilities in order to provide users with the best information collections that are well-organized for access. Thus, in the selection, gathering, organisation, and transmission of knowledge, librarians should adhere to generally accepted moral norms. The main goal of the LIS code of ethics is to maintain the six freedoms of study, thought, speech, the press, knowledge dissemination, and instruction while remaining impartial to caste, creed, religions, and ideologies.

The importance of ethics can be summed up as helping professionals make decisions related to their professional work; improving and validating the perception of a profession and professional; assisting librarians in projecting their practices; and also fostering a sense

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of professional zeal among the members.The code of ethics for librarianship is crucial because it teaches professionals about what is expected of them, how they should behave to meet the requirements of clients, and how to enforce standards to preserve the reputation of the profession. It helps to protect customers, librarians, and the reputation of the field.

Although "Librarian's Canons of Ethics," published in 1909, is where the code of ethics for librarianship originated, the ALA (USA) code of ethics, published in 1938, served as the foundation for the global development of the code. 34 nations currently have a code of ethics for librarians, however India does not have it.Having an ethical code is essential in every career. There are definitely ethical standards for librarianship, but whether or not they can be implemented on a regular basis is still up for debate. This is because of elements that exist both within the professional body and among librarians. Every librarian has a part to play if librarianship ethics are to be upheld like those of their counterparts in the medical sector and judiciary. For a librarian to rigorously adhere to their professional standards of behaviour, they must be exceptional and sincere in their motivation. The professional body must also be resolute in adapting, overseeing, and upholding the ethical codes. To better serve the changing demands of the industry, clients, and society at large, the collection of rules must be renamed and expressed in quantifiable behavioural statements.Professional ethics are essential for professional practices in order to ensure excellence in the services provided and societal recognition, despite these challenges, issues, and problems.

1.12 GLOSSARY& ABBREVIATIONS

Ethics **:** The Latin term "ethicus," meaning the character, custom, or attitude of people or the society, is the root of the English word "ethic." Morality is synonymous with ethics. It focuses on behaviour, attitude, and character of a professional. It discusses what is good or terrible, or what is right or wrong. A person's professional conduct, behaviour, morals, values, dedication, and obligation to the community/profession are all governed by ethics.

Professional Ethics : Professional ethics are a reflection of a profession's spirit, culture, and practises. It highlights what makes the group unique. When we talk about a person's work being very professional, we mean that their performance, intellectual and/or technical knowledge, sense of responsibility, and dedication to their clients are all nearly faultless.

Code of Ethics **:** A code of conduct established for each profession to guide ethical behaviour within that profession is known as code of ethics. It serves as a guide for making moral decisions since it promotes constructive interactions and guards against exploitation.

ALA **:** American Library Associations

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IFLA : International Federation of Library Associations

1.13 ANSWERS TO IN-TEXT QUESTIONS

1. True	13. True
2. False	14. False
3. False	15. True
4. True	16. True
5. False	17. d)
6. True	18. True
7. False	19. False
8. d)	20. False
9. False	21. d)
10. a)	22. True
11. d)	23. True
12. False	24. False

1.14 SELF-ASSESSMENT QUESTIONS

1. Explain Professional ethics and its significance in the Library Information Science Profession.
2. Define code of Ethics especially in the context of Library Information Science as a Profession.
3. Discuss the issues and challenges in following the professional ethics in the Library Information Science profession.

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LESSON 3

ROLE OF LIBRARIANS IN DIGITAL ERA

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STRUCTURE

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1.2 Introduction
1.3 Digital Era and Digital Library
1.4 Developments of Digital Libraries
1.5 SWOT Analysis of Library And Librarian In The Digital Age:
    1.5.1 Strengths
    1.5.2 Weaknesses
    1.5.3 Opportunities
    1.5.4 Threats/Challenges
1.6 Skills, Knowledge, Competencies Required For LIS Professionals
1.7 Librarian in the Changing Environment
1.8 Role of Librarians in Digital Era
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    1.8.2 Librarian as Facilitator
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    1.8.7 Librarian as Open Source Software Manager
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    1.8.9 Librarian as Sifter of Information Resources
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1.9 Barriers & Recommendations
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1.11 Glossary & Abbreviations
1.12 Answers To In-Text Questions
1.13 Self-Assessment Questions
1.14 References
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1.1 LEARNING OBJECTIVES

A rapid change in information communication technology has led to revolutionary transformation of the traditional libraries. The collection, resources, services and even working of the library has changed. The profession of librarianship has also changed drastically due to ICT. Now the librarians need to use various www 2.0 tools to facilitate various traditional library services as well as innovate some web based information services to increase their reach to the patrons. Selecting, acquiring, arranging, disseminating, and providing access to information in line with the particular needs of individuals or groups of people is commonly understood to be the focus of librarianship. Every practical librarian is aware that the bounds of librarianship have been substantially fudged, loosened, and obliterated in recent years due to rapid expansion in the world's communication infrastructure.

This unit seeks to clarify, reframe, reconfigure, and expand the boundaries of our concerns as we move forward to more discontinuous changes by taking a broader perspective of the purpose of librarianship and beyond. The goal is to start and encourage contemplation and conversation that must take place right away among us in order for our profession to meet the challenges of change, not to make forecasts or give solutions. The new functions of LIS professionals are also made clear, including those of content manager, consortium manager, web designer, service provider, mediator, site manager, collection manager, and database developer. It also explains the role reversal of librarianship as a profession. (Govind, 2018)

1.2 INTRODUCTION

The library information science, an interdisciplinary science which includes humanities, law and applied science along with the study of topics related to the libraries, resources as per the parent institution, services, organization, preservation and dissemination of information. It also includes archival science. Majorly the library science as a discipline includes collection acquisition, organization & management, Information Communication Technology, classification, cataloguing, preservation of information, reference etc. The aspiring professionals are taught to classify and catalog the library resources, facilitate services as per the news of the

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user groups, and how information needs to be applied cross-culturally by the libraries. They are also taught about the professional ethics and skills and competencies required to excel in the field and to best serve the user group. With the revolution of ICT the library information science as a discipline is already transforming by including new topics (e.g. Knowledge management, information architecture, database management etc).

The information communication technology age has imposed many challenges to libraries, information centres, library science profession and the entire field of librarianship. The profession of a librarian comes under the service profession and is an age-old noble profession. The emergence of the World Wide Web has unpredictably and significantly altered the function of the librarian to that of an information supplier or knowledge navigator who, in light of information technology and user needs, uses new strategies to search information. The work and responsibility of librarians today are defined by the lack of resources, continual change and need for flexibility. Good communication skills also define the work and responsibilities of librarians. In other words the role of librarian is very much affected by the ICT & WWW (Kamble & Wankhade, 2021). Library professionals need to update and educate themselves continuously. They also need to upgrade their ICT skills and adapt them to face the challenges of the World Wide Web. New set of skills is required to use www 2.0 tools to facilitate innovative web based information services, to access digital resources and digital libraries. The library professionals need to develop skills of developing and maintaining websites, library networking and resource sharing, open source software, courseware, Barcode, QR code and RFID technology etc.

It is inferred that libraries need to have a clear awareness of the user's information and knowledge demands on the one hand, and the knowledge and accessibility to pertinent information resources on the other, in order to fulfill this function effectively. The description also gives our roles an end goal, which is to assist people in finding information that will advance their knowledge in all areas of their life. It draws a contrast between knowledge and information because the latter is intrinsic to an individual's character and cannot be separated from it. We assist people in locating reliable information, but it is ultimately up to each person to absorb it and claim knowledge as their own. It is clear that the majority of librarians work primarily in an intermediary capacity. We will try to learn about the new roles ICT has challenged us with.

1.3 DIGITAL ERA AND DIGITAL LIBRARY

Technology that accelerates the pace and breadth of knowledge exchange throughout the business and society is what defines the Digital Era. The growth of the digital era can be viewed as the creation of an evolutionary system in which knowledge turnover is not only highly high

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but also increasingly outside of human control, making it a period when managing our lives is more challenging. The social and economic effects of the Digital Era are profound and will get worse as technology grows more knowledge-based, becomes more integrated into our daily lives, and develops a "life" of its own. In the digital era the information is in the digital format. It could be born digital or converted from print into digital that is digital reformatted (Shepherd, 2004).

Traditional libraries used to have only print collections but due to the explosion of digital resources, these have been converted into hybrid libraries having print and non print resources. The libraries having only digital resources are known as digital libraries and also known as virtual libraries as these do not need physical space to build their collection. Digitization is the process of converting print information or resources into digits for computer use. This helps to send information across a single channel while lowering the likelihood of information distortion. Additionally, the integration of ICTs led to easy handling of information quickly, and with greater flexibility. A lot of libraries are currently working to digitize resources including rare books, periodicals, patents, manuscripts, photos, and other visual materials. National Digital library is one very prominent example of the same.

Other than this traditional libraries are also trying to progress through the integrated library management system to automate their housekeeping operations. It helps the library staff in the circulation process. Yet long lines, especially during peak hours, lead to explosive situations in many libraries as many customers lose their cool. Here the implementation of Radio Frequency Identification (RFID) technology comes to the rescue of the library staff. It provides for the function of borrowing books along with the installation of self-checkout equipment and also to deposit books using a self-return book drop facility. Here the status of the book in the circulation database is updated as soon as it is returned. Which is a big achievement for the traditional libraries?

IN-TEXT QUESTIONS

1. ---------- libraries have both types (print and non print) of collection.
2. The libraries having only ---------- resources are known as digital libraries
3. Digital Libraries are also known as ---------- Libraries.
4. Integrated library management system helps to ---------- the libraries.
5. The library information science is an ---------- science which includes humanities, law and applied sciences.

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1.4 DEVELOPMENT OF DIGITAL LIBRARIES

The ability of digital compression and improved radio frequency usage, which was one of the factors slowing the expansion and acceptance of wireless communication, have been made possible by the application of digital technology to telecommunication. It has aided in the fusion of information, images, and sounds, assisting in the transition to the multimedia era. Digital libraries offer a technique to improve the Teaching Learning Process from a Distance and are capable of managing content from numerous locations. Network of Electronic Libraries is another name for the global virtual library system known as "Digital Library."

In simple terms a digital library is a library that can be accessed online. They are network-based distributed systems, and each server is in charge of keeping a specific local collection of digital documents, from a set of electronic texts to video on demand services. They would give users a cohesive, consistent view of various information sources, enabling connectivity and engagement with that information regardless of time or place.

Some of the characteristics/merits of digital library are simultaneous multiple access, remote access (Free or paid), accessible anytime, anywhere (24 x 7 x 365), preservation of data/information in digital format, faster access to resources, combining library collections and commercial databases through federated search engines, saving space, less cost, help in resource sharing and Interlibrary loan, union catalogue, and faster publication of new research etc. Some demerits are need of Hardware/Software to digitize and access, need of Internet connection, up gradation of infrastructure, trained personnel, good search strategies to find information, Copy right and IPR etc.

IN-TEXT QUESTIONS

6. The issue of ---------- and ---------- is frequently encountered and challenging to solve in digital libraries.
7. Digital libraries help in ---------- and interlibrary loan.
8. Digital libraries give faster access to library collections by using ----------.
9. Both ---------- and ---------- are needed for preserving digital data.
10. Network of ---------- is another name for the global virtual library system known as "Digital Library."

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1.5 SWOT ANALYSIS OF LIBRARY & LIBRARIAN IN DIGITAL AGE

Technology in the area of librarianship has advanced from writing by hand through electronic pens, typewriters, word processors, and finally computers. Now more than ever, the process of finding reference material is much faster due to electronic resources and the Internet. The large card catalogues have already been replaced by computer databases, and browsing options have expanded. Very Few libraries have remained unaffected by technology. One of the oldest professions in the world, librarianship now requires a new generation of professionals that can understand and integrate information, education and technology. However, technical skills like knowledge of HTML, programming languages, hardware fundamentals and troubleshooting, understanding of software, and the ability to search, display, and retrieve data effectively in a variety of information retrieval systems are necessary for librarians to survive in the field.

For the SWOT analysis, following are the strengths, weaknesses, opportunities and Threats (Challenges) of the library information science profession (Rawal & Prajapati, 2008).

1.6.1 Strengths:

- Library a service organization and the librarian is service oriented.
- Librarians are able to:
    - Identify, evaluate and organize print as well as electronic information resources.
    - Understand the needs of the user and relevance of the information.
    - Train user to search & retrieve information through information literacy tutorials
    - Believe in information sharing via networking and resource sharing.
- The management concepts are most similar to the organizing, documentation, storage, and making information accessible on networks and librarians are familiar with them.

1.6.2 Weaknesses:

- The majority of librarians are:
    - Intimidated by technology advancements.
    - Don't have the same level of technical expertise as the relevant experts.
    - Are no longer custodians of knowledge.

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- Communication skills to interact with end users and IT professionals

- Users' misconception that all information is available and accessible on the Internet.
- No feedback system to understand needs of users.

1.6.3 Opportunities:

- There are several opportunities for the librarian in www environment to facilitate access to information to users in a timely and suitable manner.
- Multiple users can access simultaneously, eliminating time wastage.
- Provide access to rare and delicate historical documents that have been digitized and preserved.
- Electronic indexing, abstracting and bibliographic services
- Electronic interlibrary loan and document delivery.
- Electronic books and Online Reading accessible to users
- The library catalog is available on the web (OPAC) accessible remotely with user friendly interface & platform independent.
- The library uses a variety of methods to inform its patrons of its physical and digital collections, such as electronic newsletters and bulletins.
- Virtual reference service by email, social networking sites, using a Web form or through various meet platforms like Google meet, zoom etc. available any time anywhere (24 x 7 x 365)
- Virtual tours to describe the actual library,. These may be circulated through social media, uploaded on the library website or YouTube channel. These may also be presented through the various virtual meet platforms.
- Web forms are increasingly being used to provide services that were previously only available offline, such as interlibrary loan forms, book and journal request forms, suggestion forms, plagiarism check etc.
- Use of open source software to generate Barcodes, QR-codes, posters, brochures of webinars etc for easy access to information.
- Some other options include hosting online tutorials, posting instructions, managing electronic bulletin boards, supporting distance education, and providing access to e-journals.

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Knowledge is unquestionably a source of power in today's world. Expanding one's knowledge base will undoubtedly result from gaining more expertise, understanding, and familiarity with the key elements of one's work. An informed librarian is better equipped to deal with the alterations and uncertainties in the new situation. A student studying library and information science should be capable of working with current technology in the field of information science. Traditional librarians need to change their mindset and also make efforts to acquire skills of modern tools and technologies.

1.6.4 Threats/Challenges:

- Threat from the Internet? All information is free. It is convenient to use and more fun
- Decreasing value of librarians due to the Internet?
- Are traditional libraries in competition with digital libraries?
- Lack of understanding of libraries on the part of administration.
- Stereotyping of librarian and many still view them as outdated.
- Institution culture does not respect library and library professionals and reinforce the negative perception.
- To think that anyone may search online databases obviates the need of librarians

In a nutshell, information is not media specific. Both print and internet sources may contain it. If libraries are to remain as sources of information, then this reality must be reflected in their operations, structure, and content. This ought to be reflected in every library budgeting and financing decision. It is important to see the change that is required as a chance to stay current with the times rather than as something negative. An improvement in the routine work of the librarian has occurred. The potential created by digitalization is huge.

1.6 SKILLS & COMPETENCIES NEEDED FOR LIS PROFESSIONALS

Access to information for those in need has always been the primary objective of the library and information professions. Over time, the actions taken to accomplish this goal have changed and evolved. This involves the necessity of using available technologies for a growing information society. The advancements in knowledge storage, display, and archiving, knowledge generation and organisation, information explosion, and computer-assisted information retrieval

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have influenced information activities. Librarians and information specialists active in obtaining, storing, retrieving, and disseminating information along with support of computer specialists and information specialists are important for digital libraries.

Users may access the information differently, but information professionals can adapt their abilities from existing procedures to manage this information. There is no disputing that the global library environment is new, and librarians are still getting used to it. However, the fundamentals of the profession and the duties and responsibilities attached to it will help to guarantee librarian survival. Information handling abilities, facilitation and training skills, evaluation skills, and customer focus are the core competencies typically associated with information workers. All of these competencies are essential today. These abilities include cataloguing, classification, indexing, inquiry work, and user education—all tasks that, if performed by librarians, will make it simpler to use the Internet.

It is important to reevaluate the traditional library abilities and apply them to information services in the internet environment. For instance, networked information retrieval can be made more user-friendly by using cataloguing and classifying skills. Users may find needles in the Internet haystack with the use of well-written metadata files that are created using cataloguing principles. It is possible to guarantee networked resources' availability, authenticity, dependability, and validity by creating catalogues that include electronic resources.

IN-TEXT QUESTIONS

11. Librarians through ---------- and information literacy programmes help to train users to search and retrieve information.
12. The primary objective of the library and information profession is ---------- to information for those in need.
13. ---------- is unquestionably a source of power in today's world.
14. ---------- users can see the same electronic document simultaneously.
15. An ---------- librarian is better equipped to deal with the alterations and ---------- in the new situation.

1.7 LIBRARIAN IN THE CHANGING ENVIRONMENT

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To manage the evolving workplace environment, the librarian today needs a broad range of personal and transferable abilities. Here, it's important to emphasise the value of transferable talents over information technology expertise. Managers of networked resources and services will benefit from librarians' management and interpersonal abilities. Instead of specific technological competence (which can be learned), it is more crucial that digital librarians exhibit certain personal attributes (which are intrinsic)

This is not to argue that librarians should bury their heads in the sand and ignore the electronic age. The new electronic information environment requires the information professional to evolve and adapt. They must become knowledgeable about new technology and understand their advantages and disadvantages. Computers and technological advancements shouldn't make librarians feel threatened; instead, they should embrace the new technology and play a crucial part in organisations.

In this age of information explosion, organisational skills are even more important. Due to their extensive skill set and understanding of their users' and organisations' information demands, most librarians are well-suited to lead intranet/internet initiatives through the many stages of design and management. The librarian's job in this situation is to assist users in finding the information they need and then give them the means to evaluate and utilise the resources according to their particular needs. To do this, librarians actively seek out people in various contexts and make full use of information and multimedia technology by providing training in a variety of ways, which include Web based instruction and online tutorials.

1.8 ROLE OF LIBRARIANS IN DIGITAL ERA

Our society transitioned from being an agrarian society to an industrial society during the Industrial Revolution. An information society has replaced the industrial one thanks to computers. As a result of the Internet, our society has transitioned from an information society to a global society. Human civilization is undergoing a fundamental revolution due to the explosive growth of information and the use of information communication technology in the form of high levels of computerization and transmission of electronic information. (Tubachi & Halvegar, 2020)

The World Wide Web and the Internet are incredibly strong and are changing not only librarianship but also his day-to-day professional operations. The librarians need to become more effective and take on new roles like intermediary, facilitator, end-user trainer/educator, web organiser & designer, researcher, interface designer, knowledge manager/professional. Although a librarian fills a variety of tasks within an organisation, it might be challenging to pinpoint one

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as their major responsibility because these positions fluctuate depending on the goals and needs of the organization. (Rawal & Prajapati, 2008)

Sharing information resources and providing a clear picture of research & growth of libraries as a component of parent institutions are fundamentally the main competencies for library professionals in the Digital era. People's perceptions of the information landscape in academia, research, consumer education, and the public's use of information to address problems in their daily activities have altered as a result of the application and integration of ICT services. They need to learn and practice various ICT tools, implement them in their library information centres for facilitating web based information services. In that case librarian plays a variety of roles by implementing and maintaining ICTs. Some are as follows:

1.8.1 Librarian as an intermediary in search:

Traditionally librarians were the ultimate search engine before the reinvention of search with the web. They were pioneers and innovators in information taxonomy as well as reliable, trustworthy sources for historical data. We can all now easily obtain knowledge thanks to online research and the power of the web. Through a formal conversation known as a reference interview, research librarians assist people conducting research in finding the data they require. Advanced information searching methods and other information seeking strategies should be fundamental knowledge for digital librarians. In an organization, though librarians began training end-users to perform their own searches, the demand for searches by information professionals have not decreased. Therefore, a user who still conducts straightforward searches on his own behalf goes back to the librarian or information specialist to conduct more complicated searches. The result has been an increase in burden for librarians as a result of the more intricate and time-consuming searches. Hence librarians are working as search intermediaries.

An intermediary may be defined as a person or device positioned physically between IR (Information Retrieval) systems and the actual user with the aim of interactively transforming information requests into query formulations that are suitable for the retrieval components of one or more IR systems, modelling and supporting the actual user with regard to his/her information need and underlying goals, and providing information from IR systems that may be valuable, relevant and pin pointed to that user. A librarian or information specialist is typically a human mediator.

Text-presentations, classification and indexing schemes, and varied information retrieval methods used in databases and other information sources are all examples of IR systems. However, research in this area is focused on developing user interfaces and system settings to integrate non-human intermediary roles into online IR systems. Research has shown that a single

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librarian or information specialist can save the comparable amount of time in comparison to the end user. They are more effective and do efficient searches. In other words, when it comes to completing their own information searching tasks, end users are three, four, or even five times less productive and efficient than librarians. This is likely the most crucial thing to keep in mind since it explains why librarians will continue to play a part in the advancing digital information world.

1.8.2 Librarian as Facilitator:

Electronic documents are already widely available on the Internet, and the World Wide Web now offers extensive support for accessing these documents. Many print journals have moved to the Web, where both free and paid publications are available. In this situation, it is essential for the conventional librarian to develop the skills needed for efficient use of contemporary technology and related applications in order to find and retrieve the widely spread information in cyberspace. In order to properly lead and instruct the information searchers in their use, they must not only become familiar with the subject but also develop a certain level of skill. Pandemic has also initiated this and librarians have become more competent and confident in using the technology to help the end user. They helped in accessing the e-resources from their home or remotely.

In order to use subscribed/paid e-resources, the traditional librarian must act as a facilitator in identifying, gathering, and organising the information infrastructure, such as network access, software access, licenses, and passwords. The traditional intermediate position of the librarian, which by its very nature might serve as a foundation for the facilitator role in a networked society, is likely to come into play. The facilitator typically doesn't address all of the users' informational issues. In one way or another, he responds to the users' requirements for communication and information and identifies the resources necessary to meet those needs.

1.8.3 Librarian as End user trainer/educator:

Users are struggling to keep up with millions of e-resources accessible to them due to the vast rise in the number and variety of information sources available, whether locally or remotely via the internet. Few patrons of libraries access information sources effectively and efficiently. But regardless of how advanced interfaces and search engines become in future information access systems, people will still need to be taught how to use them. Users will need to be knowledgeable about the fundamental methods and instruments for information collecting.

The areas in which training given by the librarian would include not only the use of electronic journals and databases of many different publishers, but also the use of abstracts and indexing databases, databanks, digital publication and document delivery services. End-user

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training aspect of librarian would also include organization of information resources, search strategies, tools, information searching skills, awareness of resource constraints and alerts to users on new resources in their subject area. The librarian therefore has critical role in the digital library of future as educator or end-user trainer.

1.8.4 Librarian as Web Site Builder or Publisher

To be highly trained and service-oriented professionals, librarians must be knowledgeable in HTML, VB Script, and Java script. They will be better able to meet their personnel needs as well as the users' information needs at all levels thanks to this. Additionally, it will give them the ability to modify their own online systems to meet the needs of their users. If nothing else, they can develop a web system, website, or online portal using open source software, which can then be uploaded to a server. Google Sites is a tool for the same that may be utilised for free design and hosting of website

The establishment, maintenance, and content-filling of a Web site of any organisation would greatly benefit by the conventional skill of a librarian in finding, analysing, and organising the information. Access to external resources, including Web pages dedicated to their discipline, is provided by an organization's website. Information that an organisation manages on its website includes information about courses, directories, statutes, annual reports, etc. Delivering information about the library and its services, such as service times and locations, staff profiles, staff policies, an interface to the library's online public access catalogue (OPAC), access to e-resources, varied research support services, online forms to facilitate library information center services etc. is the duty of the librarian while constructing a web page, a library website or a web portal. The librarian needs to develop skills to create and maintain the website and to also keep it updated. There are many open source software available for the same.

1.8.5 Librarian as Researcher:

Librarians are expert researchers who have a special understanding of the breadth and depth of information sources in a range of topic areas. Researchers' teams will increasingly include librarians as vital players. Librarians would relocate to the beginning of the information production cycle and take on a more significant role in the process by making information more accessible by finding, evaluating, synthesising, and packaging it. Teams within an organisation should have an information specialist in charge of the team's information gathering abilities.

1.8.6 Librarian as Interface Designer

The importance and relevance of interface design will increase in relation to how people access and use digital technologies. Being much more closely involved in and working in collaboration with computer and information scientists on projects like designing, organising,

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developing, and maintaining digital library repositories, interfaces, search engines, networks, and Web documents may help librarians get out of their stagnant attitude Since they have spent years guiding customers through the use of electronic media and later the Internet and World Wide Web. Librarians may assist in the creation of technology-based information services and share their deep understanding of what people want and need.

1.8.7 Librarian as Open Source Software Manager

Financial and budgetary considerations play a significant and crucial role in the development of digital libraries. These days, open source digital packages are becoming more and more popular. Open source software is preferred when creating a digital library in a tight financial situation. The freeware software's objective is to enable users, especially in academic and other public service institutions, to create their own digital libraries. It is a well-known truth that library professionals should learn about managing and administering open source software, as well as how to identify and apply relevant open source software and tools to supply or give users access to high-quality resources for teaching, research, and practise.

1.8.8 Librarian As Knowledge Manager/Professional

In order to achieve institutional goals, knowledge management (KM) entails the identification and analysis of both available and necessary knowledge, as well as the subsequent planning and control of actions to create knowledge assets. Organizations globally understand the benefits of including librarians in their knowledge management systems. They have the skills developed as information managers for the organization. Librarians may effectively engage in the process of knowledge production, which includes mechanisms for knowledge capture, exploitation, and protection in addition to the building of the necessary infrastructure. Users, knowledge professionals, and technology specialists are typically three groups of experts who contribute to the construction of the knowledge centre in an organisation.

Knowledge professionals organize knowledge into systems and structures and make it easier for people to use knowledge resources productively. They may be managers, archivists, and librarians among others. If a librarian wants to work as a Knowledge Manager or Professional, they must have a wide range of skills and competence while collaborating closely with users to gather and assess strategic intelligence across the whole enterprise. In the future, librarians would go from being in the background to being at the forefront of the company. They would move from their previous position as an unimportant support group member to a prominent one where they would co-manage knowledge management with users and technology specialists. The knowledge policies, structures, procedures, and systems that will foster organisational learning would be guided and shaped with their assistance.

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1.8.9 Librarian as Sifter of Information Resources

The usual definition of sifter or siftware is software program to extract unknown, legitimate and actionable patterns, associations, changes, oddities, and rules from big databases. Data mining is another name for this procedure. One may access a wealth of information resources via the Internet and Web. The experienced librarian who assists users in organising and making sense of the resources may be referred to as a "sifter." The people who manage the tools for filtering, searching, and making sense of the vastness of cyberspace are the ones who will own the future, not the conduits or content providers. In other words, the librarian can be crucial to the developing situation.

1.8.10 Librarian as a Library Consultant:

Since every system encounters issues from time to time, & Librar also a system, a service organisation faces them. There are numerous technological and scientific advancements occurring today that make it difficult for library to handle and manage information. Library professionals need to engage a subject-matter specialist to solve the issues. Consulting is brought into an organisation to offer guidance on particular issues where there is either sufficient internal experience or when an outsider's perspective is taken into consideration. A person specialising in LIS and ICT may be the best choice. His/her help is sought in many institutions with a view to make improvement in existing system. That may be interpreted as that librarian in the digital era must have advanced knowledge of ICT to deal with these kinds of situations. Librarians with these expertises to work as library consultants are high in demand.

IN-TEXT QUESTIONS

16. Siftware is a ---------- program to extract unknown, legitimate and actionable patterns, associations, changes, oddities, and rules from big databases
17. Knowledge management (KM) entails the ---------- and ---------- of both available and necessary knowledge
18. A Knowledge Manager or Professional must have a wide range of ---------- and ----------.
19. The librarian has --------- role in the digital library of future as ---------- or end-user trainer.
20. A librarian or information specialist is typically a ----------.

1.9 BARRIERS & RECOMMENDATIONS

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Throughout the ages, supporting knowledge cultures has been a key function of library and information workers. As the networked and digital world has evolved, libraries have also changed dramatically. The information resources that engage readers in various capacities and ways can be accessed through libraries. When a catastrophe like the COVID-19 pandemic struck, physical libraries were forced to close their doors, yet opportunities and doors for digital libraries were opened like never before. The task of delivering information services to user groups and actively involving them has been accepted by LIS experts all over the world. (Malhan, 2017)

The need for new knowledge, a more thorough search for ideas across all cultures and communities, and the adoption of best practises are being driven by growing globalisation, rising competitiveness, and technological upheaval. Institutions that produce new knowledge, gather knowledge tailored to needs and applications, and strategically use it are thriving and moving forward in the modern world. In the digital era the traditional librarians transforming into digital librarians are facing many issues, challenges or barriers. There are many studies conducted to find out the problems faced by them. Some of them are as follows.

- Inadequate Infrastructure
- Lack of funds to purchase and improve infrastructure
- Lack of technical skills
- Lack of knowledge & training
- lack of high quality teaching staff
- Lack of faculty and training for distant programs
- Lack of global perspective
- Curriculum not updated
- Lack of high caliber staff
- Slow speed of Internet
- Inadequate research in the profession
- Lack of opportunities for training of professionals
- Lack of personal initiatives or interest

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It is implied that skills and responsibilities are affected due to various barriers given above. Technology changed the information seeking behaviour of the users and accordingly library professionals also need to change and make optimum use of rapidly changing information communication technology to provide innovative web based information services, which are effective to fulfill the requirements of the users. Some solutions and recommendations are as follows:

- Arrangement of funds
- Adequate IT Infrastructure
- Library professionals to acquire technical skills to work in digital era
- Capacity building workshops, continuing education and training programmes by library associations or equivalent
- Availability of High speed Internet, modern tools & technologies
- Library curriculum needs to be revised
- High Quality teaching staff required
- Research need to be improved and disseminated
- Professionals need to be motivated and encouraged
- Issue of Status of librarians be resolved

1.10 CONCLUSION

The main objective of any library is to efficiently combine print, non-print, and electronic resources to meet the information needs of the users (Kumar 2016). These days, new technologies are used to change the services offered by any traditional library. One of the key ideas that have changed how the traditional library is envisioned is the digital library. This phrase is used to refer to libraries that don't have books, libraries that have information in electronic form, and libraries that offer access to information in digital form. A new type of predicament has been introduced by the establishment of a sizable informational repository on the Internet. The traditional knowledge gatekeepers, the library and information science (LIS) professionals, are in danger of losing their position since their knowledge is undervalued and no one seeks out their opinion. According to what users may believe, search engines direct users directly to the

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information they need, eliminating the need for a middleman to categorise, catalogue, cross-reference, or provide source recommendations.

In light of the expanding digital landscape, networked environment and changing information seeking behavior, libraries must now go through huge transformations. In this changing scenario a librarian needs to be a highly competent professional whose exclusive focus shall be on processing, disseminating, and utilising information. With the incorporation of the Internet into the profession of librarianship, the function of librarians is continuing to change. Although it is challenging to predict with certainty how active the role of librarians will be in this changing era, it can be said with confidence that their services cannot be dispensed with because they possess the necessary qualifications and historically have had the first right to attend to the information needs of seekers. They will be considered one of the most highly compensated professionals in the world due to engagement in the global realm of knowledge.

Libraries can increase their functionality and provide services in recently emerging areas. A typical information user is faced with information overload and a time-constrained environment, so they need professional assistance in order to find useful information. Increasing information unbundling, new knowledge management (KM) tools, content management software, and big data difficulties are creating new service opportunities for LIS workers. The new service opportunities will be determined by how quickly professionals can recognize service gaps, comprehend new roles, and get ready for them. This is because when trained personnel are deployed in the appropriate location and put to work, new potential services are inherently more likely to succeed.

1.11 GLOSSARY & ABBREVIATIONS

DL	Digital Library
KM	Knowledge Management
ICT	Information Communication Technology
IPR	Intellectual Property Rights
IR	Information Retrieval
RFID	Radio Frequency Identification
SWOT	Strength, Weakness, Opportunity, Threat

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Digital Library — A virtual library with digital resources/collection accessible anywhere, anytime (24 X 7 X 365). It is a digital repository, or digital collection, an online database of digital objects that can include text, still images, audio, video, or other digital media formats.

Digitalization — It is the process of converting information into a digital format. In this format, information is organized into discrete units of data (called bit s) that can be separately addressed (usually in multiple-bit groups called bytes).

Sifter — It is a software program to extract unknown, legitimate and actionable patterns, associations, changes, oddities, and rules from big databases. Data mining is another name for this procedure.

Intermediary — An intermediary is defined as a person or device positioned physically between IR (Information Retrieval) systems and the actual user with the aim of interactively transforming information requests into query formulations that are suitable for the retrieval components of one or more IR systems, modelling and supporting the actual user with regard to his/her information need and underlying goals, and providing information from IR systems that may be valuable, relevant and pin pointed to that user.

1.12 ANSWERS TO IN-TEXT QUESTIONS

1. Hybrid
2. Digital
3. Virtual
4. Automate
5. Interdisciplinary
6. Copyright, Intellectual Property
7. Resource sharing
8. Internet
9. Hardware, Software
10. Electronic libraries
11. User Education
12. Access
13. Knowledge
14. Multiple
15. Informed, Uncertainties
16. Software
17. Identification, Analysis
18. Skill, Competence
19. Critical, Educator
20. Human Mediator

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1.13 SELF-ASSESSMENT QUESTIONS

1. Explain the digital library, its characteristics, advantages and disadvantages.
2. Please explain SWOT analysis of digital libraries.
3. What are the various roles of a librarian in the digital era?
4. Explain Skills and competencies required for librarians in the internet age.

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LESSON 1.1

CLASSIFICATION: CONCEPTS AND TERMINOLOGY

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Concept of Classification
1.3.1 Historical Perspectives
1.4.1 Classification Terminology
1.4.2 Terminology concerning entities.
1.4.3 Terminology concerning assortment of entities
1.4.4 Terminology concerning array
1.4.5 Terminology concerning chain
1.4.6 Terminology concerning filiatory sequence
1.4.7 Other Terminology
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson you will be able to:

- understand the concept of Classification
- learn the historical development of different classification scheme
- concept of different terminology used in library classification

1.2INTRODUCTION

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With the development in the society and humankind, the concept of ‘classification. has flourished. Classification is the orderly arrangement of objects. From birth through old age, every person makes conscious or unconscious use of categorisation in its everyday activities. Humans have always used categorization systems. It would be difficult for humankind to progress without categorization.

The human mind is always looking for novel concepts, beliefs, and ideologies. As a result, information is continuously being produced across all disciplines as a result there is a boom in the publications. The library is the only effective and long-lasting institution that optimises the societal value of knowledge and information that has been preserved. Library gathers, compiles, and distributes information to those who need it. Therefore, maximising the use of the collected recorded knowledge is the fundamental and most important role of libraries, with each user having their own document and each document having their own reader. The libraries have been methodically arranging papers on shelves utilising a variety of ways and procedures to do this. Users approach the library for a document whose author, title, or subject are already known. Among all the search through subject is the most popular. To fulfil these different approach of the users library use the classification for organising the document in the library.

The present lessons explain the term classification its concept in library and its associated terminology.

1.3 CONCEPT OF CLASSIFICATION

The word "classification" is derived from the Latin word "classis," which was used in the Roman Empire to classify individuals according to their status and wealth. Similar to how the Sanskrit word "vargikarana" is employed in India to separate similar items, so too have the ‘Vedas’, ‘Smrites’, and ‘Upanishads’. However, one must bear the following in mind in order to comprehend the categorization process:

i. Classification is done with things: Before beginning the classification process, one must have the items or objects they want to categorise, group, or arrange. The technique of categorization can only be used when there are items or objects to group or divide.
ii. Cause for which it is performed: There has to be a basis, such as a trait, to categorise objects into like and unlike. This trait might be created artificially or naturally.
iii. Objective: Dividing or grouping items or objects into like- and unlike-groups must always have a rationale.
iv. Mental process: Classification may be seen as a mental exercise or process since it involves our minds continually during the whole procedure.

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The term "classification" is used in library and information science to describe three different but related ideas: a system of classes, ordered according to a predetermined set of principles and used to organise a set of entities; a group or class in a classification system; and the procedure for assigning entities to classes in a classification system. Here, the first Classification is seen as a process. As a process, classification is the orderly and systematic assignment of each thing to one and only one class within a system of classes that don't overlap and don't belong to the same group. This process is lawful and systematic. It is lawful because it follows a set of rules that govern the structure of classes and the relationships between them. It is Systematic because it requires that these rules be applied consistently within a set order of reality. The scheme itself is arbitrary and artificial; artificial because It is like a tool which is used for a meaningful organisation and arbitrary because the criteria used to determine its classes only take into account one viewpoint on the domain, to the exclusion of all other perspectives. (Sharma, 2006)

1.3.1 Historical Perspectives

The History of Classification is mainly the history of academic schemes of arranging human knowledge or documents. For the last four to five thousand years, the thinkers and philosophers have shown interest and attempted classification of thoughts.

The Vedic and Buddhistic thoughts were classified according to prevalent social systems; Buddha, being more revolutionary in his viewpoints.

The Greek classification was mainly utility centered and medieval Europe was more feudal than logical, which become highly scholastic in due course.

Bacoman classification of thoughts (1605) was psycology centered , while Kanrs' Classification (1781) based on primitive human interest .

From the middle of the 16th century to the middle of the 19th century, the decimal integer notation was use. Brunet Museum Library Classification. In 18thCenturu Charles Ammie cutter originated the Expensive Classification (1893). It was established in seven expansions. All six expansions were published in one volume in 1893, the seventh was published in the beginning of the 20th Century. It is an enumerative classification scheme.

Another scheme published in 1895 is Universal Decimal Classification which was initiated by the Paul Outlet and Henri La Fontaine, which was further expanded with the arrangement with Melvil Dewey.

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In the early 19th century Dewey Decimal a Librarian of Amherst College established a classification scheme based on the scientific method named as Dewey Decimal Classification. Which is the most Widley used scheme till date.

Another significant contribution in the classification schemes is made by Professor S.R. Ranganathan via his intuitive and intellectual insights. He enunciated the first edition of colon classification (CC) in 1933 and subsequent edition appeared in 1939, 1950, 1952, 1957 and 1960. This scheme provide the autonomy to the classifier as it provides the set of rules and devices which help classifiers to construct class number of new foci, not listed in the schedule of CC. Another remarkable contribution of Ranganathan was the development of Dynamic theory of Classification, published in 'Prolegomena to Library Classification' in 1937. The postulates, cannons and principles formulated by him provided a scientific basis to the theory of library classification. His ideas formed the basis of much of the progress made in classification theory in England during 1950's.

The founding of the Classification Research Group (CRG) in 1952 was another important development that took place in the Great Britain. British achievement. CRG was significantly influenced by the Ranganathan's work. The group's major focus in the 1950s was the application of aspect analysis and synthesis methods to the creation of classification systems for specialised disciplines. The classification schemes for the social science by Kyle, the diamond technology scheme by Farradane, and the occupational safety and health scheme by D.J. Foskett are only a few examples of the special schemes created by CRG. A faceted categorization must serve as the foundation for all information retrieval techniques, according to a letter produced by CRG in 1955. This idea was expanded upon at the Dorking Conference (1957) which resulted in the development of a comprehensive dictionary of terms for usage on a global scaleput together by B.C. Vickery. The International Federation for Information (FID) and Documentation conferenceCommittee on Classification Theory, where Ranganathan was strongly involved in the idea propagation, were good complements to this movement.

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IN-TEXT QUESTIONS

1. Classification Research Group is located at _____.
2. Prof. S.R Ranganathan is one of the principal contributorof library classification. True / False

1.4 CLASSIFICATION TERMINOLOGY

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The fundamental concepts of the subject must be properly described in order to comprehend the theory of classification. Consider the following example, If someone have to choose two students from each class to take part in a "open university quiz". Studying each student's traits or attributes in the class would be the greatest way for selection. Some of the traits may be shared by all of them, while others will set them apart from each other. Being a student, for instance, is a common quality. This means that grouping a class into smaller groups is impossible. Other characteristics such as sex, age, complexion, IQ, height, speaking ability, etc. may classify pupils into groups, although not all of them are relevant when considering the classification's objectives. Sex, intelligence, and speaking ability may all be significant qualities for our purposes. Let's apply the first characteristic, which is sex, to all pupils. The "Universe of Students" may be divided into two groups: boy and girl. Assume that each group has a fixed location of 1 for the females and 2 for the guys. In other words, group I (female) and group 2 are rated as the two subdivisions (boys). They are now known as classes.

If we sequentially apply the second as intelligence level and third characteristics as 'Good' or 'bad' each of these classes. Class 1 and Class 2 are created by using the same characteristic, their relationships are equal. This is an array of these classes. The classes with the subordinate sort of connection like Class I girl has a second characteristic of intelligence level which is further subdivided into third characteristic. Thus this create a Chain. The arrangement is known as a filiatory sequence if these classes are organised in a linear order while maintaining their parent-child relationship.

On the basis of the above analogy, Hussain (1993) define certain terms under the following headings

- Terminology concerning entities.
- Terminology concerning assortment of entities
- Terminology concerning array
- Terminology concerning chain
- Terminology concerning filiatory sequence

1.3.1 Terminology concerning entities

i. Entity : "Any existent, concrete or conceptual, that is a thing or an idea" is called an Entity (Ranganathan, 1967).From the above example the entity is boy, or girl.
ii. Aggregate: "A collection of entities without any special arrangement of them is known as an Aggregate". (Ranganathan, 1967). Any unorganized group is knows as aggregate like group of students, a group of colleges, a group of subjects.

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iii. Universe: " An aggregate under consideration in a context" is known as a Universe.(Ranganathan, 1967). For example: 'group of students' is the above example can be called a 'Universe of students'. Universe is divided into finite having finite number of entities and infinite in which entities are not known.

iv. Attribute: Attribute is a "any property or quality or qualitative measure of an entity" (Ranganathan, 1967). For example in case of a person; color, height, age, sex, etc. are some of the attribute. Further, it is divided into two;

- Like Entities: these are the "Entities sharing a given attribute equally in measure, intensity, extent or any other basis, the likeness being with reference to the said attribute". (Ranganathan, 1967).
- Unlike Entities: these are the "Entities sharing a given attribute unequally in measure, intensity, extent, or on any other basis, the unlikeness being with reference to the said attribute" (Ranganathan, 1967). For example: like a book on similar subject is alike but differ in terms of author.

v. Characteristics: is defines as "an attribute, or any attribute complex, with reference towhich the likeness or unlikeness of entities can be determined and at least two of them are unlike". For example 'Gender' is an characteristics of the entity in a universe of students but 'expression' of student cannot divide the universe into at least two.

1.3.2 Terminology concerning assortment of entities

i. Division and Group

Division:

Sense 1 "Division is defined as the process of sorting the entities of a universe into sub-aggregates on the basis of a preferred characteristic, or putting like entities into the same sub-aggregate and unlike entities into different sub-aggregates".

Sense 2 It may also be defined as "the result of division in Sense 1, i.e. a group of sub aggregates" (Ranganathan, 1967).

For example: In the above example of Universe of students, by applying the first characteristic, i.e. 'gender' the entities can be divided into two sub- groups i.e. 'boys' and 'girls'. Which is further divided into like entities. The process of sorting the entities of a universe on the basis of a particular characteristic, is called Division, or classification

Group:

'Any sub-aggregate of the entities formed by the division of the entities of a universe is called a group.'

`A Unitary group is a group containing one and only one entity.'

`A Multiple group is a group containing two or more entities'(Ranganathan, 1967).

In the example, boys and girls each form a group that contains a sub-aggregate of the entities. A group may consist of a single entity or a variety of entities.For instance, there is only one girl in the class and all the other students are boys. As a result, the group of girls

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will be referred to as a Unitary group and the group of boys as a Multiple group. It is possible to re-divide each Multiple group into universes based on other characteristics.Therefore, each multiple group will produce a number of groups, some of which may be unitary and others multiple. The universe will eventually be totally sorted into unitary groups, or all of the universe's entities will have been separated out, if the process of division is carried out by applying characteristics one by one.As a result, "complete division" is the process of continuing to divide universe entities according to a series of characteristics until no multiple groups left.

v. Assortment and Class

Assortment:

The "process of the division of (the entities of) a universe into groups, plus that of arranging the groups in a definite sequence" of ranking. Is called Assortment (Ranganathan, 1967).

As a result, assortment is the stage after division. It entails classifying things into categories and then placing them in a set sequence.

Class:

"A Class is a ranked group". There exist a two types of Class; Unitary Class: which comprises of only one entity and; Multiple Class: Which comprises of two or more entities.

IN-TEXT QUESTIONS

3. A collection of entities is called _____.
4. Class is a ranked group arranged in a definite sequence by the division of the entities of a universe. True / False
5. 'A book' is an example of which of the following:
   a) Entity b) Universe
   c) Class d) None of the above
6. _____is any property or' quantitative measure or quality possessed by or inherent in an entity.
7. Name any two type of Characteristics with example.

1.3.3 Terminology concerning Array

i. Array: It can be defined as "the classes derived from a Universe on the basis of a single characteristic at anyone step in the progress towards its complete assortment and arranged inthe preferred sequence". Array are divided into:

- Open Array:is the one which can accommodatee new classes at both its end (extrapolation);

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- Closed Array:In an closed array accommodation of new classes is not allowed.
- Discontinuous Array: can accommodate new classes is between two consecutive classes (Interpolation).
- Continuous Array: "An Array of classes, not admitting of interpolation" is a continuous array.

1.3.4 Terminology related to Chain

Chain: It is "a sequence of classes made up of any given class, and its universe of Remove 1, Remove 2, Remove 3, etc. carried backwards to any point desired". The classes with the subordinate sort of connection like in the above example Class I girl has a second characteristic of intelligence level which is further subdivided into third characteristic forming a Chain.

Example

Class I	Asia
⇓	⇓
Girl	India
⇓	⇓
Good	Delhi

Link: "A class in a chain' is called a Link"

Primary Chain: It is "a chain with the original universe as the first link".

Frozen Chain: It is "a chain with a unitary class as its last link". Its primary class contain only one entry.

Complete Chain: It is "a chain with the original universe as its first link and a unitary class as its last link".

1.3.5 Terminology related to Filiatory Sequence

The term filiatory is dervided from the filial which means " related to son or daughter". Filiatory aarrangement is the placement of all classes, of a universe derived complete assortment in a definite sequence in a single line according to their mutual relationships. For example :
Suppose the original universe 0 is like a father having two sons, 1 and 2. on No. 1 has three children, viz. 11, 12 and 13. Similarly, Son No. 2 has two children, viz. 21 and 22. The sons of No.1 and No. 2 will be grandsons of 0. Now the grandson 11 has three children, i.e. 111, 112 and 113. The second grandson, numbered 12 has two children, viz. 121 and 122. Similarly, 21 has three children, viz. 211, 212 and 213. They are all great grandsons of 0. The Basses originating from original universe 0 maybe arranged in a linear order in such a way that their filial relationship (i.e. parent-child relationship) is maintained, as shown below:

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0

1

11

111

112

113

12

121

122

13

2

21

211

212

213

22

This is known as a filiatory sequence.

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IN-TEXT QUESTIONS

8. On the basis of the Characteristics group of Isolates are known as _____.
9. An array is a sequence of equally ranked classes arranged in some definite order. True / False

1.3.6 Other terminology

Classificationist: A person who devised the scheme of classification. For example: Dr. S.R. Ranganathan designed colon classification and Melvildeweydesigned Dewey Decimal Classification; both are classificationist. However the second scheme mentioned above does not have a theoretical basis and, therefore, does not provide for the accommodation of newly developed subjects. Such a scheme is revised with time to time to include newly emerging subjects. Dr. S.R Ranganathan is a classificationist in the real sense of the term, as he not only

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designed a classification scheme but also provided a theoretical basis to take care of the problem of the growing universe of subjects.

Classifier: "one who classifies a universe in accordance with a preferred scheme of classification and fixes the position of any newly emerging class by interpolation, or extrapolation, as the case may be, in the correct filiatory position among the already existing classes, and determines its class number, in accordance with the postulates and principles laid down by the classificationist for this purpose" (Ranganathan, 1967). A classifier is a person who organises library materials into categories using a categorization scheme. This allows for the systematic organisation of materials and their effective and efficient retrieval. A classifier has to be knowledgeable with the theory and practises behind the library's classification system.

Classifying: Classifying means translating a subject's from normal language into a classificatory language, or a language of ordinal numbers. A classifier first identify the topic of the document by looking at the details provided on the title page and introductory pages. Then pinpoints the topic as precisely as feasible in the categorization system before translating it into a class number that is given to the document. The whole procedure is referred to as classifying.

Knowledge and Subjects

Library's are the knowledge hub of all the disciplines which emphasised librarian to be familiar with the evolution and organisation of knowledge. A librarian examines the body of knowledge so as to appropriately classify materials pertaining to related areas of expertise. A classification scheme offers a map of the body of knowledge in which all the various disciplines are classified and put in some kind of logical sequence.

Knowledge is a confident opinion or a well-known fact. Two parties—one who knows and is referred to as the knower, the other who is known and is referred to as the Knowe, or things or concepts—are engaged in the processor's "knowing. Knowledge expands as the knower interacts with the Knowe and strives to learn more and more about objects or concepts. The volume of published work has grown to such an extent that it is impossible for anybody, not even superhumans, to become an expert in just one field of knowledge. In this case, the only way to keep up with the knowledge's ever-expanding dimensions is via subject-specific specialisation. At this point, the process of classification of information into distinct domains begins. A classificationist's classification system depicts the current state of the body of knowledge. Knowledge is defined as the "is the totality of the ideas conserved by humans" (Ranganathan, 1967).

Subject: In a modern library the arrangement of documents is usually by subject. Thus, subject is the characteristic of division for arrangementof books. A Subject is a systematised,

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homogeneous and cohesive group of thought or a chunk of knowledge whose depth and breadth are comfortably within the intellectual competence and; the field of specialisation: of a normal intellectual person. But in library classification we are mostly concerned with what is known as a specific subject. A specific subject is always in the context of a document. A specific subject of a document is defined as the subject of the document "whose extension (scope/breadth) and intension (depth/specificity) are equal to the thought content of the document. Ranganathan divides the subjects into:

Basic subjects
Compound subjects
Complex subjects

Basic subjects: are the subjects "without any isolate idea as a component" (Ranganathan, 1967). Basic subjects are also enunciated in the classification scheme schedule. For example: Education, Library Science, Psychology etc.

Compound Subject is a "base subjectwith one or more isolate ideas as components". Example: Child Psychology = Psycology+Child
(CS) (BS) (ISOLATE)

Complex Subject: is formed with two subject i.e. basic or compound. Example: Economics and Sociology, Psychology for managers etc.

IN-TEXT QUESTIONS

10. What are the three kinds of subjects according to Ranganathan?.
11. 'Economics' and 'Library Science' are the examples of _____.
12. Knowledge has been divided into major areas called _____.

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1.6 SUMMARY

The present lesson discussed the concept of library classification in detail. The historical development of library classificationschemes discussed the development of various scheme all around the world and the signification contribution of Dr. S.R. Ranganathan in library classification.

The different library classification terminology's along with the definition and suitable example have been discussed in the lesson.

1.7 GLOSSORY

Classification :	the orderly arrangement of objects
Universe:	"An aggregate under consideration in a given context",

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Entity :	Any existent, concrete or conceptual -that is, a thing or an idea
Attribute :	**Attribute** is any property or' quantitative measure or quality possessed by or inherent in an entity.
Complex Subject :	is a two phased subject and is formed by the combination of two or more basic or compound. subjects, and made to express the relation between them, but excluding, the case when one of the subjects forms an isolate of the other, formed by subject device

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. London 2. True 3. Universe 4. True 5. a) Entity 6. Attribute 7. i. Natural Characteristics: For ex. height or age or ability of a person. ii. Artificial Characteristic: For ex. Cloth; Mode of dressing hair".	8. Basic Subjects, Compound subject and Complex Subject 9. Basic Subject 10. Disciplines 11. Facets 12. True

1.9 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of Classification. Discuss the various terminologies of Classification with suitable examples.

1.10 REFERENCES

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1.11 SUGGESTED READINGS

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LESSON 1.2

CLASSIFICATION: CONCEPTS AND TERMINOLOGY

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Classification Terminology: Historical Perspectives
  1.3.1 Relation to other Terminologies in Library Science
  1.3.2 Nature of Terms
1.4 Sources of classification Terminology
1.5 Definitions
  1.5.1 Meaning of Classification
  1.5.2 Universe and Entity
  1.5.3 Group and Class
  1.5.4 Attributes and Characteristics
  1.5.5 Kinds of Library Classification
  1.5.6 Disciplines and Subjects
  1.5.8 Arrays and Chains
  1.5.9 Classification Schedules
  1.5.10 Species of Classification
  1.5.11 Notation
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson you will be able to:

- understand the importance of technical terminology in a scientific subject; and
- grasp the meaning of terms and their use in the theory and practice of library classification.

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1.2 INTRODUCTION

A term may be defined as a standardized name for a given entity or concept which is precise. Terminology, in its turn, is defined as a system of terms used to denote the classes or ranked isolates in a scheme for classification. There should always be a one to one correspondence between the concepts and the terms used. It means that each concept will be denoted by one word or phrase, and conversely a word/phrase will denote one concept only.

In a scientific/academic/legal communication, precise terminology is not onlyimportant but most essential. Effective communication cannot take place unless concepts and terns representing them are precisely defined. Predefined words are also known as technical terminology. Paradoxically the ordinary language that the common man speaks is both rich and poor. It is full of homonyms, i.e., one and the same term is often used with two or more meanings. For example, "bridge" and "cricket" have two meanings each. The word "order" has more than 200 meanings in the Oxford English Dictionary? Further, a word may connote different meanings in different contexts' A line of poetry has different meanings for different people. It (language) is also full of synonyms, i.e., one concept may be denoted by more than one word in the same language, e.g., wages, salary, and pay denote the same concept. Thus ordinary language is not a perfect tool of communication. If this is used without modifications in a scientific discipline, it will lead to problems in communication and ultimately hinder the development of the discipline. A Tower of Babel will lead only to chaos and confusion instead of any understanding and progress. The solution is to have a precisely defined terminology. No discipline can progress without its technical terminology.

In other words, there should be an organized attempt to:

i) delimit the vagueness of words and eliminate ambiguity;
ii) establish an agreed standard terminology free from homonyms and synonyms
for each subject-field; and
iii) lay down methodology to coin new terms, when new ideas come into being or an old term has to be replaced.

S.R. Ranganathan (1892-1972) was of the view that scientific terminology is of dual importance to librarians. Firstly, librarians and information scientists have to learn the technical terminology of other disciplines to communicate with and serve library users effectively. Secondly, we have to understand the terminology of our own discipline to discuss technical matters with colleagues for research and, development of our discipline and profession.

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1.3CLASSIFICATION TERMINOLOGY

HISTORICAL PERSPECTIVES

Library classification as an academic discipline is about 125 years old. Its teaching and research has gained momentum comparatively recently. It must be admitted, however, that the terminology is not well settled.

One of the principal contributions of Professor S.R. Ranganathan (1892 -1972) to library classification, besides his intuitive and intellectual contributions, is the terminology for expression of ideas. The development of the terminology of library classification in India came along with the development of the theory and practice of classification. It grew at a faster pace between the sixties and eighties. This is due to intensive developmental research in the field.

The spread of jargons in classification to an international circle can said to be fostered by the CRG (Classification Research Group) in London. The CRG members have had very close contact with Ranganathan and critically analysed each of his terms. They refashioned some of them and retained many of them as such and provided explanatory notes to the definitions and then spread them to library schools in Britain and other countries. Textbooks began to appear using many of the concepts, which Ranganathan had propounded.

The First International Study Conference held at Dorking principally supported by CRG saw to it that a comprehensive glossary of terms was developed for use at the international level. The glossary was compiled by B.C. Vickery for the benefit of the new audience. This movement was very well complimented by the FID (International Federation for Information and Documentation/Federation International Information et de Documentation) congress, and FID/CA (Committee on Classification Theory) in which Ranganathan himself was very much involved in the propagation of ideas. The growth of the terms in the second, third and fourth study conferences indicated a steady improvement in classification research.

Today, we can find that the contribution of Ranganathan to classification terminology is almost an integral part of any classification research, teaching, learning or writing.

1.2.1 Relation to other Terminologies in Library Science

Classification is a vital discipline in the field of library and information science and pervades all the other sub-fields of library science. Thus, the terminology of library classification is an' interactive terminology. The symbiotic nature of classification and cataloguing has taken a

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common link in relation to subject indexing terms. Many of the verbal plane rules of classification terminology can also act as rules for cataloguing terminology.

In relation to reference service, classification provides the analytic and synthetic framework for; efficient handling of reference work and service. Many of the classification terms can be used! in more or less the same fashion in reference and information work. Thus, a streak of symbiosis' can be seen between the two sub-fields of library science. To a certain extent, management aspects of libraries can be explained using classificatory terminology.

To conclude, classificatory terminology is crucial to the development of the discipline of library science. It can be considered, so to say, that the intellectual framework of library science lies in classificatory terminology.

1.2.2 Nature of Terms

In an analysis of classification terminology, Prasad (1986) had identified three types of terms - normative, fundamental and associative. Normative terms are operative in nature and prescribe the procedure and help identify the expected quality of the operations that would result from such prescriptions. Example: Canon of Differentiation.

Fundamental terms, on the other hand, define the basic concepts which are germane to the very nature of classification process. Examples: Division, Characteristics.

In their turn, associative terms are those which extend the, meaning of the fundamental terms into different contextual levels for discussion and operation in classification research. Example: Open-ended array.

This table presents a census of terms, which are grouped according to their nature:

Thus, there are in all 514 technical terms used in the three editions of the Prolegomena. These terns have been distributed in the three planes of work- Idea Plane (298 terms), Verbal Plane (35 terms) and Notational Plane (181 terms). In addition to the terms, many new terms and refinement of old terms have resulted due to the work undertaken at DRTC (Documentation Research and Training Centre) by Ranganathan and his followers.

Further, the interdisciplinary nature of classification called for coordination of epistemological, logical, psychological, mathematical, linguistic and sociological concepts and terms in papers and discussion at the Third International Study Conference on Classification Research held at Bombay in 1975. The universality of classification concepts, then- capability to interconnect several diversified approaches to classification and ordering of knowledge were discussed at the conference. "International Classification" (now called Knowledge Organisation), a periodical publication from Frankfurt, West Germany began

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work pertaining to the consolidation of terminology occurring in classification literature. Classification vocabulary started getting refined further and made extensive use of concepts pertaining to Systems Theory, Computer Science, Communication Theory, etc. FID/CR (Committee on Classification Research) brought out several country reports at this juncture and Bliss's Classification Group brought out several depth versions of the scheme.

IN-TEXT QUESTIONS

1. Classification Research Group is located at _____.
2. Prof. S.R is one of the principal contributorof library classification. True / False

1.4 SOURCES OF CLASSIFICATION TERMINOLOGY

The following are sources for classification terminology :

a) ALA Glossary of Library Terms; 1956

b) BLISS (H E), Bibliographic Classification; 1-11, 1952

c) RANGANATHAN (S R)

i) Classification and Communication; 1951

ii) The Series on Common Isolates (Review of Documentation, 23-25; 1956-57)

iii) Prolegomena to Library Classification; Ed 2, 1957

iv) Classified Catalogue Code; Ed 5, 1964

v) Library Classification Glossary (Annals of Library Science, 5; 1958; 76-112)

vi) Colon Classification; Ed 6, 1959 and Ed 7, 1987

vii) ElementsofLibraryClassification;Ed3,1961

viii) Notational Plane: Interpolation and Extrapolation. (Annals of Library Science. 10; 1963; 1-13)•

d) SAYERS (W C Berwick)

i) Manual of Classification; Ed 3, 1955

ii) Introduction to Library Classification; Ed 9, 1958

e) VICKERY (B Q). Faceted Classification.

f) WANGER (Frank S). Dictionary of Documentation Terms. (American Documentation 11'; 1960; 102-119).

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1.5 DEFINITIONS

Most of the terms with definitions were used for the first time in the first edition of Prolegomena to Library Classification (1937). The definitions, in this section 'have been takenfrom Ranganathan's Prolegomena to, Library Classification, 3rd ed. Vol..1. 1967.

1.5.1 Meaning of Classification

"In popular usage, the term 'Classification' is used in two or more senses. In other words, the term `Classificationis a homonym". To facilitate correct communication, this homonym should be resolved.

Classification in *Sense 1*

Division

i) "Process of sorting the entities of a universe into sub-aggregates on the basis of a preferred characteristic, or putting like entities into the same sub-aggregate and unlike entities into different sub-aggregates".

ii) "The result of division in the Sense-1 - that is, a set of sub-aggregates" formed by the division of the entities of a universe.

The alternate terms for divisions are classification in Sense I and specification.

Classification in Sense 2

Assortment

"The process of the division of a universe into groups plus -that of arranging the groups in a definite sequence --- that is, of Ranking that is, assigning a Rank to each resulting group".
The result of the assortment of a universe in the first sense.
The alternate term is classification (Second Sense: Common Use) - classification, in the first sense and arrangement of the resulting groups in a preferred sequence.

Classification in Sense 3

"Classification in Sense 2 plus Representing each entity by an ordinal number taken out of a system of ordinal numbers, designed to mechanise the maintenance of the sequence,

i) Either when an entity has to be replaced after having been taken out of its position;

ii) Or when a new entity has to be interpolated or extrapolated in the correct place in the sequence'".

1.5.2 Universe and Entity

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“There are substantial terms in the Theory of Classification" which are assumed terms. While some of them are given some explanation, some are defined by being linked together in astatement”.

Entity

"Any existent, concrete or conceptual -that is, a thing or an idea" is an entity for "example: A boy,-A book, Sweetness, A system of philosophy, A subject of study".

Universe

"An aggregate under consideration in a given context", aggregate, in its turn, "is a collection of entities, without any special arrangement among them".
Universe may be of three types:
Finite Universe : “A universe with a finite number of entities, e.g., Students in a classroom”.
Infinite Universe : “A universe with an infinite number of entities, e.g., Universe of integers”. (Ranganathan, 1967)
Growing Universe :”A universe with new entities added to it or emerging in it from time to time, e.g., Subjects of study

1.5.2 Groups and Class

Group
“Any sub-aggregrate of the entities formed by the division of the entities of a universe” is a group.
Groups, in their turn, are of two types:

Unitary Group : Group consisting of one and only one entity.
Multiple Group Group consisting of two or more entities.

Class

Class is a ranked group and ranking is "arranging in a definite sequence the groups formed by the division of the entities of a universe, so as to arrive at an- assortment of them".

Classes are of two types

Unitary Class : "Class comprising one and only one entity".
Multiple Class : "Class comprising two or more entities".

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IN-TEXT QUESTIONS

3. A collection of entities is called _____.
4. Class is a ranked group arranged in a definite sequence by the division of the entities of a universe. True / False
5. 'A book' is an example of which of the following:
   a) Entity b) Universe
   c) Class d) None of the above

1.

Attribute is any property or' quantitative measure or quality possessed by or inherent in an entity. Ranganathan has cited the following examples in the Prolegomena.

Examples

The following are some of the attributes of a book:

Subject-matter
Form of expression, such as catechism, drama, prose, narrative, pictures, etc.
Language
Author
Year of publication
Binding

The following are some of the attributes of a system of philosophy:

Number of ultimate principles assumed, such as monism, dualism and pluralism; attitude towards reality, such as idealism and realism; country of origin.'

Characteristic

On the other hand, a characteristic is "an attribute, or any attribute-complex with reference to which the likeness or unlikeness of entities can be determined and at least two of them are unlike".

Example:

"Height is a characteristic of boys. But, possession of a face is not. Possession of a face is an attribute shared equally by all boys".

Characteristics, in their turn, can be of different types.

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Natural Characteristic: "A characteristic possessed in common by all the entities in the universe considered and inherent and inseparable from the entities" For example, height or age or ability of a person,

Artificial Characteristic: "A characteristic possessed in common by the entities in the universe considered but not necessary for -their being included in the universe. Examples Cloth; worn by a person, Mode of dressing hair".

Division Characteristic: A "characteristic used as the basis for the division of the entities of a universe. For example, the aggregate of boys in a classroom is a universe. If we sort them on the basis of their height, then the Division Characteristic is height and the boys of the same height form a sub-aggregate".

Assortment Characteristic: A "characteristic preferred as the basis for the assortment of a universe

IN-TEXT QUESTIONS

6. _____is any property or' quantitative measure or quality possessed by or inherent in an entity.
7. Name any two type of Characteristics with example.

1.5.5 KindsofLibraryClassification

When entities are books or other items of information, their classification is called Library Classification. Library classification has also been defined as classification of knowledge as contained in the books and other reading material. Library classification is ostensibly utilitarian in the sense that it has an immediate purpose. Library classification has got many meanings. It is Book Classification when it is used to arrange books and other macro documents on the library shelves. When it is used to arrange not the books but records to them, i.e., catalogues, or bibliographies it is called Bibliographic Classification. The Dewey Decimal. Classification (DDC) was designed to be a book classification, whereas the Universal Decimal Classification (UDC) was designed to be a bibliographic classification. The term bibliographic classification is also used for depth or detailed classification., Detailed classification required for micro documents is known as Depth Classification. Library of Congress Classification is relatively a depth classification. A classification which is not too detailed and meets the requirement of small libraries is called Broad Classification. ' Rider's International Classification. (1961) and early editions of the DDC are broad classifications.

Classification for a smaller area of knowledge, say for economics, occupational safety, environmental engineering, or leather technology, is known as Special Classification. Special

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classification of the entire universe of knowledge is known as General Classification. Some call it Universal Classification:

Library classification, whatever its kinds, may be defined comprehensively as:

A systematic arrangement by subject of books and other learning resources and/or similar systematic arrangement of catalogue or index entries in the manner; most useful to those who are seeking. either a definite piece of information or the display of the most likely sources for the effective investigation of the subject of their choice.

- Rita Marcella and Robert Newton

The purpose is to facilitate the optimum use of library resources. It is a tool for information retrieval both in manual and automated retrieval systems.

1.5.6 Disciplines and Subjects

In a modern library the arrangement of documents is usually by subject. Thus, subject is the characteristic of division for arrangement' of books. A Subject is a systematised, homogeneous and cohesive group of thought or a chunk of knowledge whose depth and breadth are comfortably within the intellectual competence and; the field of specialisation: of a normal intellectual person. But in library classification we are mostly concerned with what is known as a specific subject. A specific subject is always in the context of a. document. A specific subject of a document is defined as the subject of the document "whose extension (scope/breadth) and intension (depth/specificity) are equal to the thought content of the document.

Knowledge has been divided into major areas called Disciplines.

A **Discipline** is a major continuous area, of knowledge formed on the basis of either the similarity of the objects of study (i.e., whether natural objectives, or social issues); or, obtained by a similar mode of study or method of acquiring knowledge (i.e., whether imaginative, or empirical). Broadly speaking there are three major disciplines of the universe of knowledge:

Sciences (study of natural objects)
Social Sciences (problems of society)
Humanities (by imagination/perceptions)

However, connotations of a discipline vary from time to time. Nowadays all classifications are by disciplines - a breakthrough made by Melvil Dewey (1851-1931). A topic may fall under variousdisciplines.

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Disciplines are further divided into:**Basic subjects or main classes:**A main class is, conventional but very cohesive area of knowledge. In library classification it is more or less the first line of division of the universe of knowledge. A traditional subdivision of an old main class is known as a Canonical Class. For example, heat, light, magnetism, electricity are canonical classes of the main class physics. Similarly algebra, geometry, analysis are canonical classes of the main class mathematics. Obviously the canonical classes are only of an ancient or traditional main class. A new main class such as library science, journalism, computer science does not have canonical classes. Main classes expounded from a school of thought; say Marxian economics, or Newtonian physics or Homeopathy medicine, are known as System Main Classes. A main class studied from a specialised viewpoint, say aviation medicine, child medicine, sports medicine, or small scale economy are known as Special Main Class. Similarly a main class expounded from a physical or social milieu or environment is known. as Environmental Main Class. For example, war economy, high altitude engineering, tropical medicine are examples of environmental main classes. Main classes as such, canonical, systems, special and environmental main classes, when taken together, are known as Basic Subjects..

Ranganathan postulates that there are three kinds of subjects:

Basic subjects
Compound subjects
Complex subjects

Basic subjects are subjects which:

a) are enumerated in the schedule of-basic subjects;
b) cannot be expressed as the compound subject of any of the existing basic subjects;
c) are evolved through one full cycle of the spiral of scientific method as propounded by Ranganathan.-They also exhibit different modes of formation of subjects; and
d) call for schedules of Special Personality Isolates, Matter Isolates and Energy Isolates.

Library Science, Physics, Algebra; Ayurvedic Medicine, Marxian Economics, Psycho-analysis are some of the basic subjects. The concept of a basic subject is social. The total number and connotations of a basic subject vary from age to age and also from society to society. For example, the number of basic subjects in the sixth edition (1960) of the CC was about 150 but in .the seventh edition (1987) it has risento more than 750.

A Compound Subject is a basic subject when it has at least one focus, or has at least an aspect, i.e., it has a basic facet and one or more isolate facets. Agriculture is a

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basic subject, but agriculture of wheat or diseases of wheat plants are compound subjects. Psychology is a basic subject but child psychology, or personality disorder are compound subjects. The number of compound subjects in this universe is infinite.

A Complex Subject, on the other hand, is a two phased subject and is formed by the combination of two or more basic or compound. subjects, and made to express the relation between them, but excluding, the case when one of the subjects forms an isolate of the other, formed by subject device. Examples: psychology for nurses; comparative study of Indian and British constitutions; or influence of geography on history, or relation between anatomy and physiology. Such subjects are mostly interdisciplinary. The process of analysing a complex subject into its constituent phases is known a. Phase Analysis.

IN-TEXT QUESTIONS

3. What are the three kinds of subjects according to Ranganathan?.
4. 'Economics' and 'Library Science' are the examples of _____.
5. Knowledge has been divided into major areas called _____.

.

1.5.7 Categories, Facets and Isolates

A solitary, unattached idea, which cannot be further, subdivided, and by itself it cannot form a subject, is called an isolate. For example, the terms wheat, child, India are isolates as by themselves they are vague. These have meanings only in the context of a main class. For example, wheat diseases, child psychology or India: history have meanings. An isolate is the ultimate division of knowledge. Going back a little, Ranganathan defines a compound subject as a basic: subject forms a compound subject having one or more isolates, An isolate is the context of a basic subject forms a compound subject and a Basic Subject is a basic subject without an isolate idea.

Isolates are grouped in what are called facets on the basis of-common characteristics. A facet is thus a totality of isolates obtained on the basis of a single train of characteristics of a given entity. As a matter of fact, Ranganathan defined facet as "A generic term used to denote any component- be it a basic subject or an isolate - of a compound subject, and also its respective ranked forms, terms, and members". We may speak of Basic Facet, Isolate Facet, Geographical Fact,Language Facet, Educational Facet Property Facet, Organ Facet, Cultivar Facet, etc.

The totality of the facets having a common characteristic form a category. For example,- in library science all the facets pertaining to the kinds of library, j-.e., academic, public, special, form a category named personality category, in this 6ase. Yet; another "category -is the

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library activities, i.e., acquisition, processing, servibes, preservation, called energy category in this case. A category is a highly, generalized division of knowledge. Ranganathan postulates that a subject is constituted of at the most ' five fundamental categories, namely, Personality, Matter, Energy, Space and Time (see Unit 7, Block 3 of Course BLIS-03). In other words all the concepts of the universe of knowledge belong to five and only five fundamental categories

1.5.8 Arrays and Chains

Isolates are arranged in what are called arrays and chains. An array is a sequence of coordinate (equally ranked) classes arranged in some definite order. Ranganathan defines array as "a set of classes arranged in the proper sequence and derived from a universe' on the basis of a single characteristic at any step in the progress towards a complete assortment of the entities of the universe". For example, all the student of BLIScourse, when arranged in some order, say by roll number, or alphabetically by name or in order of merit, form an array.' Similarly, the sons and daughters of the same parents are said to form an array. All th4 continents of the world form an array; and all countries of the world when arranged in some order form an array. The army of classes, in its turn, can be an open array when admitting of extrapolation and a closed array when not admitting of extrapolation. A systematic or utilitarian arrangement of members of an array is called Helpful Sequence. This arrangement is called helpful,as it is helpful to the majority of the classification users though not to all. Broader groups in an array are arranged in what is called a Filiatory Sequence. It means placing together closely related .classes. The order of main classes in J.D. Brown's Subject Classification (1906) is in the evolutionary order of matter 7 force - life - mind - record.

A chain is the sequence of classes of a universe consisting of a class and of its universe of successive removes, carried backwards to any point desired-that is, all the members are of unequal rank and are arranged in the order of constantly decreasing extension and increasing intension. The order in a chain is from general to specific or in the reverse order of specific to general. For example, the World, Asia, India, Maharashtra, Mumbai form a chain of classes in this or reversed order. Similarly social sciences, economics, finance, money, banks form another chain of classes. Your grandfather, your father, and you form a chain of classes, but all your brothers and sisters form an array of classes. The arrangement of entities in a chain is always hierarchical.

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IN-TEXT QUESTIONS

6. On the basis of the Characteristics group of Isolates are known as_____.
7. An array is a sequence of equally ranked classes arranged in some definite order. True / False

1.5.9 Classification Schedules

Library classification invariably requires written has of damps and their subdivisions arranged in a systematic way along with corresponding symbols denoting classes. This systematic and elaborate list of classes is known as Schedules. Schedules along with an alphabetical index of classes referring to their symbols, and with some auxiliary concepts called common subdivisions, is known as Classification System. There are various systems of classification, e.g., the Dewey Decimal Classification, Ranganathan's " Colon Classification, and the Library of Congress 'Classification. There are about half a dozen living general classification systems. An index is an alphabetical approach to the systematic schedules. Topics which are scattered by discipline in the schedules are collocated in the index.

In addition to the schedules which are the core of a classification' system, there are some auxiliary tables ' of some recurring concepts, say geographical isolates, time isolates; language isolates, form of presentation of the document (e.g., whether a dictionary or a cotiferenc6 proceeding) or to "physical format, say book, journal, floppy, maps, CD- ROM or 4 videotape. These recurring concepts are issued once and for all along with their given symbol. These auxiliary concepts are known as Standard Subdivisions in the DDC; Common Isolates in the CC and Common Auxiliaries in the UDC. These usually represent the various non-subject aspect of a document or some peripheral but recurring subject aspects.

The schedules may be either in print form or in electronic form, say, on a floppy or CD-ROM. The DDC, 21st edition (1996), is available in a CD-ROM format entitled Dewey for Windows.
A designer of a classification system is known as classificationist. S.R. Ranganathan, Melvil Dewey, H.E. Bliss, C.A. Cutter are a few outstanding names of classificationist. A person who operates these systems is known as classifier.

1.5.10 Species of Classification

There are broadly speaking two species of classification systems - enumerative and faceted. **Enumerative classification** is that in which all classes and their corresponding

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symbols are enumerated, i.e., listed. It "consists essentially of a single schedule enumerating all subjects of the past, the present and the anticipatable future". In other words, the symbolsor series of symbols for a' class are available readymade and the classifiers do not, have any' need or authority to construct a number. The Library of Congress Classification System, the Rider's International Classification and the early editions of the Dewey Decimal Classification are examples of an enumerative classification system. Enumerative classifications are contemptuously described as mark and park systems.

"**An Almost Enumerative scheme** for classification, consists of a large schedule enumerating most of the subjects of the past, the present, and the anticipatable future, and in addition a few schedules of common isolates". Subject Classification of' Brown and Dewey Decimal Classification are good examples.On the other hand, the other species of classification is known as **Faceted classification** which consists of schedules of basic classes, common isolates and special isolates only and includes the **Almost-Faceted, Rigidly-Faceted and Freely Faceted** classification. By definition, "an Almost-Faceted scheme for classification consists of a large schedule enumerating most of the subjects of the past, the present and the anticipatable future; and in addition a few schedules of common isolates and also, some schedules of special isolates". For example; Universal Decimal Classification and Bibliographic Classification of Bliss. In the next type, the "Rigidly-Faceted scheme for, classification, the facets and their sequence, are pre-determined for the entire subject going with a Basic Class". The first three editions of Colon Classification which have given a facet formula for each basic class are good examples of Rigidly-Faceted schemes. But, "in a Freely Faceted Scheme for Classification, there is no rigid, pre-determined Facet Formula for the Compound Subjects going with a Basic Subject". It, essentially is an, **Analytico-Sythetic** Classification guided by postulates and principles. While, editions 4, 5 and 6 of CC can be described as almost-freely faceted schemes for classification, edition 7 of CC can be considered as a fully freely faceted scheme for classification.

1.5.11 Notation

It is well known that subjects should be arranged in a helpful filiatory sequence on the basis of a scheme of successive characteristics. Further, there is a need to mechanise the arrangement, To 'mechanise'means to eliminate the need to remember or consider the exact connotation or denotation of the classes in their mutual relation. These two aids make the, following additional concepts necessary: 1) Terminology;, and 2) Notation. The importance of terminology has already been highlighted in Sec-1-1.,

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As regards mechanising an arrangement of subjects in a preferred sequence, one possibility is alphabetical arrangement. But, alphabetical arrangement, of subjects by their names, as 4 means of mechanising their arrangement must, be ruled, out:

- as the sequence it gives is not helpful
- as the names of subjects are not stable
- as the names of subjects are not unique
- as the alphabetical position of a subject would vary with the language from which the name is taken
- as the subjects denoted by a term are not unique.

IN-TEXT QUESTIONS

13. Name any two schemes of Enumerative classification system.

1.6 SUMMARY

In this lesson, we have discussed the importance of terminology and traced the 'historical perspective of classification terminology with emphasis on the Indian School of Thought.

The core/basic concepts of classification discussed pertain to,: Universe and Entity; Group and Class; Attributes and Characteristics; Kinds of Library Classification; Disciplines and Basic Subjects; Categories, Facets and Isolates; Arrays and Chain; Schedules for Classification; Species of Classification; and Notation.

1.7 GLOSSORY

Universe	**:**	"An aggregate under consideration in a given context",
Entity	**:**	Any existent, concrete or conceptual -that is, a thing or an idea
Attribute	**:**	**Attribute** is any property or' quantitative measure or quality possessed by or inherent in an entity.
Complex Subject	**:**	is a two phased subject and is formed by the combination of two or more basic or compound. subjects, and made to express the relation between them, but excluding, the case when one of the subjects forms an isolate of the other, formed by subject device

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. London	8. Basic Subjects, Compound subject and Complex Subject
2. True	9. Basic Subject
3. Universe	10. Disciplines
4. True	11. Facets
5. a) Entity	

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6. Attribute 7. i. Natural Characteristics: For ex. height or age or ability of a person. ii. Artificial Characteristic: For ex. Cloth; Mode of dressing hair".	12. True 13.Library of Congress and Rider's International Classification

1.9 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of Classification. Discuss the various terminologies of Classification with suitable examples.

1.10 REFERENCES

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LESSON 1.3

SPECIES OF CLASSIFICATION SCHEMES

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Species of Classification Schemes
1.3.1 Enumerative Classification
1.3.1.1 Purely enumerative scheme
1.3.1.2 Almost enumerative scheme
1.3.2 Faceted Classification
1.3.2.1 Almost faceted scheme
1.3.2.2 Fully but rigidly faceted scheme
1.3.2.3 Almost freely faceted scheme
1.3.2.4 Freely faceted scheme
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

1.1 LEARNING OBJECTIVES

In this lesson, you will be introduced to different species of library classification. After reading this lesson, you will be able to:

- know the different species of library classification being used today for the organisation of knowledge;
- understand the characteristic features and limitationsof different species of classification;

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1.2 INTRODUCTION

The classification schemes have been designed to arrange books and other documents in the library. All the classification schemes have divided the whole universe of subjects into a series of main classes, which are further sub-divided in a hierarchical manner leading to co-ordinate and sub-ordinate classes. Many such schemes of classification are available for use in libraries.

The designing of classification schemes was based on the literary warrant. The structure and dimensions of subjects led to the classificationist to evolve new species of classification schemes to accommodate subjects and to classify them and provide coextensive numbers.

1.3 SPECIES OF CLASSIFICATION SCHEME

Ranganathan has recognised three distinct periods in thegrowth and development of library classification during thepast hundred years. These are :

1. Pre-facet period 1876-1896,

2. Transition-to-facet period 1897-1932, and

3. Facetperiod 1933 to date.

In the pre-facet period Melvil Dewey'sDecimal classification (1876) and CA Cutter's Expansiveclassification (1893) were published. In the Transition toFacet period (1897-1932), Universal Decimal Classification (1897) Library of Congress(1901) were published. The Facet period (1933) has been thepublication of Colon Classification (1933), Bliss bibliographic Classification (BC)(1935), Library and Bibliographic Classification (BBK) (1960).

It was Dr. Ranganathan who classified the various schemes of classification into different groups and called each group as a ‘species’ of classification. He had enumerated six different

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species. These are:

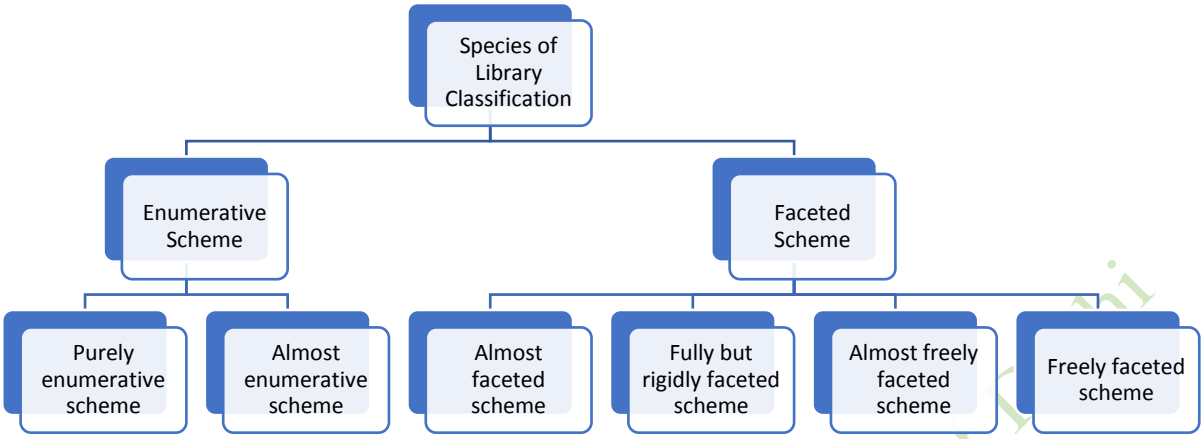

Fig 1.1 Types of Species of Library Classification

1.3.1 Enumerative Classification:

The word "Enumeration" means to make a list or a count.An enumerative classification scheme generally consists of a single or large schedule listing all subjects from the past, present, and anticipated future.It means that the schedules have a list of the class numbers for each subject.No distinct extra schedules of 'common isolates' are available to build a number.Enumerative classification separates and subdivides the subjects and places them in an order with the read made numbers for each division and subdivision.

Prof. S.R. Ranganathan defined "A scheme of classification isenumerative, if it enumerates all possible specific subjects in a preferred helpful order along with their respective class numbers"

According to Palmer and Wells "Enumerative classifications lists composite subjects built up from a number of basic subjects".

Some of the common features of enumerative classification are: (NIIMLS)

1. It consists of a single schedule that lists all of the simple and compound subjects together with their ready-made class numbers.

2. It makes an effort to include all available knowledge in its schedules.

3. It gives its schedule a relative index, which is more practical for managing the schedule.

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4. It gives even compound subjects ready-made class numbers without the usage of any connecting symbols.

Following are some of the demerits of Enumerative classification schemes:

1. The enumerative schemes are not based upon any established theory of postulates and principles. These simply enumerate all classes.
2. Enumerative scheme design is entirely depend upon the creativity and intuition of each classificationist.
3. It doesn't have the option to add new topics as they come up.
4. There is no recognised theory of postulates and principles upon which the enumerative schemes are founded. These only list every class.
5. There are no provisions in enumerative schemes to show the different types of relationships that might exist between fundamental classes, facets, or isolated ideas.
6. Schedules for enumerative schemes are lengthy because they make an effort to list every subject known to have existed as well as any that might be expected to do so in the future.

1.3.1.1Purely Enumerative Scheme

"An enumerative scheme of classification consists essentially of a single schedule enumerating all subjects of the past, the present and the anticipatable future". (Ranganathan, 1967)

Some of the characteristics of Purely Enumerative Scheme are:

1. There is one single omnibus schedule.
2. No Provision for synthesis
3. Most of the subjects are compound in nature
4. The class number constructed by using a purely enumerated scheme are necessarily to be long.

Two good examples of Purely enumerative schemes of classification are

'Library of Congress Classification' (LC) and

'Rider's international Classification' (RIC)

There are 31 volumes of LC. The schedules are excessively lengthy, and because a classifier have to deal with so many volumes, it is sometimes challenging for a classifier to prepare a class number. Even common isolates, which have been incorporated into class numbers differently in various courses, are not provided individually by LC. Although LC offers significant notation gaps, it has found it challenging to handle the knowledge shared by LC.

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RIC has been intentionally designed as an enumerative classification. It provides one omnibus schedule of enumerated subjects, most of which are compound subjects.Even the schedule of geographical isolates has not been provided separately. The geographical isolotes have been included as an integral part of the tables of the scheme. The schedules are short, enumerating 18,000 sub-

1.3.1.2 Almost Enumerative Classification

"An almost enumerative scheme for classification consists of a large schedule enumerating most of the subjects of the past, the present and the anticipated future, and in addition a few schedules of common isolates". Most of the documents gets ready made class numbers, but with the help of supplementary schedules, it is sometimes possible to do a preliminary synthesis.The positive aspects of a scheme for classification which comes under this category is that it enumerate not only basic subjects but also compound subjects. A few auxiliary schedule support the main schedule to construct class number for few more compound subjects.

Some of the characteristics of Purely Enumerative Scheme are:

1. There is one single omnibus schedule. In addition a few common isolates are enumerated which can be added to any schedule.
2. The provision for synthesis on account of common isolates. But this is only to a limited extent.
3. Schemes are revised time to time to accommodate new subjects.

Two examples of Almostenumerative schemes of classification are

- Subject Classification
- Dewey Decimal Classification

Subject Classification: was enunciated by J.D. Brown's. Only two schedules are in it: the main schedule and the categorical tables. The man schedule lists Universe of subjects and compound subjects. With the help of the isolates listed in categorical tables, you can come up with more compound subjects.

Dewey Decimal Classification: DDC is almost an enumerative scheme because it can't make class numbers for all subjects that are coextensive. But numbers have been made by following some rule of synthesis. It gives separate schedules for form, space, and time divisions. As the DDC went through new editions, it changed from being a list to being a set of rules. This was done to make room for new subjects and to give subjects the same class number for all of them. The 20th edition of DDC is made up of 4 books. The second and third volumes list all of the subjects, and the fourth volume gives an index to the schedule. In volume 1, there are a number of tables. The add device and the subject device are used to make complicated numbers and to add new subjects.

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IN-TEXT QUESTIONS

1. Who gave the concept of Species of Classification _____.
2. Subject Classification is an example of Purely Enumerative Scheme. True / False
3. Library of Congress is an example of _____ scheme.
4. Dewey Decimal Classification: is Almost an enumerative scheme. (True/False)
5. Which one of the following is not a type of Faceted scheme.
   a) Fully but rigidly faected b) Almost freely Faceted
   c) Freely Faceted d) Almost enumerative

1.3.2 Faceted Classification Scheme

Faceted scheme for classification comes with'schedules of Basic classes', 'Common isolates' and 'Special isolates' (IGNOU). With the help of 'Basic subjects', 'special isolates', and the 'common auxiliary tables', class numbers for compound subjects are made.The nature of faceted classification schemes includes some synthesis. Faceted schemes identify and list the various facets and sub-facets that the document's subject presents, and they then combine these facets and sub-facets using a few connecting symbols. The class number created using the faceted categorization technique present a clear picture of the document's thought content. (IGNOU)

According to Palmer and Wells "Faceted classification list the basic terms and leaves the building of the derived composite terms to the classifier".

As per Ranganathan, "in a faceted classification there will be no schedule enumerating compound subjects. The Class numbers of any compound subject is constructed with the aid of the Basic subjects, the common isolates and the special isolates enumerated for each subject. The class numbers of a compound subjects will have connecting digits of species different from the semantically rich digits used in the schedules for Basic Class Numbers and the Isolate numbers. Therefore all the compound class numbers of a faceted classification will be polylithic".

The common features of Faceted Scheme are:

1. This scheme provide some freedom to the classifier.
2. A faceted classification provides co-extensive class numbers to micro-subjects.
3. It is feasible to add new and emerging subject in both in array and chain.

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4. The compound class numbers formed by faceted classification tend to be polylithic (i.e. divided into different blocks of digits).

Types: The following different species of **faceted classification** have been recognized by Ranganathan.

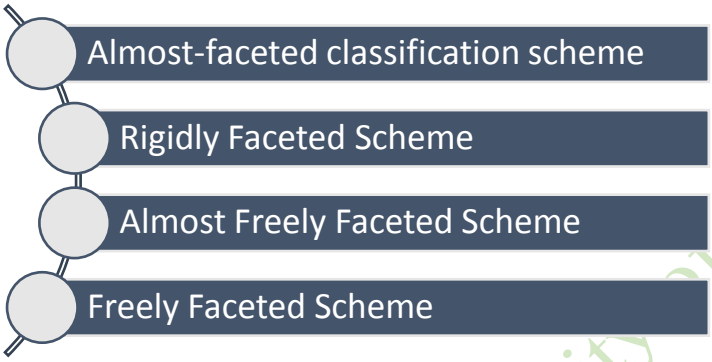

Fig 1.2. Types of Faceted Schemes

1.3.2.1 Almost-faceted classification scheme

The almost-faceted classification is clearly intermediate in the path of evolution between the almost-enumerative classification and the fully faceted classification. "An almost faceted scheme for classification consists of a large schedule enumerating most of the subjects of the past, present and the anticipated future and in addition a few schedules of common isolates and also some schedules of special isolates". The schedule of subjects of a scheme which come under this category will enumerate not only basic subjects.

Some of the characteristics of Purely Enumerative Scheme are:

1. The scope for synthesis is much greater thanthat in an almost enumerative scheme.
2. With the help of schedule, common isolates, class number of more compound subjects can be constructed.
3. In this species also the schedules are bound to be long.
4. Blocks of digits in the class number makes it easy to read, write and remember.

Demerits:

The schedules of Almost-Faceted schemes are generally long as the) try to enumerate the subjects of the past, the present and the anticipatable future.

Two examples of Almost-faceted classification schemeare:

- Universal Decimal Classification (UDC) and

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- Bibliographic classification (BC).

UDCis the first almost faceted scheme of classification.It provides four independent schedules of common isolates, consisting of form, place, time and point of view common auxiliaries. Distinctive indicator digits have been provided for attaching these to main UDC numbers. Language isolates, race and nationality isolates are not common isolates. In addition, schedules of special isolates for use in compound subjects, going with certain enumerated basic and compound subjects, have also ben given. However, special isolates are not available in all possible cases. UDC also provides long schedules of enumerated subjects, most of which happen to be compound subjects. The scheme has recommended the use of the colon (:) which allows for the use of some of the enumerated subjects as facets in the formation of compound subjects. In addition, the colon has been employed to form complex subjects.

Universal Decimal Classification: UDC is the first almost faceted scheme of classification. Itconsistsofthefollowingschedules:

1. The Main tables: The main tables enumerated the Universe of knowledge into 10 main classes, as in decimal classification. It consists of mostly compound subjects with some provision for synthesis.
2. ii) Auxiliary tables: UDC provides independent schedules of common isolates viz., Form, Time, Space, Language, Persons and Materials.
3. iii) UDC has also provisions of special Auxiliaries with limited applications.

The indicator: (Colon) is used as the most important synthetic device. Distinctconnecting symbols are used to combine numbers from common as well as special auxiliaries. It is in the auxiliaries' notation which provides synthetic quality in UDC. The use of several connecting symbols helped the class number to become polylithic.

Bibliographic Classification: Bliss introduced the concept of composite specification in his bibliographic classification. BC consists of large general schedule enumerating basic and compound subjects and two kinds of systematic schedules-

i) the common systematic schedules, the class numbers of which could be used commonly with all the classes of the main schedules and

ii) ii) Specialsystematic schedules which could be applied to specific subjects using the indicator comma (,).

iii) The synthetic quality and provision of connecting symbols enables its notation to produce polylithic numbers.

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1.3.2.2 Rigidly Faceted Scheme

"In a Rigidly-Faceted scheme for classification, the facets and their sequences are pre-determined for all the subjects going with a basic class". In this type of classification scheme, each basic subject is divided into number of facets and enumerated. Each basic subject is provided with a predetermined facet formula to be followed for constructing numbers for compound subjects. In it each subject coming under a main class is filled within the same facet formula whether some facet is present in it or not. The class numbers were enumerated only for isolate ideas and not for compound subjects. The principle of analysis and synthesis was introduced for constructing the class number of a subject.

Some of the characteristics of Rigidly Faceted Scheme are:

1. The scheme for classification consists of schedules of basic classes, a large number of special isolates and a few common isolates.
2. No effort is made to enumerate compound subjects and compound subjects are represented by adding common and/or special isolates to be basic subjects.
3. More hospitable to new subjects.

Example of Purely Enumerative Scheme are: Colon classification, from edition 1 (1933) to Edition 3 (1950), is termed as Rigidly Faceted Scheme because:

i) The facets and their sequence was predetermined for all subjects going with a basic class.
ii) Only one connecting symbol colon (:) was used to indicate different kind of facets. Due to this it was imperative to insert the connecting digit colon(:) even for the absent facet. This created cluttering of connecting digits.

Example: Design in Electrical Engineering D66:::4

The facet formula for engineering was engineering (work): Secondary work: (Part): (Problem).
In the above example secondary work facet, and part facet are absent, but their absence has to be indicated by the repetition of (:) colon in the class numbering which results in cluttering.

iii) The pre-determined rigid facet formula prevented interpolation and extrapolation of additional facets.

1.3.2.3 Almost Freely Faceted Scheme

As mentioned above that in a rigidly-faceted scheme of classification "the facets and their sequence are predetermined for all subjects going with a basic class" (Ranganathan,). This

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leads to a great deal of rigidity. A scheme becomes almost freely faceted "because the use of different indicator digits for diverse kinds of facets and the concept of rounds and levels removed severe rigidity in the number and the sequence of facets that can occur in a compound subject. However, some rigidity lurked in respect of levels of facet within a round". There-fore we can see that such a scheme does have some rigidity, because of which it cannot be freely faceted in full measure. As a result, it cannot be referred to as freely faceted classification.

Colon classification, Edition 4 (1952), edition 5 (1957) and edition 6 (1960) with annexure are regarded as second version. In this version the postulates of five fundamental categories, Rounds and levels, use of different connecting digits in place of one single connecting digit : (Colon) were used.

1.3.2.4 Freely faceted classification scheme:

A great deal of rigidity occurring in version 1 (edition. 1-3) of colon classification was removed in the second version (edition 4- edition 6). However, some rigidity remained with respect to levels of facets within a round, because of which it was not freely faceted in full measure. "In a Freely Faceted Scheme for classification, there is no rigid, pre-determined facet formula for the compound subjects going with a basic subject."

With the aid of sector notation, the rigidity with regard to the number of levels of facets and of their sequence in around (this kind of rigidity existed in the almost-freely faceted scheme) has almost been removed. Besides, some of the facets which were recognised earlier as levels have been designated as sub-facets in a facet belonging to one and the same level. Another change in concept has been that facets are now considered to belong to compound subjects not to basic subjects. The basic subject has no facets; it is a basic facet itself. This is an important idea.

Therefore, the predetermination of the facets for all the compound subjects likely to go with any basic subject is out of the question. This is a very logical solution to the problem. Therefore, we can see that rigidity has been removed to a large extent. Any scheme which follows the above approach can be considered a freely faceted scheme for classification. In freely faceted classification, the same pattern of facet sequence is followed in all subjects. A compound subject has the freedom to use any number of facets as may be found necessary. The sequence of facets is determined with the help of postulates and principles for facet sequence. The sequence obtained follows the absolute syntax of isolate ideas, because it has been found that such a sequence is preferred by a majority of thinkers. The sequence of facets is determined at the idea plane and implemented at the notational plane. Thus a freely faceted scheme is not subject to pre-determined facet formula for compound subjects going with a basic subject. Each compound subject determines its own facets (that is facet ideas, facet terms, facet numbers) and class numbers. It also determines its own facet sequence. This means there is nothing rigid about the number as well as the sequence of facets. Everything is free. Such a scheme is guided by canons,

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postulates and principles, and can, therefore, claimed to be called a freely faceted scheme for classification.

Examples

The dynamic theory as well as the techniques of library classification have been developed to the extent that the notational system used in CC is quite capable of placing any new main subject, a non-main basic subject (whether simple or compound) in a helpful place in the sequence. The same is true for any new compound subject. Version 3 of CC has nowcome out. CC 7 is now available It incorporates all the findings of the dynamic theory of library classification which is being developed consciously. It is believed that the new version of CC will tend to become a freely faceted scheme for classification.

According to Ranganathan ' The term Analytico-synthetic scheme is a generic term to denote any scheme in which a compound subject is first analysed into its facets in the idea plane and latersynthesized in the verbal plane and notational plane respectively'.

Colon Classification due to its faceted feature has also been termed as Analytico- synthetic classification scheme. Bliss was the first library scientist who described CC as 'Synthetic' scheme. Later it was A.J.Wells, who replaced the term with 'Analytico-synthetic'. According to Ranganathan alleditions of colon classification are fully Analytico-synthetic and the UDC has slight touch of Analytico- synthetic quality. He considered all faceted schemes of classification are Analytico-synthetic. However, in CC7 it has been emphasized that 'any faceted classification is not Analytico-synthetic unless it isfreely faceted.

The above discussions will make you understand the salient features of different schemes of classification. This knowledge will enable you to methodical and comparative study of various classification schemes.

The advantages of Freely faceted Schemes are :

- A freely faceted classification, based on explicitly stated postulates and guiding principles, is the most suitable scheme for adaptation in the design and development of depth schedules for the co-extensive classification of micro-subjects.
- A freely faceted scheme is Analytico-synthetic classification guided by postulates andprinciples.

The main features of freely faceted classification scheme are listed below:

- There is no rigid, predetermined facet formula for the compound subjects going with a basicsubject.
- Facets belong to compound subjects and not to basic subject.
- A subject is rotationally synthesized with only those facets that are components of it.

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- The sequence of the facets is determined on the basis of clearly stated postulates and principles.

Colon classification 7th edition (1987) incorporated all the findings of dynamic theory of library classification developed by a research team in DRTC from 1962 to 1986. The rigidity found in the predetermined facet formula was removed; thereby CC7 became a freely faceted scheme for classification. Only some pilot schedules of CC7 are published so far and CC7 is still yet to be completed.

In view of analysis and synthesis occurring successively in the course of construction of class number, another name for this kind of classification is Analytico-Synthetic classification. According to Ranganathan, "a scheme of classification which admits of facet (i.e. postulates and principles) provides for the schedules for the different kinds or facets needed in diverse subjects, provides connecting symbols and admits of the synthesis of Basic Class number (BC) and isolate number of a subject into its class number is called Analytico-synthetic scheme of classification."

IN-TEXT QUESTIONS

6. Write two examples of Almost Faceted scheme.
7. _____ is a generic term to denote any scheme.
8. 6th edition of Colon Classification in an example of which scheme:

a) Freely Faceted b) Enumerative
c)rigidly-faceted d) Almost facted

1.6 SUMMARY

The libraries may be categorized broadly into general and special libraries depending uponthe users the serve. The general schemes of classification, although cover the whole universe of subjects may or may not meet the demands of special libraries. Ranganathan, however differ from these groupings and identified that all the schemes of classification are guided or unguided by some postulates and principles. He has grouped the unguided schemes as enumerative and guided schemes as faceted classification schemes. Among these schemes of classification Ranganathan has recognized different species of enumerative and faceted schemes, which are discussed in this unit.

1.7 GLOSSARY

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Analytico-Synthetic Classification: A freely faceted classification based on postulates and principles for analysis and synthesis of the subjects, and where there is no rigid, predetermined facet formula for the compound subjects going with a basic subject.

Almost Freely Faceted Classification: the facets and their sequence are predetermined for all subjects going with a basic class.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. S R Ranganathan 2. False 3. Purely Enumerative Scheme 4. True 5. d) Almost enumerative	6. UDC and Bibliographic Classification 7.analytico-synthetic scheme 8. a) Freely Facted

1.9 SELF-ASSESSMENT QUESTIONS

1. List out different schemes and species of classification and explain in detail the features of enumerative classification.
2. Write an essay to substantiate that Colon classification is a faceted scheme of classification.
3. What is an Analytico-synthetic classification scheme? Give examples.

1.10 REFERENCES

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LESSON 2.1

THEORY AND DEVELOPMENT: HISTORICALDEVELOPMENT OFGENERALTHEORY

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 ClassificationofKnowledge
1.3.1HinduClassificationofKnowledge
1.3.2 Western and MidevialClassifcation Systems
1.3.3 DDC and CC
1..4 UDC,LCC and Later Classifcation Systems
1.4.1 UDC
1.4.2 LCC
1.4.3 Later Classifcation Systems
1.5 Development of Theory of Library Classifcation
1.5.1 Historical Development
1.5.2 AimsandProcessofClassification
1.5.3 Functionsoflibraryclassification
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

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1.1 LEARNING OBJECTIVES

Once you complete this unit, you can:

- developaninsightontherelevance ofLibraryclassification
- Identifythemechanismandtheoreticalbackgroundofthearrangementoflibrarycollections
- Understand the necessity oflibraryclassification

1.2 INTRODUCTION

We know that categorization and library classification is a type of organizing objects. Wecan observe such categorization in in a fruit shop. The fruit seller there arranges apples togetherand bananas together. We also do it in our home just in our homes as well:all newspapers arekeptinoneplaceandCDSandDVDarekepttogether.Wecanobservethesimilarcategorizationin Malls, Super stores etc. So human beings started organizing things time immemorial and wemoved from Categorization to Classification. Callimachus, of Alexandria (3rdCentury BC) could be considered as the earliest library classificationist. He hasdeveloped ***Pinakes,*** which is the first known Library Catalog and it had influenced several laterlibrariesintheMediterraneanandPersianGulfforalongtime.Unfortunately, welostthisLibraryCatalog.[1]

The Library Classification is the process of organizing information resources in a systematic wayand it facilitates subject access. The Ultimate aim of any classification systems is to help thelibrary users to locate books. Such systems also can accommodate the new subjects thathappens due to exponential growth of Research studies in all domainsof knowledge.Wewilldiscussthe historical development of knowledge and library classification in this unit and you will get aclearinsight on the how these classification systems helped librarians to organize variousinformationresources,beitmanuscripts,printedbooksorpapyrusscrolls,fortheeasyaccessof Libraryusers.

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1.3 ClassificationofKnowledge

As mentioned earlier, The Library Classification is the process of organizing information resources in a systematic way and it facilitates access to these resources,be it physicalresources or digitalResources. We are going to discuss the historicldevelopmentfvarious classifications systems in the following sections and provideyou an insight on the importamce and relevance of Library Classifcation systems. We cn see that these systems can accommodate the new subjects that are evolved due to exponential growth of Research studies in all domainsof knowledge

1.3.1 Sub-Section 1: Hindu Classification of Knowledge:

Knowledge was and seeking knowledge weregiven high priority in ancient India and the ***Kathopanishad***suggested people tobecomeKnowledgeable person***(Vijananavan*)**. **A** type of classification of knowledge existed in ancientIndiawhichhastwocomponentsnamely***ParaVidya***and***Aparavidya***.WhileAparavidyabri ngsforth material benefits, , Para vidya, helps people to achieve spiritual knowledge and Moksha(Salvation).***MundakaUpanishad***declaresthatallscience,art,literature,politics,andecon omicsall belong to the category of ***Apara Vidya***. Even the knowledge of Vedic rituals and all related toit belongs to ***AparaVidya***..On the other hand, the***Para Vidya*** refers to the knowledge by whichtheimperishablechangelessrealityoftheonebehindallisrealized.ItleadsonetotheAbsoluteby ensuringthepurityofthemind. [2]

Secondly, the Hindu classification of supreme goals that man can attain (Purusharta), namelyDharma,Artha,KamaandMoksha,canbeconsideredasapreliminaryformofvaluesan dthoughtprocess towards classification of knowledge. They can be roughly divided into two levels ofvalues, viz., Values related to material growth called ***Abhyudhaya***and it consists of Dharma,ArthaandKama;andthesecondoneindicatesthespiritualvaluesknownas***moksha***. ThetheoryofPurusharthas(thepurposeofexistence)formsthebasis ofIndianthought. [3]

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ACTIVITY

Visitaneighboringlibrary,whetherornotit is a college library or public library andmeetthelibrarianthere.Introduceyourself. Request him to show where thebooksonIndianHistoryarelocated.Notedown the Classification number of bookson theabove

1.3.2 Sub-Section 2: Western and MidevialClassifcation Systems

Plato(429?–347B.C.E.)isthefirstwesternthinkertodividehumanknowledgeintothreesubject **areas .**Porphyry, (b. 234–d. 305 CE), a Greek scholar, proposed a dichotomous System. This dichotomousdivision, is known as the "Tree of Porphyry. At the end, there is a term that cannot befurther divided. This classification system is based on the logical division of genus and species.[4].BasedonapassagefromPorphyry'sIsagogus,itbecamepopularinmedievallogicaltexts.[5]

Conrad Gessner (1516 – 1565) ,a Swiss bibliographer and physician, created a *KnowledgeClassificationduring*1548–1549anditconsistedof21components.(Bernd,2004).Thiscanbeconsideredasthebeginning ofScientificClassificationofknowledgedomainsduringthemedievalperiod.Thefollowingisthe structureofGessner'sclassification.[6]

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1. Grammatica	8. Astronomica	15. Metaphysica
2. Dialectica	9. Astrologia	16. Ethica
3. Rhetorica	10. Historica	17. Oeconomia
4. Poetica	11. Geographia	18. Politica
5. Arithmetica	12. Divinatio et Magia	19. Juriprudentia
6. Geometrica	13. Artes literates	20. Medicina
7. Musica	14. Physica	21. Theologia

Gessner also compiled a monumental work on bibliography, namely *Bibliotheca universalis, whichis*an exhaustive catalogue of all known works till his time in the languages of Latin, Greek and Hebrew.

MedievalSystems

Sir Francis Bacon [1561-1626], authored *magnum opus* called *Advancement of Learning*, andpresented his classification of *Knowledge of Sciences. He divided knowledge in to* ***Memory, Imagination,*** and ***Reason***based on human faculties. Such division can result in a similar classification pattern havingHistory*, Poetry, and Philosophy*. WT. Harris implemented the inverted Model of Bacon's in the St. Louis Public Library,Missouri. It is generally considered that the Bacon's ***Chart of learning*** is the basis for theclassificationmainclassesofDDCandMelvilDeweyhasacknowledgedhisindebtednessto W.T.Harris.[7]

Bacon's scheme classes

HISTORY	
A	Natural History
B	Civil History
C	Appendix to History
POETRY	
A	Narratice or Heroic
B	Dramatic
C	Allegorical. Fables, Mithologies
PHILOSOPHY	
A	Theology or Divine Philosophy
B	Natural Philosophy
C	Philosophy of Man

Source: Harris (1870)

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Another important contribution came from a French librarian Gabriel Naudé(1600-1653), whoauthored an important book titled *Advice on Establishing a Library* (1627).Hisclassificationsystemincluded theclasses such as Religion, Medicine, and Law. Five more classes added to this system in later years, making the total number of classes twelve.[8]EventhoughNaudé'*sbook*wassupposedtohelplibrariansinprivatelibraries,hedidsupporttheideaoffreepubliclibrarysystem[9].Latercenturieswitnessedaknowledgerevolutionwiththegenesisof Genetics,EvolutionTheory,Economics,Psychology,etc.whichledtothesystematizationoforganizationofknowledgein various domains.Contributions of Carl Linnaeus (1707-1778) to the field of Botany/Biology, andsimilar contributions by Antoine Lavoisier (1743-1794) to Chemistry, etc. helped create the ideaof a human order of the universe. The 18thcentury Europe, especially Northwestern Europe,witnessed sea-change by path breaking inventionssuch as the steam engine by James Watt[10].

As mentioned earlier, writings of Sir Francis Bacon were the starting point of William Torrey Harris's classification forlibrariesin theUnited Statesinthesecond halfofthe1800s. [11] His system focused on the classification from general to special classes.

ACTIVITY

Please visit a neigbouring public Library and check with the Librarian about the method he/she followed in arranging books. Find out where is books Sociology located nd ask the librry staff ,why sociology books are kept in a distance from Psychology books. Take note of the salient points

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1._____authored magnum opuscalled *Advancement of Learning.*

2.The Classifcication in the field of Botany was mainly due to the contributions from Carl Linnaeus. **True/False**.

3._____.Adopted the ideas of Bacon for the use in the libraries of USA.

1.3.3.DDC and CC

Melville Dewey (1851 – 1931), designed the Dewey Decimal System of library classification.He was influenced by Baconian system and publishedthefirstedition of DDC in 1876. It was a 42-page pamphlet and it heralded the beginning oflibraryclassification.ThefirsteditionofDDChad 18 pages of index and 12pages of tables in addition to the 12pagesofpreparatorymatter.[12]

The original 42-page first edition became a voluminous work of over 3,000 pages in its latestedition (23rd Edition). Most of the Public libraries in USA, Canada, and thousands of academiclibraries in India, UK, Japan, (Japanese version of DDC-The **Nippon Decimal Classification**)SouthKorea(KoreanversionofDDC-The **KoreanDecimalClassification**)usethisclassificationscheme.

Main Classes in DDC

In DDC, theprincipleofhierarchicalstructurehasbeenfollowedwithfocusonPracticalusefulness.Ther egularpracticeofrevisionandefficientOrganizationalsupporthaveensuredthecontinuedwid espreaduseofDDC.Beinganenumerative classification, DDC divides the Universe of Knowledge into ten main classes, whichare further divided into a hundred divisions, each one being further divided resulting in about athousand sections. DDC's position inthe field of classification has been strengthened with the incorporation of numerous additionalsynthetic devices in the19th edition [13] DDC did not claim the support of any

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philosophical principles; rather it focused on practical usefulness".[14]

Classes in DDC

000 Computer science, Information & general works

100 Philosophy & psychology

200 Religion

300 Social sciences

400 Language 500

Science

600 Technology

700 Arts & recreation

800 Literature

900 History & geography

Even though DDC was criticized for having too many subdivisions, itcould quickly gain enormous popularity and was quickly adopted by other libraries in theUSand othernations.[15]

Colon Classifcation

S.R.Ranganathan,designed the newscheme of Library classification called***ColonClassification(CC)*** anditsfirsteditionwaspublishedin1933.This scheme is different from the DDC in the fact that it advocated for analyzing the subject of a bookfrom the point of views of five fundamental categories namely: ***personality, matter, energy,spaceandtime***.InColonClassification,thereare108mainclassesand10generalizedclasses,whicharerepresentedbyamixednotationofIndo-ArabicnumeralsandromanandGreekletters.Each main class comprises five fundamental categories or facets, personality, matter, energy,space, and time. It is believed that the main contribution of Ranganathan was his fundamentalfacets.[16]

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The Colon Classification starts with a set of main classes and these classes are divided intofacets. CC believes that these facets are the manifestations of the five fundamental categoriesmentionedabove.Putininother way, these ***main classes*** are the traditional subjects, such as Physics, Chemistry, orEconomics.ThenumberofmainclassesinCCisgreaterthan thoseinDDCandUDC.Ranganthanhasputforwardedanumberofconceptssuchas Postulates ,Canons,etc.Postulatesare assumptions that are not tested for their veracity. The postulate on fundamental categoriesstates that there are five fundamental categories (FC), viz., Personality [P], Matter [M], Energy[E], Space [S], and Time [T], and this order of fundamental categories is described together asPMEST and these are arranged accordingtothedecreasingconcreteness[17].

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The scheme of Main Classes given in CC 6th revised edition is reproduced here:

z	Generalia	LX	Pharmacognosy
1	Universe of Knowledge	M	Useful Arts
2	Library Science	Ä	Spiritual Experience and Mysticism
3	Book Science	MZ	Humanities and Social Sciences
4	Journalism	MZA	Humanities
A	Natural Sciences	N	Fine Arts
AZ	Mathematical Sciences	NX	Literature and Language
B	Mathematics	O	Literature
BZ	Physical Sciences	P	Linguistics
C	Physics	Q	Religion
D	Engineering	R	Philosophy
E	Chemistry	S	Psychology
F	Technology	Ó	Social Sciences
G	Biology	T	Education
H	Geology	U	Geography
HX	Mining	V	History
I	Botany	W	Political Science
J	Agriculture	X	Economics
K	Zoology	Y	Sociology
KX	Animal Husbandry	YX	Social Work
L	Medicine	Z	Law

Courtesy: 6th Edition of Colon Classification

Ranganathan has given much importance to the term ***Facet*** in his classification scheme, whichcomes under the group of *Facetted Classification*. Theterm***facet*** has been defined as thecharacteristic by which ' a class is divided/grouped. [16]. CCusesamixednotationthat consistsof Indo-Arabicnumerals, (1-9), Romanalphabet-bothcapitals andlower case,AtoZandatoz., parentheses (}4) and Indicatordigits.[17]

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Becauseoftheongoing interdisciplinaryresearchnewsubjectsareformedveryfrequentlyandadynamicclassification schemeshouldbeabletoprovideappropriateplacesforsuchnewsubjectswithinitsclassificatorysequenceorframework.ColonClassificationprovidesanumberofdevicesforaccommodatingnewsubjects.Thesedeviceshelpclassificationistinformingnew isolates andhaveconsequently made the classificationscheme Lean and **thin**.Thefollowingsix devices used in CC[18]

1) Chronologicaldevice: usedforindicatingthedateoforigin.ForexampleClassnumberforCCwouldbe 2:51N3

2) Geographicaldevice: TheGeographicaldevices(GD)consistsofusingthe geographical area such as continent. Ex.HistoryofIndianLaw:V44

3) Subjectdevice:Thesubjectdevicesconsistinusingtheappropriateclass(subject)foranisolate Ex. MedicalLibrary24(L)

4) Mnemonicdevices:

5) Alphabeticaldevice:

6) Superimposition devices

Use of Mnemonic Device in CC

Class	Anatomy	Physiology	Diseases
G Biology	G : 2	G : 3	G : 4
I Botany	I : 2	I : 3	I : 4
K Zoology	K : 2	K : 3	K : 4
L Medicine	L : 2	L : 3	L : 4

Courtesy: Egyankosh(2013)

Merits and Demerits of CC

Merits:

a. Colon Classification is based on a sound theoretical framework and it has provision forhospitable notation.
b. CC is known as analytico-synthetic classification.
c. CCcanbeeffectivelyusedininformationretrievalsystems

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d. CCgivesmaximumautonomytoclassifiers duetoits inbuiltfeatures

Demerits:

- Nomechanismtofortheregular revision of CC
- Theguidance provided in theseventh edition lacksclarity.[19]
- CCisusedonlyinveryfewlibrariesinIndiamainlyduetolimitedpossibilityinclassifyingemergingsubjects.

IN TEXT QUESTIONS

4. The Main Contribution that Ranganathan has made to the theory ofClssifcation was_____

5.The First Edition of DDC was published in 200 Pages.**True / False**

6.UDC and DDC are originated from USA. **True / False**

7.No Mnemonic Devise is used in CC. **True / False**

1.4 UDC and LCC

1.4.1 UDC

TheUniversalDecimalClassification(UDC):

This classification scheme is famous for its systematicarrangement of allbranchesofhumanknowledge.T woBelgianscholarsnamely,PaulOtletandHenriLaFontaine adapted DDC aftergetting necessary permissionfromMelvilDewey.They published the first editionduring the period of 1904 to 1907.TheUDC notation is alpha numeric

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and mainly consists ofnumerals:0,to9 as in DDC. TheRomanalphabets, bothcapitaland lowercases are also used in the Notation.TheMain classesofUDC are shows similarity with DDC excepting the fact that there is a vacant class (4) and it is planned for the schedule expansion. It was made vacant bymoving linguistics into class 8 Literature. [20]

UDC is widely used in in various libraries, and documentation centers across theworld. This is an Analytico-synthetic and faceted classification andis published in more than 50 languages.

Main tables in UDC

Notation	Description
0	Science and Knowledge. Organization. Computer Science. Information Science. Documentation. Librarianship. Institutions. Publications
1	Philosophy. Psychology
2	Religion. Theology
3	Social Sciences
4	vacant
5	Mathematics. Natural Sciences
6	Applied Sciences. Medicine, Technology
7	The Arts. Entertainment. Sport
8	Linguistics. Literature
9	Geography. History

Courtesy: https://udcc.org/

MeritsandDemerits:

- Simpleandeasynotation.
- UDC follows thedecimalnotation as in DDC
- Itis verymuchflexible,andspeciallibrariescaneasilyuseit.
- TheUDCcanbeusedforindexingandretrieval

Demerits:

- Thenotation used in UDC could be longandclumsy.

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- The revision is expensive and cumbersome considering the publication of several different editions in various languages

1.4.2 LibraryofCongressClassification(LCC)

JamesHanson,thethenChiefofCatalogdepartmentat Library of Congress, developed the LCC asearlyas1897with the help of Charles Martel. It is an enumerative classification based on*Expansive Classification* of Cutter and it has 21 classes. Each main class consists of severalsubclasses. For example, Class Technology has 17 sub classes. It is the biggest of all theclassificationsystemshaving41printedschedules.Mainclasses are denoted byalphabets. Itsnotation isAlphanumeric

LCC has reached to an envious position and has been used in the Library of Congress (USA) and in most of the academic and research libraries in North America and other countries.

Outline of the major subject areas in the **LC Classification system**:

A - General works	**M** - Music
B - Philosophy, Psychology, Religion	**N** - Fine arts
C - History - Auxiliary sciences	**P** - Language and literature
D - History (except U.S.)	**Q** - Science
E - General U.S. history	**R** - Medicine
F - Local U.S. history	**S** - Agriculture
G - Geography, Anthropology, Recreation	**T** - Technology
H - Social sciences	**U** - Military
J - Political science	**V** - Naval science
K - Law	**Z** - Bibliography and Library science
L - Education	

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Courtesy: https://library.suu.edu/LibraryResearch/LC-System

Merits and Demertis

- LCCishighlyenumerative;
- subjectexpertsregularlydevelopandmaintaintheLCCschedulesandmorerelevance andauthenticity
- There is a regular mechanism to revise the LCC
- Newclasses,subclassesetc.canbeeasilyadded

Demerits

- LCCsaid to have American Biases and hence may notbeapplicableforothercountries andcollections
- Largenumberofschedules
- differentsubjectexpertsdevelopschedulespertainingtotheir subject collection (can result in lack of consistency)

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Comparative Study of Three Major Schemes of Classification:

Description	DDC	UDC	CC
Main Outline	DDC comprised of 10 Main Classeswith 9 sub-classes and 9 sub classes of each sub class. That is beginning with most general subjects to more specific ones.	The scheme follows DDC except addition of some new sub-divisions and signs of combination for indication of relation of subjects.	Main classes are comprised of Generalia (1 to 9) and 26 Main Classes (A to Z) of both Science and Humanities. The first 13 classes comprise the Science and applications and the last 13 comprises of Humanities.
Notation	Notation originally was pure; later on some letters have been used. Three figure minimum notations have beenÂ used.	Mixed notation consists of figures letters and other symbols. The decimal point is repeated after everyÂ three figure.	Notation is extremely mixed consisting of Arabic numerals, roman alphabet (both capital and small) and symbols and signs including colon. Arabic numerals (1-9) are assigned to the Generalia class and capital letters of the roman alphabet are assigned to the specific main classes. Notation is faceted. It is synthetic it uses fraction on principle for both numbers and letters and achieves hospitality in both array and chain.
Form Division	DDC uses series of nine common form divisions and these with minor alternatives are used withÂ same meaning throughout the scheme.	Form divisions (01-09) retain the original Dewey significance but have been redefined and greatly expanded.	In CC, common sub-divisions use of lower case letters with decimal sub-divisions where necessary
Mnemonics	The principle mnemonics features are: Form divisions, Geographical divisions, and Language divisions.	Number building devices as well asauxiliary schedules are mnemonics features.	The scheme is faceted one and enjoys a considerable mnemonic quality by the use of same facets and common facets.

Courtesy: https://www.lisedunetwork.com/

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Case Study on the Comparative aspects of UDC and CC

Main class structure

While UDC main class structure is based on DDC main class structure, CC decided the structure of its main classes following some principles, such as Principle of Increasing Concreteness in science subjects and the Principle of Increasing Artificiality in humanities and social science subjects. Obviously, the collocation of basic subjects is poor in UDC, as in DDC, while that of CC is much better on this account. However, in Universal Decimal Classification, International Medium Edition, English Text (1985)[UDC(M)] one of the much criticized distance between Literature and Language classes was removed by placing Language along with Literature. This collocation of Literature and Language reflects the collocation of the two basic subjects as found in CC. Possibly the decision of UDC to bring Literature and Language at one place in UDC (M) has been inspired by the collocation of these basic subjects in CC

IN TEXT QUESTIONS

8.UDC was influenced by the Principle of Increasing Concreatness. True/ False

9.In which edition of UDC, Languge was placed along with Literature?

10.According to the author,UDC was influenced by CC in bringing together Language and Literature

1.4.3 Later Classifcation Systems

BibliographicClassification(BC)

H.E. Bliss developed this classification and its first edition was published in 1953.this classification scheme was not used much. Thesecond edition was prepared by J. Mills and this edition is considered to be agoodmodel-ofafaceted classification.[21]

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Philosophicalclassifications (PC)

Barbosa noted that these classifications are purely theoretical classifications [22].Barbosapostulated that such philosophical classification systems has the main characteristic of principle of useful sequence.

BroadSystem ofOrdering(BSO)

Broad System of Ordering (BSO) was developed by UNESCO and published in collaboration with FID (International Federation for Documentation) in 1978[23] and it is a facettedClssifcation.

1.5 Development of Theory of Library Classifcation

A theory provides a structured knowledge framework or set of principles that serves as thefoundation for further evolution of a subject. It explains various processes and provides an ideaon what is going on and why. It gives a subject respectability and status by providing a scientificfoundationforit.Theoriesprovideguidanceandgivemeaningtowhathappens ina discipline.

There was no much complexities of subjects in the beginning when theoretical attempts were made to explain issues related to knowledge classification.The earlier classification schemes addressed the minor issues at that point of time. Later on, complexity of subjects increased, and it became necessary to classify knowledgemeticulously.[24].

We know that Library Classification is the basic and important activity in organizing the librarycollection and acts as a “complementary process of information retrieval. It is the process ofarrangingthings based on the likeness and unlikeness. Margaret Mann describes classificationofbooksasaknowledgeclassification. According to Sayers, LibraryClassification is the *arrangement of books on shelves.*[25]. Ranganathandescribedit as the “transformation of the subjects enshrined in the books intotheartificiallanguageof Notations and numerals".

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There can be two major divisions of Classification schemes namely, Enumerative ClassificationScheme, Analytico-Synthetic Classification, and Facetted Classification A classification whoseschedules have a long list of subordinate classes of ever increasing specificity can be describedan*EnumerativeClassification*.Suchclassificationschemesattemptstoenumerate allthepossibleclassesintheclassification;LCCandDDCareexamplesfor*EnumerativeClassification schemes.*AnAnalytico-syntheticclassificationdoesnothavetoprovidealargenumberofready-madecompoundclassesorclassnumbers;instead,itlistsindividualtermsorconceptsthatclassifierscanjointogetherasperthecontext.Itisafactthatanalytico-syntheticschemes dohavePre-coordinatedclasses,buttheydonotneedtobeasnumerous as in an enumerative scheme. [27]

Sinceitisunnecessarytoprovideclassnumbersforeverypossiblesubjectsorsubjectcombination,ananalytico-syntheticschemeiscomparativelyshorterinlengththananenumerative scheme. On the other hand, it has many more potential classes for present andfuturesubjectsthanareactuallyspecifiedintheschedules.TheUniversalDecimalClassification is the best example of an analytico-synthetic scheme. Because of its analytico-synthetic nature,and it's large number of systematic tables for frequently occurring topics, UDC make, merging orjoiningofthemajorityofotherclassesareality.TheDeweyDecimalClassificationhas also embraced some of the features of facetted classification and DDC can be considered as *an enumerativeschemewith analytico-syntheticfeatures*[28]

1.5.1 Historical Development

In the History of Library Classification, there are two developmental stages in the genesis of the General Theory of LibraryClassification. In the first developmental stage there was an emergence of , we see the emergence of descriptive theory and their applications. In stage 2, we findthe development of a dynamic theory. This dynamic theory was instrumental in guiding in the design process of classification schemes. Library Science theoreticians suchasJ.D.Brown,Sayers, Bliss, and S.R. Ranganathan contributed to the development of the descriptive theory. In the stage 2, Ranganathan played a crucial role in designing the dynamic theory and thus helped the theory of classification to have objective approach.[29].

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1.5.2AimsandProcessofClassification:

The Library Classification aims to demonstrate how the human intellect transforms sensory impressions of the authors in the form of books into a universe of concepts. The need to organize this mass of knowledge has resulted in the development of classification schemes. The main aim of all classification works is to organize the manifestation of intellectual thinking of authors in the form of books by organizing them as per their subject affiliation. Library classification serves four main purposes, namely organizing manifestations of thought content of authors systematically, arranging related books in the most useful order, shelving the returned books on book shelves, and finally providing the exact locations of the books physically by having shelve lists or on online platforms such as OPAC for the easy location by library users. [31]

1.5.3. Thefunctionsoflibraryclassification

Thefunctions oflibraryclassification may listedbelow:

i) Arrangement of books as per the classificatory sequence helps the library staff in locating a particular document, when needed.

ii) It helps to have systematic arrangement of books, which is convenient for both library users and Library staff members.

iii) Ithelpstoarrangedocumentsincloseproximity

iv) Library Classification helps the library staff add books of new subjects to the library collection by allocating proper place

v) It became an ***intelligent tool for knowledge discoveryand retrieval*** [32]

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Activity

Make a list of the Classificationschemes discussed above andmentiontheiryearsofPublications

(Note: Write only the year ofpublication of First edition, ifavailable)

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IN-TEXT QUESTIONS

11. _____ has adopted some features of Analytico-synthetic classifcation
12. _____ contributed to both Descriptive and dynamic theory of Classifcation
13. Library classification serves four main purposes. **True / False**
14. Bliss has contributed to the Dynamic Theory of Classifcation **True / False**
15. TheUniversalDecimalClassificationis can be the best example of an analytico-synthetic scheme:**True / False**

1.6 SUMMARY

The Concept of classifying Knowledge was given much importance even ancient times. By thepaassge of time, complexities of subjects increased and new schems have been proposed . Eventhough Colon Classifcation has a sound theoretical back ground,it is

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not used very much even in India. UDC,DDC, and LCC are the classification schems that are popular now days . LCC is mostly used in the academic libraries of North America. UDC is famous for its wideusage in Europe and special libraires in several countries. DDC is also popular in both academic and public libraries in various countries.

1.7 GLOSSARY

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Attribute: Attribute is any property or, quantitative measure or quality possessed by or inherent in an entity.

Characteristic: On the other hand, a characteristic is "an attribute, or any attribute-complex with reference to which the likeness or unlikeness of entities can be determined and at least two of them are unlike".

Compound Subject: A Compound Subject is a basic subject when it has at least one focus, or has at least an aspect, i.e., it has a basic facet and one or more isolate facets.

Expansive Classification: Scheme of classification designed by Charles Ammi Cutter and published for the first time in 1893.

Enumerative classification: Enumerative classification is that in which all classes and their corresponding symbols are enumerated.

Faceted classification: A faceted classification is a classification scheme used in organizing knowledge into a systematic order. A faceted classification uses semantic categories, either general or subject-specific, that are combined to create the full classification entry.

Main Class: A traditional area of coherent knowledge whose length and breadth falls with in the comprehension in of a normal scholar. Also it is the first array division of a discipline. For example, sciences are divided into main classes mathematics, physics, chemistry, zoology, etc.

MARC Record: Machine readable catalogue produced by the Library of Congress for online use and for distribution of cataloguing records. The main feature of such records is internationality recognized numerical tags assigned to each field known as MARC 21 to identify each field in a catalogue entry. **Mixed Notation:** A notation comprising of two or more species of digits, e.g., combined use of alphabets and numerals as in the LCC, or numerals and punctuation marks as in the UDC. Notation of the CC is the most mixed.

Notation: Series of short hand symbols to represent subjects and to mechanically fix their order decided in the idea plane. That is why Ranganathan called it as servant of the idea plane. It is also helpful in synthesis of numbers and to mechanize the arrangement of documents on the shelves or entries in a classified catalogue.

Pure Notation: A notation comprising of single species of digit, e.g. the DDC has only 0/9 used decimally, or Rider's International Classification comprising of alphabets uses only A/Z.

Hierarchical Notation: A notation designed to show that two terms are in the same array, or the same chain.

Relative Index

The index to the DDC. It is called "Relative" because it shows the connection between subjects and the disciplines in which they appear. In the schedules, subjects are arranged within disciplines. In the Relative Index, subjects are listed alphabetically. Under each subject, the disciplines in which the subject is found are listed alphabetically. In the print version of the DDC, the disciplines are indented under the subject. In the electronic version, the disciplines appear as subheadings associated with the subject.

Schedules

(1) Listings of subjects and their subdivisions arranged in a systematic order with notation given for each subject and its subdivisions. (2) The series of DDC numbers 000–999, their headings, and notes.

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1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Sir Francis Bacon 2. True 3. William Torrey Harris 4. Five Fundamental Categories 5. 42 Page 6. False 7. False 8. True 9. True	9. UDC(M) published in 1985 10.True 11.UDC 12.S.R.Ranganathan 13.True 14.False 15.True

1.9 SELF-ASSESSMENT QUESTIONS

1. Why we need Library classification?
2. What is a geographical device in CC ?
3. What is a chronological device?
4. Write a short note on Fundamental categories in Colon Classification
5. Discuss the importance of classification.
6. What do you understand by logical division? What are the limitations of logical division?
7. Discuss the innovative features of DDC
8. Describe with suitable examples the concept of five fundamental categories.

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Lesson 2.2

GENERAL THEORY: NORMATIVE PRINCIPLES

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Descriptive Theory of Classification
1.4 Dynamic Theory of Classification
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

1.1 LEARNING OBJECTIVES

In the present chapter, we aim to present a detailed account of the development of the theory of classification and normative principles. After going through this chapter, students will be able to know why theory is needed for library classification and the difference between static and dynamic theory of classification. Contributions by various personalities, including Dr. S.R. Ranganathan, will be discussed in this chapter.

1.2 INTRODUCTION

Looking back at the development of library classification, we can observe that in the beginning, they focused on a small number of topics that comprised all knowledge, and broad classification matched the requirements of the time. The demands of the moment were the main driving force for the creation of the strategy. These strategies appear to be driven more by short-term goals than by tried-and-true concepts.

These devices provide quick and temporary solutions to issues. The number of topics into which knowledge could be subdivided, however, continuously grew over time,

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demonstrating the inadequacy of the current method. The complexity of the topics covered in the documents made it necessary to carefully classify the information. Given this complexity, there was a need for a library classification theory that could keep up with the fast growth of knowledge.

1.3 DESCRIPTIVE THEORY OF LIBRARY CLASSIFICATION

We must comprehend the value of developing a theory before studying library categorization theory. It's also important to acknowledge the demand for such a theory. A structured body of ideas that serves as a foundation for deeper research and topic development is referred to as a theory. The what and why of current happenings should be explained. It makes a subject eligible for inclusion as a discipline in higher education. It gives the subject a solid academic foundation and bestows respect and significance. It doesn't need to be emphasised how crucial it is to the growth and development of the subject. When we look back at the development of library classification, we can see that they first focused on a small number of topics that included all knowledge, and broad taxonomies were appropriate for the needs of the time.

The demands of the moment were the main driving force for the creation of the strategy. These strategies appear to be driven more by short-term goals than by tried-and-true concepts. These devices provide quick and temporary solutions to issues. The number of topics into which knowledge could be subdivided, however, continuously grew over time, demonstrating the inadequacy of the current method. The complexity of the topics covered in the documents made it necessary to carefully classify the information. Given this complexity, there was a need for a theory of library classification that could keep up with the rapid growth of knowledge.In many facets of life, practise comes before theory.

We must be aware of two connected phases in order to comprehend how library taxonomy theory has developed. The emergence of description theory and familiarity with the creation and use of library categorization techniques are two stages in this process. Some of the personalities who led in developing the Descriptive theory of Library Classification are E. C. Richardson, Edward Hume,Brown, Henry. Bliss,SR Ranganathan, and W. C. B. Sayers

1.3.1 Era of Descriptive Theory

The first era of the principles of library classification (1901–1937) is called the descriptive theory. In the era of this theory, first classification was used, and after that, theories were formed. The same practical procedures were followed in the classification systems. The descriptive theory arose from these practical processes.The effect of this descriptive theory lasted till 1950. These principles contributed greatly to the development of the general theory of classification. The following are the main principles propounded in the period from 1901 to 1937.

1.3.1.1 E.C. Richardson (1860-1939)

EC Richardson is considered to be the first step in the formation of principles in the field of library science. He was working as a librarian at Hartford Theological Seminary, USA. After that, he took over as the librarian at the Princeton University Library. He also formulated the classification system for these two libraries. Some basic principles for library

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classification were propounded as criteria, which were included in the book Classification Theoretical and Practical, published in 1901. The principles propounded by Richardson, also known as the criterion of classification, are as follows:

1. For classification, the order of complexity, historical order, or, if necessary, the order of evolution should be used. Richardson formulated certain criteria for the sequence of subjects in this theory. Dr. Ranganathan came up with the theory of complexity, the theory of development, and the auxiliary sequence subformula.

2. There should be provision for marking in the classification system. The numbers should be compound and decimal based. so that unlimited subdivisions can be accepted and the marking memory is helpful.Sayers, Bliss, and Ranganathan have considered mixed notation suitable for library classification.

3. Classes should be broken down to the smallest level for classification. According to this principle, the classification should be divided not only into main divisions, but also into fine forms for the subject and its classes.

4. There should be provision for detailed and clear indexing in the classification methods. This makes the use of classification methods easy and appropriate. Sayers and Bliss have also propounded the Upsutra or theory in this context.

5. Goods should be classified on the basis of their similarity or dissimilarity.

1.3.1.2WCB Sayers (1881-1960)

William Charles Berwick Sayers is known as an English librarian, trainer, and teacher of library science. He was also the mentor of Dr. S. R. Ranganathan. He had also developed the principles of library classification. He is regarded as the first grammarian of library science. It is true that he did not create any classification systems but, through his theory, paved the way for the creation of classification systems for others. He published the classification principles in the book "Canons of Classification" in the year 1915. After this, all those principles were expanded in three other works. These are three compositions. Manual of Library Classification (1926), Grammar of Classification (1935), ed. 4, Introduction to Library Classification (1958).

Sayers' Canons of Classification

In total, Sayers has propounded 29 principles, which are called bye-laws. These 29 rules are divided into six parts. This six-part is as follows:

1. Canons of definition

(i) According to Sayers, the word "classification" can have four meanings.

(a) Classification is an intellectual process; (b) It is the process of organising things; (c) It is written schedules of words and words; and (d) Classification is the process of assigning proper placement to objects and books in the classification system.

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(ii) The whole world of knowledge has been included in the general classification and some parts have been included in the specific classification, such as natural science and social science.

(iii) All the ideas received from the world of knowledge, whether they are related to the present, past, or future tense, can be subject to classification.

(iv) The collection of classes and placing them in a systematic order is called a classification system.

They are put into groups based on their similarities, which are found by looking at their characteristics.

(vi) The sections should be arranged in such a way that the readers can get maximum benefit from the library.

2. Canons for division

(i) To collect things on the basis of their similarity and to keep them separate on the basis of dissimilarity is called classification. It can be of two types.

- A group of objects show an artificial trait, like the colour of their clothes, etc.
- The natural characteristics acquired by things are inherent in them from the very beginning, which is often responsible for their existence.

(ii) The essential feature is very useful from the point of view of classification.

(iii) Every sub-division of a class is called its subordinate class. All such subordinate classes remain the same in all conditions.

(iv) The process of arranging classes in any classification system starts with the main classes. Objects are put into groups based on how much detail they have and how intense they are.

(v) Fine-to-fine variation should be used at each stage of classification.

(vi) The use of the other should be done only after the full application of one principle, making it the basis of the division of characteristics.

3. Canons of book classification: The book classification is used to arrange the texts on the funds in subject-wise or logical order. The classification system should be so efficient that if a new subject comes up, it can be accepted without any hindrance. Therefore, the following points should be taken into account in the text classification process:

It is necessary to have common main classes.

(ii) must have common tables.

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(iii) There should be provision for forms such as drama, poetry, novels etc. (iv) Marking

(v) It is necessary to have provision for an index.

4. Canons of terms

(i) In classification, each class should be known by its own names and terms.

(ii) With the help of these words or words, the classes get the correct name.

(iii) The definitional words to be used should be clear, technical and prevalent, but permanent.

(iv) Definition words or terms represent knowledge correctly.

5. Canons of Notation

(i) The notation used in a classification system is notation.

(ii) When symbols of the same type are used, it is called pure notation, like notation in DDC.

(IIi) Marking should be precise, simple, flexible, and mnemonic.

(iv) The notation of the classification system should have the ability to admit new classes and sub-classes.

(v) A separate table should be made for mnemonic marking so that it will be helpful to remember it by using the same marks for such subjects.

6. Canons of Book Classification Sytem

(i) A classification system's schedules should be set up in columns so that the subjects are listed in the order of how important they are.

(ii) The rules of the classification system should be amended from time to time. By revision, new developments in knowledge can be incorporated into it.

(iii) There would be general tables with the main division of the subjects and roles related to the method to be used.

1.3.1.3 E. W. Hulme (1859–1954)

C. B. Sayers has said that Hulme contributions have provided an important form to current theories that are more complete and satisfactory. He was the librarian of the Patent office library. He said that the purpose of book classification and knowledge classification should be completely different. According to him, the schedules of the classification system should be designed according to the requirements of the published literature. Based on this

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idea, he propounded the fundamental principles. According to Hulme, all classifications can be arranged into two groups.

(I) Mechancal Classification
(II) Philosophical Classification

Hulme considered book classification as mechanical classification.

1.3.1.4 J.D. Brown (1862-1934)

He was an English librarian who made a small but important contribution to the general theory of library classification. He devised three classification systems: Quinn/Brown (1898), Adjustable classification (1898) and Subject Classification (1906). He came up with his three different classification schemes.

In 1906, Brown published the first edition of his best-known scheme, Subject Classification. Its second edition was published in 1914. Brown's classification of subjects is based on the principle that all science and art have a specific source. In the order of things, previously, there were only two factors, viz., matter and force. These, in turn, gave life. Life, in the course of time, led to the mind, which in turn gave birth to records.

1.3.1.5 H E Bliss (1370-1955)

Henry E Bliss also contributed a lot in the development of theory of classification. He also devised a classification scheme known as Bliss's Bibliographic Classification. His concepts about library classification arebrieflydiscussedbelow:

Consensus: Blissviewedtheclassificationofbooksessentiallyasaclassificationofknowledge.Hefeltthattherewasagreatdealofagreementamongscholarsaboutthearrangementofvariousbranchesofhumanknowledge.Hecalleditscientificandeducationalconsensus.Growth,organizationanddevelopmentofhumanknowledgetakesplacethroughtheprocessofscienceandeducation.Thewordagreementreferstorelativeagreementaboutthemostimportantclassesofknowledge,theirscope,location,andimportantrelationshipbetweenthem.Hebelievedthatthenaturalorderofthemainclassescame closetothisorderofconsent.Blissbelievedthatthemoreaccuratelylibraryclassificationreflectedthisconsensus,themorestable,durable,flexible,andeffectiveitwouldbe.Hisbasicclassorderisbasedonthisconsensus.

Subordination: Blisstheorizedthataclassificationschemeshouldfollowtwotypesofsubordination, i.e.

1) Subordination of the special to the general, and
2) Gradation by speciality.

Subordination of the special to the general:Thisisalsoknownastheprincipleofdecreasing extension.Theclassificationschemeshouldarrangethetopicsindescendingorderofgeneraltoaspecialtopic.

Gradation by speciality:This concept is based on the philosophical notion of gradation by speciality. Gradation principle is that some subjects depend for their existence on the works

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or findings of other subjects, and those that are dependent should follow the disciplines upon which they rely. Thisisalsocalledtheprincipleofdependency.

Blissthoughtthat"subjectgradationisnotabasisforclassification,butanessentialprinciplefortheactualprocess."

Collocation: Thisistheresultoftheabovetwoprinciples.ByCollocation,Blissmeans"bringingtogethersubjectsthataremostcloselyrelated."Ranganathancalledthisthefiliatory sequence.Theprinciplesofsubordinationandgradationofsubjectshelptodeterminetheorderofsubjectsorbroadsubjects,andwithineachsubjecttheprincipleofdecreasingextensionanddifferentorderineachseriesdeterminestheorderofsubjects.Itisalsonecessarytocombinesimilartopicsthataremorecloselyrelated.Itcanalsobe referedtosubclasses.

AlternativeLocations: Aclassificationschememustmeetthediverseneedsandrequirementsofaspecialcollection.Thus,librariescanchangetheordersetbythelogicalorder.Therefore,thescheme,ifitistobeofmaximumutility,mustallowlogicalprogressiontobeadaptedtopracticalconveniencetoaccommodatedifferentopinions.Blissdidnotbelieveintherigidandunadaptableviewoftheorderofknowledge.Tomeetthisprincipleofpracticalconvenience,provisionhasbeenmadedeliberatelyforalternativelocationsandtreatmentsinhisuniquescheme,thoughitissomewhatcontrarytotheprincipleofconsensus.Thisprincipleprovidesflexibilityneededtosolvecertainproblemsinclassificationfacedbyallclassifiersofallsystems.Butitalsoprovesthatthereisnoabsoluteagreementabouttheorderofsubjects.

Notation: Blissrecognizedthreeimportantcharacteristicsofgoodnotation.Theyare:

•Itshouldbeproportionateandsubsidiary.

•ItshouldbesimpleandshortHeevenproposedaneconomiclimitofthreetofourdigitsintheclassnumber.

•Itshouldusesyntheticproperties.Thisistoachieveeconomyintheprintinganddisplayofplans,resultinginasimplestructureandconvenientuse.

Blissdidthisbyprovidinggeneralandsystem-specifictablesforconstructingclassnumberswithequalextension

IN-TEXT QUESTIONS

1. Principle of Literary Warrant was propounded by
   (A) J D Brown (B) W Hulme (C) S R Ranganathan (D) H E Bliss
2. Who is related to Bibliographic Classification?
   (A) H E Bliss (B) Melvil Dewey (C) S R Ranganathan (D) J D Brown
3. Subject Classification was given by
   (A) S R Ranganathan (B) H E Bliss (C) J D Brown (D) E C Richardson

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1.4 DYNAMIC THEORY OF CLASSIFICATION

The importance of dynamic classification in giving a scientific form to library classification Theories have played an important role. The second stage of the library has been called the development of dynamic principles. According to RS Parkhi, "Library classification is a principle by which the method of construction and design of a library classification system can be made. With this principle, new subjects can be easily arranged without disturbing any sequence.

The dynamic theory was developed by Dr. S. R. Ranganathan from 1948 to 1955. In Prolegomna to Library Classification, he published the development of dynamic theory. Its third edition was published in 1967. Dr. Ranganathan published the first edition of the colon classification in 1933. He briefly touched upon the system of "canon and law" but did not explain the usage of the same. In order to provide a scientific basis for the "Library Classification," he deeply studied the works of universal Decimal Classification, the Library of Congress, and Brown's Subject Classification. It resulted in the discovery of canon and new vocabulary by him. He published his works, including the theory of classification, in 1937 under the title of Prolegomena, to the Library. This work included 28 canons with detailed descriptions for use in Colon Classification.Under the influence of these ideas, Ranganathan published the second edition of the Colon Classification in 1939, which is based upon these canons.

The second edition of Prolegomena to Library Classification was published in 1957, which provided a flip to the Library Classification. The number of canons rose to 35 in it. This edition also had 21 postulates and 11 principles. The important features of this edition are as follows:

(1) 11 = Laws
(2) 43 = Canons = 43
(3) 18 = Helpful Sequence Principles
(4) 13 = Proposal
(5) 04 = Facet Sequence Principles

(1) LAWS:

(a) Fundamental Laws:

1. Interpretation laws.
2. The Laws of Impartiality
3. The Laws of Symmetry
4. laws of local variation.
5. laws of osmosis.

(b) Fundamental Principles:

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1. Books are for use.
2. Every reader has his own book.
3. Every book has its reader.
4. Save the time.
5. The Library is a living, breathing organism.

(2) CANNONS:

(A) Canons for Idea Plane work:

1. Canons of differentiation
2. Canon of relevance
3. Canons of ascertainability
4. Canons of permanence
5. Canons of concomitance
6. Canons of relevant succession
7. Canons of consistent sequence
8. Canons of exhaustivness
9. Canons of exclusiveness
10. Canons of Helpful sequence
11. Canons of Consistent sequence
12. Canon of decreasing extension
13. Canon of modulation
14. Canon of subordinate classes
15. Canon of coordinate classes

(B) Canons for Work in the Verbal Plane:

1. Canon of context
2. Canon of enumeration
3. Canon of currency
4. Canon of reticence

(C) Notation Canons for Work:

1. Canon of synonyms
2. Canon of homonymy
3. Canon of realism
4. Canon of uniformity
5. Canon of hierarchy
6. Canon of non-hierarchy
7. Canon of mixed base notation
8. Canon of Pure base notation
9. Canon of faceted notation
10. Canon of non-faceted notation
11. Canon of co-extensiveness
12. Canon of non-co-extensiveness

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13. Canon of general mnemonics
14. Canon of alphabetical mnemonics
15. Canon of scheduled mnemonics
16. Canon of seminal mnemonics
17. Canon of extrapolation in an array
18. Canon of interpolation in in an array
19. Canon of Extrapolation in the chain
20. Canon of interpolation in the chain

(4) Chain Interpolation Canon:

1. Canon of Book number
2. Canon of Collection Number
3. Canon of Distinctiveness

Three (3) Principles of Helpful Sequences :

1. The Principle of Later in Time
2. The Principle of Lateral Evolution
3. The Principle of Spatial Contiguity
4. The Principle of Bottom-upwards
5. The Principle of Top-Downward
6. The Principle of Left to Right
7. The Principle of Right to Left
8. The Principle of Clockwise Direction
9. The Principle of Counter Clockwise
10. The Principle of Periphery to the Centre
11. The Principle of Centre to Periphery
12. The Away from Position Principle
13. The Principle of Increasing Quantity
14. The Principle of Decreasing Quantity
15. The Principle of Increasing Complexity
16. The Principle of Canonical Sequence
17. The Principle of Literary Warrant
18. The Principle of Alphabetical Sequence

Four (4) Postulates:

1. The Postulate of Basic Facet
2. Isolate Facet Postulate
3. The Postulate of Rounds for Energy
4. The Postulate of Rounds for Personality and Matter
5. The Round Postulate for Space and Time
6. Level Postulate
7. Facet Sequence Postulate
8. The Postulate of First Facet
9. The Postulate of Concreteness

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10. The Postulate of Facet Sequence within a Round
11. Facet Sequence Hypothesis in the Final Round
12. Level Cluster Postulate

(5) Facet Sequence Principle:

1. The Principle of the Wall Picture
2. The Whole Organ Principle
3. "Cow Calf Principle"
4. Principle of Act and Action Actor Tool

IN-TEXT QUESTIONS

4. The First Edition of Colon Classification came in
   (A) 1935 (B) 1933 (C) 1923 (D) 1925
5. Dr S R Ranganathan has given ---------- laws of Library Science
   (A) Five (B) Four (C) Three (D) Six
6. Canon of Characteristics is canon of-------- plane.
   (A) Idea (B) Verbal (C) Notational (D) All of these

1.5 SUMMARY

The contribution of Ranganathan to the evolution of the Common Theory of Classification is fundamental, unique and unparalleled. His concepts of facet analysis and fundamental categories have received wide acceptance. Since a result, many special schemes of classification have been intended applying the concepts and principles formulated through Ranganathan in his Prolegomena to Library Classification (1967), and other books.

1.6 GLOSSARY

Characteristic: A property by which concepts or things are grouped and ungrouped i.e., a basis of division.

Classificationist: A person who designs a classification scheme.

Artificial Characteristics: An attribute which is possessed in common by a group.

Natural Characteristic: A quality in the things to be classified which are due to nature.

1.7 ANSWERS TO IN-TEXT QUESTIONS

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1. W Hulme 2. H E Bliss 3. J D Brown 4. 1933 5. Five 6. Idea	

1.8 SELF-ASSESSMENT QUESTIONS

1. Write a short note on contributions of Hulme and Brown to the Theory of Library Classification.
2. Write a short note on Ranganathan's Dynamic theory of classification.

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1.10 SUGGESTED READINGS

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LESSON 2.3

MODES OF FORMATION OF SUBJECTS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Concept of Subject and Subject formation
1.3.1 Concept of Subject and Subject Formation
1.3.2 Subject formation: Theoretical Foundations
1.3.3 Subject and its Divisions
1.3.4 Characteristics of a Subject
1.4 Modes of Formation of Subjects
1.4.1 Discussion
1.4.2.Lamination
1.4.3 Loose Assemblage
1.4.4 Fission
1.4.5 Fusion
1.5 Additional Modes
1.5.1 Distillation
1.5.2 Agglomeration
1.5.3 Clustering
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

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1.1 LEARNING OBJECTIVES

After reading this unit, you will be able to:

- Develop an insight on various meanings and nuances of the concept "***subject"***
- Understand the Importance of subject formation
- Identify various modes of subject formation
- Analyze various phase relation that would help you in classifying books

1.2 INTRODUCTION

We have learned in the previous unit that *Library Classification* is the process of organizing information resources in a systematic way and it facilitates subject access. The Ultimate aim of any classification systems is to help the library users to locate books. Such systems also can accommodate the new subjects that happens due to exponential growth of Research studies in all domains of knowledge. In order to keep the new subjects in an already existing collection may pose some challenges. Ranganathan and several later Library Classificationists, however, believed that if we do have an understanding of the e process of generation of new subjects, we can better accommodate these new subjects.

In this unit, we will discuss, the very concept of subject from Library classification angle and epistemological angle. Prof. S.R. Ranganathan was the first classificationist to make investigations on the concept of ***subject*** by discussing and defining various shades of meaning of that term. As we have noted earlier, Ranganathan has built up a theoretical edifice on which Colon Classification was built and hence he could easily on delve in to the nuances of subject formation. We will have a general discussion on the attributes of the Subjects, and detailed discussion on the*subjects formation modes* ,which are 12 in number listed under various categories.

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Having an insight on these modes help you understand the interrelation between subjects and how the new subjects are evolved from already existing knowledge domains. We can

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realize that the Study and understanding of the attributes of subjects will act as a prerequisite for the proper design of any information system.

1.3 CONCEPT OF SUBJECT AND SUBJECT FORMATION

1.3.1 Concept of Subject and Subject Formation

Subject formation is the reverse process of subject analysis. In his writings, Ranganathan always mentioned about five fundamental categories in to which one subject can be divided as per his classification scheme. In the process of Subject formation we are attempting to understand the ideas that constitute the subject and thought process behind it .This is not only perceived from the angle of Library science, but also from the angle of epistemology.

E**pistemolog**ists, both from the East and the West have made attempts to study the nature, origin, facets, and limits of human knowledge. Ranganathan is considered to be the first classificationist, who started the thought process on subject formation from the angle of Library Science. He has made detailed discussion on the modes of subject formation in his voluminous writings. and this in contrast with the DDC ,which shied away in providing any philosophical foundations to its classification system, which lived mainly on its Notation(Indo-Arabic Numerals) [1] It is argued that he didn't even attempt to explain what his class symbols implied. The main feature of his system was the notation [2] Ranganathan, on the ther hand,came with dozens of canons, postulates and principles and he is the first classificationist, who delved in to the topic of ***Subject*** and proposed a defined it as [3] as an organized form of intellectual thoughts [4] We may describe the Knowledge as the sumtotal of the ideas formed~~gerated~~ in the mindsof scholars andphilosophers.[5] and ~~.A~~a subject ~~is an organized body~~ can be considered as an offshoot of collective knowledgeevolved in the minds of great thinkers as discussed above. ~~of knowledge~~[6]~~and un~~Understanding the structure of a subject is very important as this helps us to comprehend the inter reltions of the subject in question with other subjects. Bruner observed that understanding the *structure of subject*will help us learn how things and disciplines are related. (Bruner,1961).[7]Ranganathan introduced three-tier description of subject[8], that is diagrammatically shown below.

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Table 1— Ranganathan's three-tier description of subject

Tiers	Features	Describes	Structure
Tier 1	Continuous infinite universe	Birth of subject	Dimensionless at the time of birth
Tier 2	Spiral model	Growth and development of subject	Gradually attains dimension with the advancement of time
Tier 3	Idea plane	Dimension of subject in course of development	Three dimensional

Courtesy: Dutta, B, Majumder, K, and Sen, B K (2013).

1.3.2 Subject formation: Theoretical Foundations

As mentioned earlier, Ranganathan presented aplethora of Professional Literature consisting of Canons,postulates ,etc. and he is defined ~~edition of~~ "subject" in the light of his assumptions ~~is based on theoretical framework~~ of Colon Classification system. He observed that "Facet" is the basic component of subject and ~~.Ranganathan~~ exemplified various ~~so many other facets~~such as geographical facet~~,.organ facet,etc.~~[8].

Study and understanding of the attributes of subjects is a prerequisite for the proper design of any information system. The attributes of subjects considered relevant in such a study are:

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I. Development of subjects

2. Structure of subjects

3. Organization in the universe of subjects as a whole.

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ACTIVITY

Visit a college Library (under the Delhi University) nearer to your home.Find out the location of books on History in general and Indian History in particular . Just enquire with Librarian ,why specifc classification numbers (954) is given to books on Indian History.

The term "aboutness" was defined by Fairthoneand was used to convey the meaning of the **subject.**It was lateron Popularized byHutchinpopularized it ~~the term"aboutness"coined by R.A.Fairthor~~. Hutchin's intellectual contributions helped removesomeepistemologicalproblemseveolved due to the interpretativeargumentsofthe word "subject"(Horland,2001). [10]

IN-TEXT QUESTIONS

1. _____ and understanding of the attributes of subjects is a prerequisite for the proper design of any information system.
2. Ranganathan has defined "subject" as an orgnized bodyof ideas.True / False
3. Following is the term used to The name given to describe three concepts of Subjects mentioned bt Ranganathan together
4. a) complex subject b)three-tier description of subject
   c) basic subject d) repetitive subject
5. ~~Theterm"Aboutness"was~~_____coinedthe word "aboutness"~~by~~ _____.
6. _____is an organized~~ or systematized body of ideas, body of thoughts~~

1.3.3 Subject and its Divisions

~~Anattempt to develop document-independent conceptionof subject is highly relevantespecially for the classification schemes~~As we know,the concept~~s~~ of subjects~~are~~is much older than the Printed documents.It is,therefore, very important to think about the concept of subject as an entity independent of documentsespecially for the classification

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schemes ~~Thereforeit should be developed independently~~. ~~The~~The following three sefinitions of the subject have been put forwarded by Ranganathan:

Subject: assumed term to indicate an object [11]
Subject: Intellectual content enshrined in a document [12]
Subject - an organized body of ideas [13]

It is a fact that Ranganathan was heavily criticized by some western scholars such as Metcalfe, who even used the most unacceptable phrase of Pseudo-science to describe Ranganathan's theory of Classification and his cited above cited definitions of ***subject*** . In this theoretical juncture , we have to admit that it was Ranganathan, who pioneered the concept of subject in Library Science domain there could be some modification and variations in that concept by the passage of time. This will hold good, if we consider the changes that happened in Geneticsand other scientific diciplines. For example,**Barbara McClintock** proposed the theory of jumping genes in maize and suggested that *jumping genes on chromosomes* may result in variations in the phenotype(external appearances) of Grains in Indian Corns. This theory ***does not fit with traditional Mendelian ratios***, and Dr. Barbara McClintock was selected for the prestigious Nobel Prize in Medicine and Physiology in 1983.[14].So negative criticism cannot override the importance of Ranganathan's concepts on ***subject*** and hence**,** we may define the subject as the "Organized, systematized and structured collection of ideas and it is the integral component of universe of knowledge".

Subjects can be divided in to the following divisions:

a. Basic Subject (ex. Chemistry)

b. Compound subjects: (A combination of basic subject with an idea of another subject). For example, when we are thinking of the History of Asia we have two aspects namely History (Basic Subject) and the Geographical Entity called Asia.

c. Complex subjects: When one basic subject(for example Biology merges with another basic subject (for example Chemistry),the combination of these two basic subjects is known as Complex subject.In this case, we get the new subject of **Biotechnology** after the merger of the above two basic subjects.

1.3.4 Characteristics of a Subject

The main features of the subjects are listed below:

(i) It has ~~A subject possesses~~all the characteristics that a segment possesses.

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(ii) It is denoted by ~~A subject is identified by~~ a ~~name~~term, ~~a notation,~~ or an indicative symbol.

(iii) ~~The name of a subject~~It ~~sometimes~~ undergoes change due to various reasons. For example, Library Science was earlier known as ~~(~~**Library economy** ~~→ Librarianship → Library science → Information Science)~~[15].The various aspects of subjects are diagrammatically represented below:

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Subject	Definitions	Characteristics	Divisions
Subject	1.assumed term ~~(Ranganathan 1963)~~ 2. Thought-content of a document ~~(Ranganathan 1964)~~ **3.** an organized body of ideas 4.~~, (Ranganathan 1967).~~ A branch of knowledge as a course of study. ~~A subject is an organized and systematized body of idea~~	It~~A subject~~ is similar to segments (ii) ~~A subject~~It is identified by~~a notation,~~ a symbol. (iii) it can be denoted by ~~The name can be composed of~~ a single keyword~~,or a set of keywords~~(as in Sanskrit) or by a set of keywords(as in or a set of keywordsAnalytical Chemistry)~~.~~ .	**a.Basic Subjects** (ex. Chemistry) **b. Compound subjects**: (A combination of basic subject with an idea of another subject). For example, when we are thinking of the History of Asia we have two aspects namely History (Basic Subject) and the Geographical Entity called Asia. **c. Complex subjects:** When one basic subject(for example Biology merges with another basic subject (for example Chemistry),the combination of these two basic subjects is known as Complex subject.In this case, we get the new subject of **Biotechnology** after the merger of the above two basic subjects.

1.4 MODES OF FORMATION OF SUBJECTS

This is an investigation in to the relationship patterns by which different ideas that contribute to and constitute subjects. In other words, these modes of subject formation represent a system or typology of relationships among constituent ideas of subject. [16]

These modes of subject formation, represents a system of intra and interdisciplinary relations and have an important role [17] in identifying and formulating relations among various concepts that are involved in the genesis of subjects. Such an investigation is essential for facetted classification schemes, which do not enumerate all the knowledge divisions, instead permit the classifcationsts to create their own class numbers. They can

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also help us in understanding different inter -relations between subjects and their components

1.4.1 Discussion

It is very interesting to understand how new subjects are formed in the universe of Knowledge as it helps classificationsts to have an idea about the interrelationship between subjects. This can be a foundation for the classification theories that follows facetted classification systems. Ranganathan has initially mentioned about four modes of subject formation (in 1950s),.In the later years, additional modes of formation of subjects were identified making the number twelve (in seven categories) [18]. The following is the final list:

- Lamination
- Loose Assemblage
- Fission
- Fusion
- Distillation
- Clustering
- Agglomeration

1.4.2 Lamination: The mode of Lamination can be compared with the making of a sandwich ,which has two layers.In Library Science, it may have same meaning as described below: when the first layer of ~~is~~ a primary subject~~and it~~ is laminated by ~~that are~~ isolate ideas(as layers in sandwhich) ,lamination occurs. Resutl of this process will be ~~and consequesntly~~ aCompound subject ~~is formed.~~.This Mode ~~Lamination~~ is of two types:

1. Lamination 1: In this mode, one basic facet is laminated by one ormore ~~or more~~ isolate facets ~~are laminated over a basic facet~~.
This gives a compound subject.

Example: Human Anatomy

2.Lamination 2: In this mode, sub-facets of a compound facet are laminated over one another.Example: Ayurveda System of Medicine

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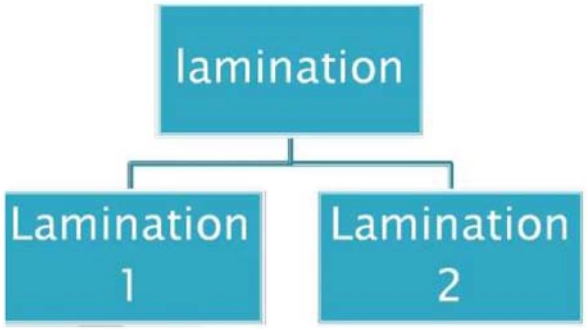

Courtesy: Bhandarkar (2015).

1.4.3Loose Assemblage(LA) : in this mode of subject formation, two or more subjects (basic or compound) and or isolate ideas are assembled in loose manner . Th~~is~~ere are three types of Loose assembllages~~ mode can be further sub divided into three kinds:~~ (a) **Loose Assemblage of Kind 1**,**Loose Assemblage of Kind 2, and Loose Assemblageof Kind 3.**

In the **Kind 1,** two or more subjects are studied in mutual relation. Such relations are called as "inter subject phase relation". These relationscan be divided in to five types and they are shown in the diagram below.This type of Loose assemblage (Kind 1) results in the formation of complex subjects.

The second kind of LA results in a complex isolate. It represents a type of subject forma*tion* when two or more isolates***from the same facet****are brought into mutual relation*.

Examples:

1) Influence of Judaism on Christianity
2) Difference between ***Lemuroidea***(family of strepsirrhine primates) and ***Anthropoidea****(*a suborder of the primates that includes humans).

Loose Assemblage of Kind 3 .This mode of subject formation occurs when two or more isolates ***from the same array of orderin the same schedule*** are brought into mutual relation.This Mode results in a complex array isolates.The following two fraphical representations providesasummry of relations with examples.Riyazuddin (2021) has come

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with examples of subjects formed in the above three kinds of loose assemblage in a tabular format [19]and Bhandarkar has presents the Phase relations in a graphicalform.

Relationship	Loose Assemblage-1 Intra-subject relation	Loose Assemblage-2 Intra-facet relation	Loose Assemblage-3 Intra-array relation
General	Introduction to Botanyand Zoology	Introduction to Hinduism& Buddhism	Study of inductive and deductive logic
Bias	Psychology for Managers	Cataloguing in Special libraries	Consumer survey for marketing
Comparison	Comparative study of geography and history	Comparative study of Jainism & Buddhism	Study of rural and urban areas.
Difference	Botany and Agriculture	Difference between chemotherapy and radiotherapy	Difference between export and import duty
Influence	Role of religion inpolitics	Influence of cataloguing on reference services	Influence of classification on cataloguing
Tool	Computers in Libraries		

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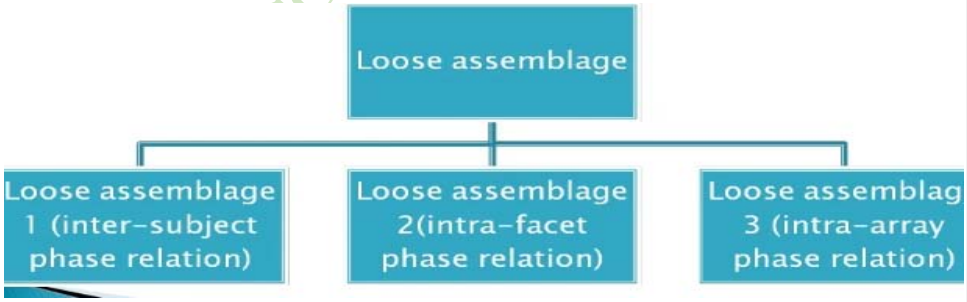
Loose Assemblage can be represented diagrammatically in the following way:



Courtesy: Bhandarkar(2015).

Sultana (2020)has graphically represented these relations [20]

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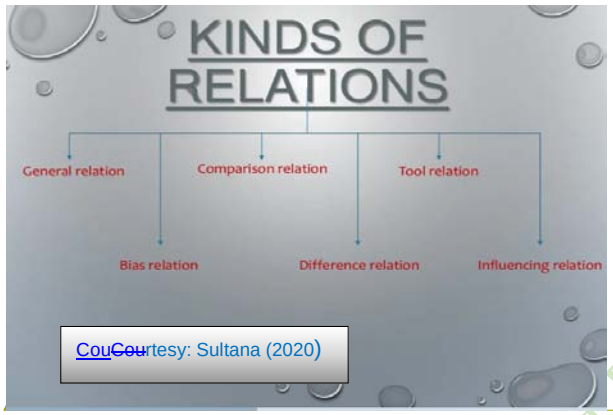

CouCourtesy: Sultana (2020)

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ACTIVITY:

List various modes of Subject formation that you have learned so far. Try to find out an example for each of these modes.

CouCourtesy: Sultana (2020)

~~Riyazuddin (202 with examples of subjects formed in the above three kinds of loose assemblage in graphical way. [19]~~

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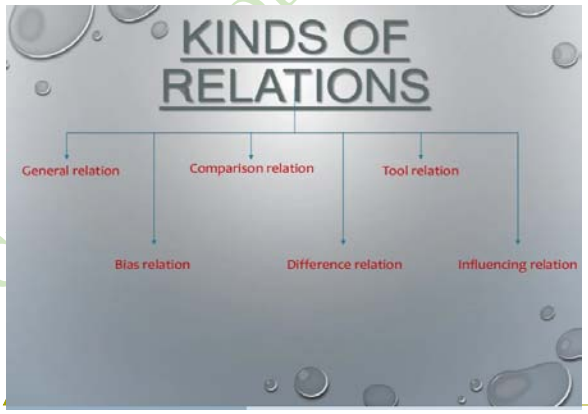
Relationship	Loose Assemblage-1 Intra-subject relation	Loose Assemblage-2 Intra-facet relation	Loose Assemblage-3 Intra-array relation
General	Introduction to Botanyand Zoology	Introduction to Hinduism& Buddhism	Study of inductive and deductive logic
Bias	Psychology for Managers	Cataloguing in Special libraries	Consumer survey for marketing
Comparison	Comparative study of geography and history	Comparative study of Jainism & Buddhism	Study of rural and urban areas.
Difference	Botany and Agriculture	Difference between chemotherapy and radiotherapy	Difference between export and import duty
Influence	Role of religion inpolitics	Influence of cataloguing on reference services	Influence of classification on cataloguing
Tool	Computers in Libraries		

~~Sultana (2020)has graphically represented those relations [20]~~



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IN-TEXT QUESTIONS

6. **Loose Assemblage of Kind 1** is also known as *inter subject phase relations.***true** / false
7. _____ also known as "intra array phase relation
8. The following is an example for Lamination
   a) **Anatomy of Human Body** b) Ayurveda System of Medicine
   c) Biochemistry d) Gandhiana
9. _____ an example for ***Tools*** Relation.
10. ~~A subject possesses all the characteristics that a~~ _____ ~~possesses~~does have all the characteristics that a subject possesses.~~.~~

1.4.3 Fission: Fission is the process of division into parts and there is no involvement by external agency. This is different from the concept of Dissection, which means the division happens under the influence of an external agency.The parts formed after the division of a common subject are called as Lamina. They are ~~equally~~ ranked equally ~~/placed in~~in the hierarchy that resultsin the formation of an Array.Ex.Primary Basic Subjects , covering Natural Sciences.

Fission is of two types,namely Dissection and Denudation.~~to form an array and each part is described as Lamina.~~

a) **Dissection**: In this kind of fission the universe of entities is divided in to components of coordinate status. For example, we can divide the Earth in to various continents,which are having coordinate status.

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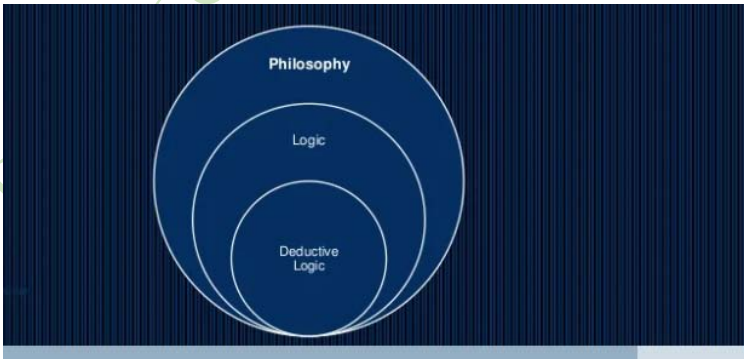
Image credit: https://tinyurl.com/2p83zu8m

b. **Denudation**:Denudation is the progressive decrease of extension and increase of intension. This is a type of fission in which Fission results in one and only one sub-division of isolate/Basic Subject.Ongoing research studies results results in the exposure of a new area of knowledge and it can be considered as Denudtion.[21].For example, we can divide Philosophy in to Logic and again Logic in to Deductive Logic. [22



Courtesy: Lihitkar (2021)

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1.5.1 Fusion : We may remember the fact that the term “Fusion” is mainly used in Nuclear Physics to indicate the joining of two Hydrogen atoms to form one Helium atom at high temperature[23].

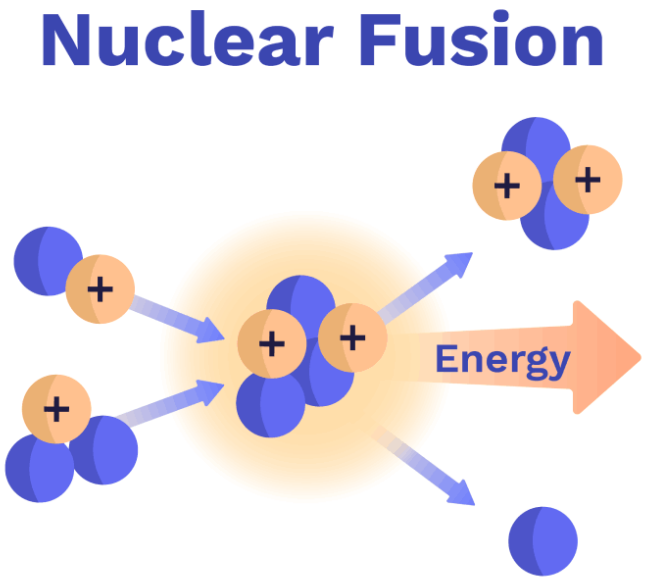

Image credit: https://climatescience.org/advanced-energy-fusion

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As a resut of ongoing interdisciplinary research studies, the borderlines among disciplines are disappearing. Accordingly, two or more primary basic subjects are combined or ~~fuse~~joined ~~d~~ together to form a new subject. Now the constituent disciplines lose their individual isolate status and become an entirely different subject. In such fusion of interdisciplinary subjects, we may call the joining subjects as host PBS 1 and host PBS 2. By the passage of time, the new born subject develops its own theoretical basis and become full-fledged Primary subject. At this stage, we may encounter with difficulties in keeping the new subject along with its parent subjects and the new field of specialization will be considered as a new Primary Basic subject. For Example,Astrophyshics. As we know,

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Astrophysics is the result of fusion of of two subjects namely Astronomy and Physics. We can have more examples such as Biophysics,Sociolinguistics, etc.

~~We may remember the fact that the term "Fusion" is mainly used in Nuclear Physics to indicate the joining of two Hydrogen atoms to form one Helium atom at high temperature[23] .Similalry in the Fusion Mode of subject formation, two or more basic subjects are merged / fused together and form new subject. and~~**Boulding** describes such *Fused disciplines* as "***hybriddiscipline***".

1.5 ADDITIONAL MODES

Three more modes of Subject formation were added in the later years by Ranganthan and his team and these modes are Agglomeration, Distillation and Clustering. Agglomeration was earlier known as Partial Comprehension (1969) and was renamed as Agglomeration in 1973.

1.5.1 Agglomeration:

Agglomeration of things is the gathering of different things together, may not be in a particular order. It also means "a jumbled cluster".In this mode, there is a gathering ~~process of the collecting together~~ of entities into large masses and there is no ~~without~~cohesion among the components/entities.~~.~~

Agglomeration can be of two kinds:

Agglomeration Kind 1 : When consecutive constituents gather together, we call it as Agglomeration Kind 1. Example :Natural sciences, Mathematical Sciences, Physical Sciences.

On the other hand, in **Agglomeration Kind two** non-consecutive constituents come together to form a subjects. Example : History and Sociology; Economics and Law; History and Economics [24]

1.5.2. Distillation

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The Distillation Process has been originally coming from Physical and Chemical Science domains. There are three stages in In the chemical distillation of any chemical compound (for example, Water).These stages are

a. Conversion of water from a mixture in to water vapor,

b. condensation of the purified water

c. collection of the condensed water [25]

In simple sense, Distillation is the process of extracting basic subjects from compound subjects .Ranganathan and his his DRTC Team took the analogy of the concept of distillation to identify the formation of pure disciplines and mentioned that pure disciplines are evolved from its appearance-in-action in diverse subjects.Boulding ~~has~~described~~s as~~this mode of subject formation as " Multi-hybrid with common methodology"(Boulding,1968). [26] According to Ranganathan et.al, there are two kinds of Distillation namely **Distillation Kind 1** and **Distillation Kind 2**.

"In the Kind 1 Distillation, a pure discipline Is evolvedas a Main Subject, out of the experiences in its appearance-in-action in diverse Compound Subjects going with different Host Basic Subjects or occassionally even with Host Compound Subjects. ~~This results in a Distilled Main Subject".~~

~~An idea denoting a practice in action may occur in a variety of subjects going with different Main Subjects. Later on, it may happen that sane guiding principles may be distilled out about the idea after observing, experimenting and experiencing it as practice-in-action in various fields. When this happens. 269 persons begin to specialise in the new emerging field, a s a result of it, the ideas generated in the emerging field cannot be conveniently and helpfully placed as an isolate idea denoting practice-in-action in subjects going with the existing Main Subjects. At this stage, it is found necessary and helpful to deem the ideas go with a new Main Subject,~~ A Main Subject formed in this way is called a Distilled Main Subject. ~~SgSBBL" Exhibition technique Museology Systems research, systemology Management science 4 Policy science Career Metrology Standardisation methodology Specification methodology Research methodology Evaluation methodology Conference technique Commission technique~~

~~Communication theory Symbolism Computer science 270 Distillation of kind 2 t It has been observed that sometimes the scholars start studying extensively and in depth some~~

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particular idea or even several ideas going with a particular Basic Subject. This leads to a considerable increase in the literary warrant ~~for ~the idea or ideas concerned. As a result, the study of the idea (s) attains a certain amount of autonomy or independence. A stage is soon reached when the studies on the particular idea (s) become a field of specialisation by itself. This trend is reflected in the publication of a new periodical, the formation of a research group or institution etc .predominantly devoted to studies and investigations on the idea. When this happens, the formulation of a new Main Subject is found more helpful from the point of view of the new group of specialists working on the idea(s). Such a Main Subject is known as Distilled Main Subject of kind 2. ^he following is a list of some Main Subjects recognised to be formed by Distillation of kind 2 : Statistical calculus Operations research Information theory Cybernetics Astrology Applied linguistics Applied psychology Historical

https://www.academia.edu/35321835/MODES_OF_FORMATION_OF_SUBJECTS

In Kind 1, the new PBS essentially accommodates the discipline theory emerging 'or distilled out of an idea(s) occurring as a practise - in-action in subjects associated with various BS. However, even after the formulation of a new pure discipline, the appearance of the idea as a practice in action will continue and should be treated as such - that is, it should be placed as an isolated idea in the subject under consideration.This mode is equivalent to what Boulding refers to as "multi-hybrid with common methodology.". Examples from CC:Ex: Research Methodology, Management Science.

On the other hand, in the second kind of distillation, the idea occurs only in subjects related to a specific BS, and there may be a trend toward the formulation of a new discipline with recognisable literary warrant, as well as some principles and postulates to guide its development.

In Kind 2 distillation, on the other hand, the idea appears only in subjects associated with a specific BS, and there may be a trend toward the formation of a new discipline with recognisable literary warrant. Examples: Statistical calculus, and Microbiology.

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ACTIVITY:

Visit a public Library and meet the Library Professional there. Request him/her to tell you about the main classes of DDC. Also note down important book in each main class (for example Book on Economics for**MainClass 300**).

Preape a Table with main classes of DDC and list of books in each class

Clustering: ~~**1.5.3 Clustering**~~

Clustering was earlier known as ***Subject Bundling***.There is an increasing trend for interdisciplinary research and borderlines of subjects are being blurred. This has necessitated the inclusion of two or more compound subjects with different BS in the same document.In ths mode, "several specialized studies on a particular phenomenon / person or an entity are brought together into the field of study (Shewale,2021).[27]

Examples:

1) **Area studies** such as Indology/South Asian Studies , and Sinology (Chinese studies),

2) **Generalia person study**, in which a multi-faceted personality of particular person forms the focus of the research and it constiturtes a cluster. Example:**Gandhiana.**

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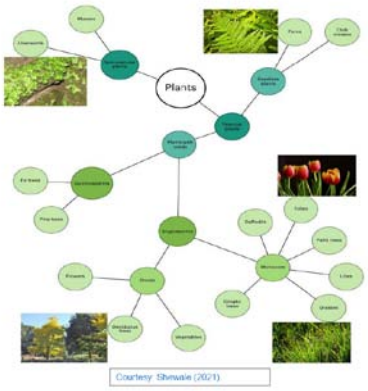

CASE STUDY

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Modes of Knowledge and Growth

Knowledge is essentially a cerebral construct though social in character; and only the socially available or the public knowledge is knowledge *ipso facto*. Factors and means to procreate knowledge are numerous and varied. Nature is the ultimate source, and human being is the only agent to unearth knowledge. Non-human creatures do not have this creative facility. Research is one process to increase the fund of knowledge. Intuition, imagination and apperception are transcendental ways to conceive knowledge, whereas experimental, empirical, and speculative methods are available to all. Studies on the nature of knowledge have given rise to a body of knowledge called social epistemology (Shera, 1962).

In spite of the increased importance of epistemological studies in philosophy, psychology, metaphysics, sociology, economics, education, genetics, linguistics, research methodology, cybernetics, artificial intelligence, and of course the library and information science surprisingly there have been very few studies on the mode of topology of growth of subjects. *"We do not take enough notice of what contemporary philosophers and scientists have to say about the nature of knowledge",* aptly warned D. J. Foskett (1980, 3). Knowledge is librarians' stock-in-trade, and study of its nature is of as much important to us as the study of anatomy to a surgeon (Machlup 1962, 33-34). Its implications in information management are all pervasive and too numerous (McGarry 1993). In Library and Information Science (LIS) discipline, S.R. Ranganathan (1892-1972) is a pioneer in the studies on the modes of knowledge growth and on the science of knowledge. In the year 1948 Ranganathan got introduced to a paper "Development and structure of the universe of subjects" in the postgraduate library science curriculum of the University of Delhi, though his announced book on the subject was never published. However, he had an abiding interest in the field and always obtained fresh results (Kemp 1976, 11, Ranganathan 1968). The work has been continued by his schoolmen at the Documentation Research and Training Centre at Bangalore (Neelameghan 1973a, Neelameghan 1973b, Gopinath and Seetharama 1979) and elsewhere (Puranik, 1952, Vickery, 1952, Kabir, et al, 1996). Late Dean Jesse H. Shera (1903-1982) lauds this as Ranganathan's "intellectual contribution to the underlying philosophy of librarianship" (1962, 106-07).

Courtsey:Satija,et.al(2015)

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IN-TEXT QUESTIONS

11. Studies on the Nature of Knowledge have results in Social Epistemology. True / False
12. _____ has warned Librarians and Knowledge Professionals about the recent research studies on the nature of Knowledge
13. According to the author,the Following Library Scientist is not an school man of S.R. Ranganathan

    a) Neelameghan b) Jesse H.Shera

    c) M.A.Gopinath d) S.Seetharama
14. Ranganathan was teaching in the University of Madras in 1948.True/False
15. Documentation Research and Training Centre is located in _____.

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Modes of Subject Formation with Examples from CC			
Sl. No	**Mode of Subject formation**	**Sub division of the Mode**	**Examples**
1	Lamination	Lamination Kind 1	Human Anatomy
		Lamination Kind 2	Ayurvedlc System of Medicine
2	Loose Assemblage	Loose Assemblage Kind 1	Politics and Economics
		Loose Assemblage Kind 2	Influence of Hinduism on Buddhism
		Loose Assemblage Kind 3	Medicine-Ayurveda-Tropical Climate-Child
3	Fission	Dissection	Division of The Earth in to continents
		Denudation	Division of Philosophy in to Logic and then Logic in to Deductive Logic.
4	Fusion	Not Applicable (NA)	Biophysics
5	Agglomeration	Agglomeration Kind 1	Natural sciences
		Agglomeration Kind 2	History and Sociology
6	Distillation	Distillation Kind 1	Research Methodology
		Distillation Kind 2	Microbiology.
7	Clustering	Not Applicable (NA)	*Gandhiana.*

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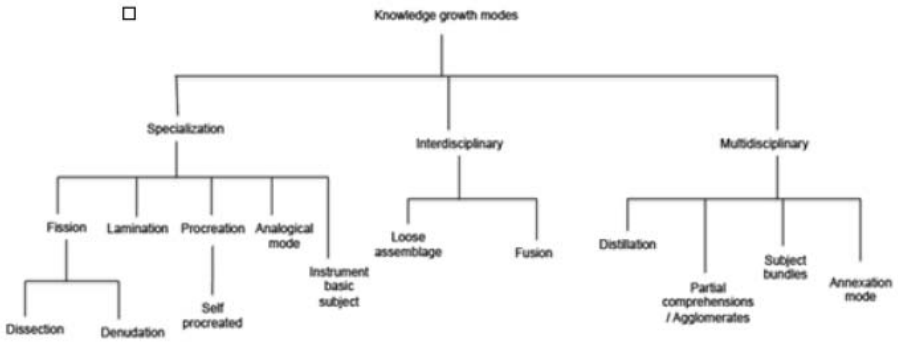
1.6 SUMMARY

We have discussed various aspects of ***subject*** or Universe of subjects in this unit.There was a lenghthy discussion on the modes of formation of subject as these modes cast a considerable influence on the structure of the subject. Several scholrasinclusing Ranganathan, Neelameghan,Seetharama.It was Prof. Satija, made painstaking effort to explain these modes and their roles in subject formation. [28] .There is a table with examplesfor each of these modes for esy comprehension by you, our students. It is hoped that the above discussion has presented a clear picture on the modes of subject formation as per Ranganathan and his supporters. Because of its philosophical background, most of these discussion can be applicable in CC and other facettedclassifcation schemes. The following graphic representation of various modes of subject formation and their interrelationships summarizes Ranganathan's concept.



A schematic diagram of the modes of knowledge growth

Courtsey: Satija,et.al. (Retrieved from https://tinyurl.com/2z9xby2v)

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1.7 GLOSSARY

Agglomeration: the process of collecting together of entities into larger masses without cohesion among the components

Classificationist: A person who designs a scheme of library classification.

Classifier: A person who classifies documents/information in a library,

Dissection. Dissection usually implies the splitting, breaking up, etc., of an entity into parts by an outside agency.

Fission is an internal process of division without the involvement of an outside agency

Idea: An idea is a result of thinking, reflecting, imagining, etc., got by the intellect, by integrating with the aid of logic a selection from the apperception man and or that is directly apprehended by intuition and deposited in the memory.

Information: Data - whether in the form of numbers, graphics, or words that has been organized, systematized and presented so that the underlying patterns become clear. The temperature, humidity and wind reports from hundreds of weather stations are data a computer simulation that shows how this data predicts a strong possibility of tornadoes is information.

Knowledge: Knowledge is the totality of ideas conserved by human civilization, - that is, the Universe of Ideas.

Lamination is construction by an over layering facet, just as one makes a sandwich by layering a vegetable over a layer of bread

Loose assemblage is assembling together of two or more of subjects (basic or compound) isolate ideas

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1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Study 2. True 3. Three-tier description of Subject 4. R.A. Fairthorne 5. Subject 6. True 7. Loose Assemblage of Kind 2 8. Anatomy of Human Body	9. Computers for Libraries 10.Segment 11.True 12.Foskett 13.Jesse H.Shera 14.False 15.Bangalore

1.9 SELF-ASSESSMENT QUESTIONS

1. Explain the concept of subject.
2. Discuss characters of the subject and list evaluate the contributions made by Ranganathan and hs team.
3. Discuss various modes of subject formation. Support your answers with relevant examples.
4. You are asked about making short lists of books on Mahatma Gandhi and Indian studies. How you will proceed with? . Can you recollect the name of the mode that deals with such scenarios?

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LESSON 4.1

Notation: Need, Purpose, Types and Qualities

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STRUCTURE

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1.2 Introduction
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1.1 LEARNING OBJECTIVES

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In this Lesson, the students will be introduced to the concept and importance of Notational System in Classification system. After reading this lesson, the students will be able to understand the meaning of Notation, its importance, need/purpose and types of notations, respectively. This lesson will also highlight the major qualities of Notationwhich are essential for the classification of documents in library classification.

1.2 INTRODUCTION

E.C. Richardson defines Notation as "a shorthand sign". According to Bliss, 'A notation is a symbol of marks or symbols in some order, denoting terms or members of a series or system of things". This is a general definition of Notation. Dr. S.R. Ranganathan has defined the Notation in the context of classification. According to him, Notation is " a number forming a member of a notational system".

In library classification, Notation is essentially required for the classification of documents. In classification system, Notation serves as a 'symbol' for the 'terms'. It is crucial in the context of library classification, as Notation represent the 'terms' in a symbolic form without changing its meaning.

1.3 What is Notation?

1.3.1 Definitions

In simple words, we can say that Notation is easy to remember, is a system of signs or symbols coined for a specific purpose.

In a classification of universe of subjects, a notation serves to denote the classes and their order without naming them or defining them.

The most important significance of Notation is that it is convenient to use and can classify documents essentially and accurately.

According to Ranganathan, 'Notation is a system of ordinal numbers used to represent classes in a scheme for classification. Ordinal numbers mean those which occupies a definite position in a series for e.g., Digit 3 has a third position in a series of Indo-Arabic Numerals i.e. 123456789 (Notation is an artificial language).

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Bliss describedNotation as a system of symbols for maintaining the structural order of classification and it is subsidiary'.

Vickey Says' Notation is only a tool. It must always be subservient to the indexing order. It is designed to preserve and display the order. It must never be allowed to dictate the order.

Palmer and Wellssay 'Notation is a device for mechanizing arrangement and must be composed of written symbols whose order is defined.

According to Margaret Mann'symbol which stands for the classes and their sub-divisions, is called the Notation of that scheme'.

In simple words, we can say that Notation is a system of signs (easy to remember) or symbols that are carried out for a specific purpose.

1.3.2 Role of Notation

(1) It is primarily an ordering device.
(2) It provides a mechanical reference from the catalog entry to the material on Shelf.
(3) Synthesis in number building leads to enormous economy in the construction and the physical size of the schedule.
(4) Mnemonic quality assists in remembering the sequence of classes.
(5) Assists in guiding of a library.
(6) Servicesas a charging symbol in a lending library.
(7) Represents sub-ordination and coordination of subjects symbolized.

1.3.3 Capacity of the Notational System

The notational system of a scheme for classifications should be organized so that it can implement the findings and implications of the idea plane and meet the new developments of the ever growing infinite universe of subjects. The Notational System of Scheme for Classification, therefore, should:

1) Be able to accommodate the decisions made in the idea plane.
2) Be capable of providing unique class number for each and every subject in the universe of subjects.

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3) Be capable of co-extensively resenting each and every component idea in the subject and the exact kind of inter-relationship between the components.
4) Preferably have in its base only those digits which are universally familiar.
5) Be able to provide infinite hospitality at all levels and at all points, such as an array chain speciators facets and phase in the construction of a class number.

1.4 Need of Notation

According to Dr. S.R. Ranganathan, Notation is "a number forming a member of a notational system." In Library Classification, there is a requirement to arrange the universe of knowledge (i.e. subjects) in a helpful filiatory sequence on the basis of a scheme of successive characteristics along with proper logical arrangement which can only be achieved with the help of a notational system. Also, it is pertinent to mention here that 'alphabetical sequence' is unhelpful for this purpose.

The alphabetical sequence is unhelpful for the following reasons:

(i) It leads to an unhelpful sequence, resulting in the alphabetical scattering of documents on related subjects;

(ii) The names of subjects are unstable;

(iii) The names of subjects are not unique due to synonyms and homonyms, and

(iv) The names of subjects are different in different languages. These give different sequences in different languages.

Species of Digits

The 'species of digits'which can be employed in a notational system are as follows:

- Arabic numerals,
- Roman caps, Roman smalls,
- Greek letters, Sanskrit alphabets etc.
- Punctuation marks,
- Mathematical symbols.

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The following species of digits are used in Dewey Decimal Classification (DDC):

Arabic numerals, dot (Roman alphabets are allowed to be used, if desired).

Colon Classification (CC)use the following species of digits:

- Arabic numerals
- Roman caps and Roman smalls
- Greek alphabets (these have been given up completely in CC7)
- Punctuation marks
- Mathematical symbols
- Arrows

Universal Decimal Classification (UDC) use the following species of digits:

- Arabic numerals
- Roman caps and Roman smalls
- Punctuation marks
- Mathematical symbols

The capability of the idea plane to manipulate and systematise the concepts in any way it likes has been known to all. The words representing the ideas are important to secure the arrangement preferred by the idea plane. It is left for thethe notational plane to fix the desired arrangement of concepts. The fact can be explained by a very simple example. Suppose Ram, Rahim, Roshan and Robert are four students of a class, who can be arranged in 16 different combinations. However, a teacher, in view of certain criterion, wants to arrange them in the following order:

Robert, Rahim, Roshan, Ram

The verbal plane can only effect alphabetical arrangement, which the idea plane in this case does not prefer. The best way to secure a permanent arrangement is to assign serial numbers to all the students in question, i.e.

1. Robert
2. Rahim

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3. Roshan

4. Ram

Similarly, the other students of the class may be arranged according to the teacher's desire. It may, however, be noted that this arrangement could be made possible primarily due to the predetermined order of each digit in the notational system.

Incidentally, the above discussion brings in three important concepts pertaining to Notation. These are:

(1) Ordinal Value

(2) Cardinal Value, and

(3) Semantic Value

1.4.1 Ordinal Value

Each digit of a base has a particular ordinal value, which defines the position of a digital series. For example, digit 3inan IAN (Indo-Arabic Numerals) base comes after 2, and before 4. In other words, the position of digit 3 in the series, 123456789, is third in order. Similarly, all the digits in a base, whether it consists of numerals or alphabets, possess a particular ordinal value. It is this ordinal value of the digits that facilitates the arrangement of entities in a group in classification. In the above example, a teacher fixed the sequence of the students according to some principle, or criterion, and then mechanised the sequence by allotting ordinal numbers. In a scheme of classification also, the ordinal value of the digits of paramount importance, as it assists in mechanising the arrangement or subjects. Melvil Dewey was the first to use this principle for the arrangement of subjects in his scheme. It is for this reason that he is regarded as the Father of Modern Library Classification.

1.4.2 Cardinal Value

The cardinal value refers to the quantitative value that each digit possesses inherently. This value is generally used in counting. For example, 3 pens, 4 boys, 5 books, etc. In classification, we are seldom concerned with the cardinal value of a digit.

1.4.3 Semantic Value

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Each digit, or digit group, used in a notational system is made to represent a particular concept, except when postulated otherwise. The semantic value of a digit refers to the concept that it represents. For example, in Colon Classification, B stands for mathematics, Cfor Physics, and D for Engineering.

The fact that the terms used in the classification of knowledge are to be translated into ordinal numbers reveals the basic need for Notation. **In addition, the following are other reasons for which Notation is needed :**

1. Notation is required to replace the terms. It be cores a permanent symbol through which the terms of classification are referred.
2. It is a medium of and guide to the sequence of terms and fixes their relative position.
3. An alphabetical index is possible only through Notation.
4. It is written on various parts of documents and cards etc.
5. It helps in the arrangement of documents on the shelves and the entries in the catalogue.
6. The efficient working of the catalogue depends on Notation, which refers to the position on shelves.
7. It figures among the guides used in a library.
8. Il shows the sequence and the subordination and coordination of classes.
9. It shows various types of phase relations between classes, facets, isolates, etc., and differentiates between the facets of a class and the types of relations.
10. Il arranges entries in bibliographic and lists etc.
11. It restores the sequence of documents if they are pulled out from their respective places.
12. One can determine the specific subject through Notation without reading the text.
13. It facilitates the use of mnemonics.
14. It is used for author marks, book numbers, sequence numbers, etc.
15. It is used for charging and discharging documents, etc.

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IN-TEXT QUESTIONS

1. Notation is a system of _____ used to represent classes in a scheme for classification.
2. Notation is a device for mechanizing arrangement and must be composed of written symbols whose order is defined. True/False
3. Notational system of scheme for classification should be able to accommodate the decisions made in the_____.
4. The alphabetical sequence leads to an_____, resulting in the alphabetical scattering of documents on related subjects.
5. Alphabetical index is possible only through Notation. True/False

1.5 Purpose/Functions of Notation

The Notation has following three primary purposes:

1. It provides a class alternative massive to subject.
2. It is distinguishable fromall other symbols.
3. It relate the subject to sub-ordinate coordinate, sub-ordinate and collateral subject.

In any scheme of classification, Notation serves the following functions:

1) Notation is convenient to denote the classes briefly. The term used in a scheme of classification area is permanently referred by the respective symbols that stand for them.

2) Notation maintains the systematic order of the classes in the schedules, and on the shelves. It helps fix the relative position of the classes, or the subjects.

3) The alphabetical subject index, which forms an integral part of the classification scheme, is made effective by Notation only. Without Notation an alphabetical index cannot serve.

4) The library catalogue cannot function smoothly without Notation, classified or alphabetical. The location information in a catalogue consists of class and book numbers. If the class number, or Notation is not given, the location of books from the shelves will be difficult, if not impossible.

5) Notation mechanizes the arrangement of documents on the shelves.

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6) Notation helps to show the co-ordinate and sub-ordinate relationship of classes, as shown below:

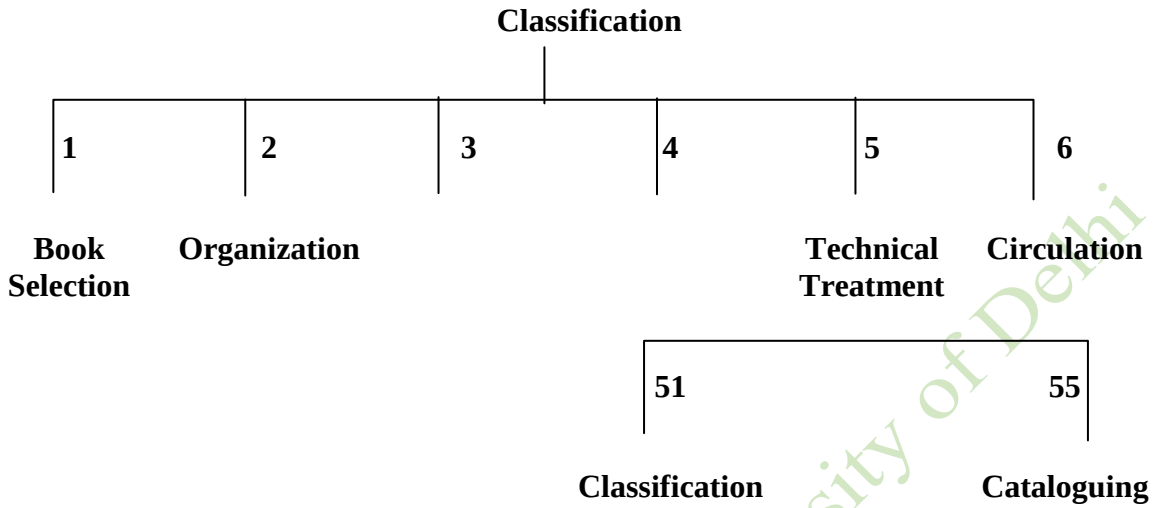

Fig. 1. Coordinate and Subordinate Relationship of Classes

The classes represented by 1, 2, 3,4, 5, 6 indicate coordinate relation. The classes represented by 55 and 51 are subordinate to 5.

7) Notation may serve as a means of translating the various terms or classes of one classification to those of another classification in other languages (s).

8) New additions to the collection can be quickly made by the class marks assigned to each book.

9) Notation plays a vital role in the circulation section too. The issue records are arranged in classified order.

10) The statistics of daily issue is easily maintained with the help of Notation. Books on different subjects issued on a particular day can be known easily by the issue record.

In Library Classification, the significant advantages of Notation are:

(1) Problems in alphabetization are solved
(2) It mechanizes the arrangement.
(3) Inconsistencies in decision-making by the change in persons can be overcome
(4) It helps in knowing the relationship among subjects.
(5) Free from the language barrier
(6) Homonyms, synonyms, etc., in natural language, can be overcome.

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1.6 Types of Notation

There are broadly two types of Notation: Pure Notation andMixed Notation.

Pure Notation: This type of Notation uses only one kinds of digits, i.e. either Indo-Arabic (1, 2, 3, 4), numerals on alphabets (A, B, C, D, …). Like DDC, it contains only pure Notation. In this, no class number contains more than one species of digits.

Following pure Notation may be used in classification.

Indo-Arabic Numerals (IAN) 1, 2, 3, 4 ….

Roman Capitals (RC) : A, B, C, ….Z.

Roman smalls (RS) : a, b, c, d, e, f, g, … z

Ex. 341, ALM, COP

- DDC has adopted mixed Notation by including capital letters.

Mixed Notation: In this Notation, a class number may have two or more species of digits i.e., contains two or more species of symbols, consisting of Indo-Arabic numerals and Roman Capitals, Roman capitals and Roman smalls; Indo-Arabic numerals and Roman smalls; Indo=-Arabic numerals plus

A mixed notation consists of more than one species of symbols, consisting of Indo-Arabic numerals and Roman capitals; Roman capitals and roman smalls; Indo-Arabic numerals and Roman smalls; Into-Arabic numerals plus Roman smalls plus Roman capitals. Colon Classification is a perfect example of mixed Notation.

4.2.1 Indo-Arabic numerals + Roman capitals

1...9+ A...Z

4.2.2 Roman capitals + Roman smalls

A...Z+a...Z

4.2.3 Indo-Arabic numerals +'Roman smalls

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1...9+a...Z

4.2.4 Indo-Arabic numeral + RS + RC

1...9+a...Z+A...Z I

It may be noted that the earlier schemes of classification, like DDC and Cutter's Expansive classification, used only pure Notation. Even Berwick Sayers also emphasized the need for pure Notation. The first deviation from the popular appeal of pure Notation came from Richardson, who prescribed the use of mixed notation Bliss also suggested the need to use letters and figures together in the Notational System. He used mixed Notation in his scheme of classification. Richardson went to the extent of propounding that every scheme of classification will have to adopt a mixed notation sooner or later. Dr. S.R. Ranganathan not only corroborated the view of Richardson and Bliss, but also proved mathematically that a faceted classification scheme with a mixed base is the only answer to the problem of the evergrowing reverse of subjects.

It is deprived of a scheme in its simplicity but workability is there and it scores more than the pure Notation in qualities except simplicity.

Difference between Pure Notation and Mixed Notation

Pure Notation	Mixed Notation
It uses only one kind of digits, i.e., Indo-Arabic (1, 2, 3, 4) numerals or alphabets (A, B, C, D) e.g., DDC is the exampl of Pure Notation (DDC has adopted mixed Notation by including capital letters).	It uses more than 1 species of Symbols, i.e. (1…I + A …Z) IAN & Roman Caps or Roman Caps (A…Z+2…Z) & Roman Smalls, IAN & Roman Small etc. Colon Classification is very good e.g. of mixed Notation. (It is deprived of scheme of its simplicity but workability is there). It scores more than the pure Notation in (Notation except simplicity).

Further, Notation is also classified as Faceted and Non-faceted Notation.

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(1) Faceted Notation: In a faceted notation, the digits, used in a class number are separated into blocks, with the help of connecting digits which is called Multipartite Notation. E.g. Colon Classification.

Library Science in India. 2.44.

Dot is the connecting digits.

However, all multipartite notations cannot be called as faceted notations unless the connecting digits are made meaningful and indicate the distinctive character of the succeeding block of digits.

Multipartite Notation (linear, horizontal, right-handed Notation, with digits separating into blocks of three to six digits by space or by a semantically poor digit, usually a dot), with the blocks of digits connected by the meaningful indicates digits, analogous to punctualities marks, with each indicator digit indicating the interrelation between two component ides of subject called faceted Notation.

Example : (LCC)

6175 : 4 : 6 445246 'N85

Treatment of eye diseases in Aligarh during 1985.

L	Medicine	First Facete
185	Eye	Personality Facet [P]
: 4	Disease	Energy Facet [MP]
: 6	Treatment	Energy Facet [E]
445246	Aligarh	Space Face [S]
N85	1985	Tie Facet [T]

Non-Faceted Notation : A non-faceted notation is one in which the digits constituting the class number form one block only. Alternatively, this is named 'unipartite notation'. It consists of linear, horizontal, right-handed Notation with all the digits written closely to form a block.

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Non-faceted Notation are found in Library of Congress and Bliss Bibliographic classification.

Example 1: Library of Congress:- HJ980 internal revenue.

2. Bliss Bibliographical Classification:- JAC philosophy of Education.

1.7 Qualities of Notation

Different authors on classification have given different qualities of Notation. To Berwick Sayers', the Notation of a scheme of classification should have the following qualities.

1.7.1 Brevity

There is no doubt that the Notation should be as brief as possible. The reasons are not far to seek. The Notation used in a scheme of classification effects directly the length of class numbers allotted to each book in the library. These class numbers help mechanize the arrangement of books on the shelves and will ultimately be used by the readers to retrieve a book from the library collection. The greater the length of the class number, the more difficult it is to memorize. It may be interesting to note that an ordinary human mind can recognize and remember four or five letters in one pulse of attention. Therefore, the brief Notation will lead to a higher recall. However, the number of digits in a class number depends upon the subject's intention. The greater the intention, the larger the class number. Besides this, a book consisting of a few pages may have great intention of the subject. A coextensively allotted number may go beyond the derth of the spine of the book.

1.7.2 Simplicity

As the Notation is to be used by the general readers, it should be simple, so that it can be easily recognized, written, and remembered. The simplicity of Notation indicates two distinct features:

(i) The first feature is that the Notation should convey sequence clearly, a prerequisite to any good notational system. The Indo-Arabic numerals and letters, or alphabets, are well-

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known and simple to users and automatically maintain the sequence of the classes denoted by them. If other symbols are used, their ordinal values must be predetermined.

(ii) The second feature of Notation is that it should be easy to write, to pronounce and well-known. If a scheme of classification being used in Indian Libraries consists of Greek letters and other alphabets of lesser-known languages, one can visualize the difficulties faced by the readers.

1.7.3 Flexibility

The flexibility of Notation means that the new classes should be accommodated in the correct position. Different people have defined this quality differently. Bliss calls it expansiveness. According to him, "a notation for libraries should be inherently expansive from its inception and should be further expansible".

To Sayers "flexibility in notation... means that as classification must permit the insertion of any new class, or part of class, so also the notation symbols must be capable of expansion to mark that insertion without dislocating the rest of the notation."

Dr. S.R. Ranganathan termed this quality as the hospitality of Notation. He was the one who meticulously planned the accommodation of new classes in between the existing classes found in arrays and chains. The new classes may occur at the ends or between two consecutive classes of an array or chain. The process of accommodation at the ends is called extrapolation. The insertion of a new class in between two consecutive classes is called interpretation. We will deal more with interpolation and extrapolation in Chapter 8.6.

1.7.4 Mnemonic Quality

Ordinarily, mnemonic means something that assists memory. Generally, the words of a language possess the mnemonic quality, e.g., the meanings of the words snarl and howl, drowsy and curt are naturally expressive and, therefore, can be easily remembered. Thus, mnemonic is a linguistic quality. However, the numbers or figures which are arithmetical generally lack this quality. However, still mnemonics is found in Notation. For example, literal Notation like C for chemistry, and B for Biology is more easily remembered than the class marks of these subjects. Librarians and users gradually learn the order of the classes and remember the class numbers. The more systematic the system is, the more readily they will

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learn and the more efficiently they will remember. This is the rational ground for mnemonic quality of Notation. However, mnemonics should be casual, and should not be forced into the system, otherwise, they may distort classification and cost more than they are worth.

In brief, the Qualities of Good Notation are listed as below:

(1) Simplicity: Achieved by avoidance of symbols, using mixed Notation, using distinguishable symbols, and using symbols that are easy to write, pronounce and remember.

(2) **Brevity:** It is achieved by a broad base, allocating more symbols for growing subjects, a fixed number of digits in a class number.

(3) **Hospitality:** Must be able to accommodate new subjects to the correct position.

(4) **Synthesis:** Provision of synthesis reduces the bulk of schedules, repetition, range of specification extended, and reduces reference to schedules.

(5) **Mnemonic:** Mnemonic feature help in remembering class/isolating numbers quickly.

(6) **Flexibility:** Flexibility means the scope for an alternative location and treatment.

For Example:

Alternative Location: Biography of economist (DC :3309).

Alternative treatment: Varying the sequence of application of characteristics.

UDC List and Log fort pen + Aut.

Lit + Long Pen + Author.

Lit + Long + Auth

Flexibility Means that new classes should be accommodated in the correct position. Bliss says it can be further expansible. According to Sayers,'flexibility means that classification must permit the insertion of any new classes, or part of class B also the notational symbol without dislocating/disturbing the rest of Notation.

(7) **Speed in writing:** This is imp. because the class number has to be written in several places in the book.

(8) **Pronounceability:** This possibility when the notation is iter alone.

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(9) **Block formation:** According to the physiology of the eye, the optimum number of consecutive digits that can comfortably picked-up by the eye in a single sweep is three and maximum six. Block formation with partition of digits or facetization will solve the problem.

IN-TEXT QUESTIONS

6. The library catalogue, whether _____ or_____, cannot function smoothly without notation.
7. Notation mechanises the arrangement of documents on the shelves. True/False
8. In a faceted notation, the digits, used in a class number are separated into blocks, by the help of_____.

1.8 SUMMARY

A notationis essential for practically applying the 'book classification". The classification system is the foundation of library science and thus,'Notation is the basis of practical classification of books in a library.

In this lesson, the concept of notation has been explained in detail, along with the types and need of notation. Notation is the base forlibrary classification. In brief, we can say that Notation must mechanize the arrangement. Notation must be hospitable, which must allow inserting the terms, arrays, chains, hierarchies or facets into the schedule in their logical and preferred position. The Notation may reflect and demonstrate structural features of the subjects classified. Also, we can clearly state that a good notation does not make a bad classification good as it is just a device to reflect what the scheme of classification represents in the ideal plane.

1.9 GLOSSARY

Brevity: the state of being short or quick.

Cardinal Number:a whole number, for example 1, 2, 3, that shows quantity.

Classification: the act or process of classifying.

Mnemonic:a word, sentence or poem used to help remember a rule, name, etc.

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Notation:the act, process, method, or instance of representing by a system or set of marks, signs, figures, or characters.

Ordinal Number: a number defining the position of something in a series, such as 'first', 'second', or 'third'.

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. Ordinal Numbers 2. True 3.Idea Plane 4. Unhelpful sequence	5.True 6. Classified or alphabetical 7.True 8. Connecting Digits

1.11 SELF-ASSESSMENT QUESTIONS

1. Define the term 'Notation'. Briefly explain the need and functions of notation.
2. What are the types of notation used in Library classification? Explain the qualities of a good Notation.
3. Differentiate between Pure Notation and Mixed Notation with suitable examples.

1.12 REFERENCES

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1.13 SUGGESTED READINGS

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LESSON 4.2

CALL NUMBER: CLASS NUMBER, BOOK NUMBER AND COLLECTION NUMBER, AND CONSTRUCTION OF CLASS NUMBERS

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1.1 Learning Objectives
1.2 Introduction
1.3 Call Number
1.3.1 Class Number
1.3.2 Book Number
1.3.3 Collection Number
1.4 Construction of Class Number
1.5 Summary
1.6 Glossary
1.7 Answer to In-Text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

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In this unit, we introduce you to Call Number and its three parts- Class Number, Book Number and Collection Number. By studying this unit you should be able to:

- understand the Call Number of a document
- explain Class Number, Book Number and Collection Number
- construct full Call Number with the support of Book Number and Collection Number

In this lesson we will try to understand the concept of Call Number. It is used in a library to call for a book or document. This number is a unique number assigned to a document in a library. Call Number is a combination of three different numbers, named- Class Number, Book Number and Collection Number. These three numbers indicate the three different varieties of characteristics related to a document.

The main objective of classification is to fix the position of documents in relation to other documents. It is done with the help of class numbers provided by the scheme for classification. But the class number serves half the purpose of classification. It individualise each and every document in relation to other documents on a subject.

A class number may cover hundreds of documents and so, a large number of documents may bear the same class number denoting their specific subject. The new problem how to identify every individual document having the same class number arises. This problem is solved by book number. Book number individualises the documents among other documents having the same class number. Book number is the ordinal number which fixes the position of a document in a library relative to the other documents having the same class number.

In olden days, when most of the libraries are kept closed, Call Number is used by the users to call for a book or document. Maybe the term 'Call Number' mighthave started from this use. The Call Number shows the fixed or exact relative position of a document in a library and the position of its entry in the catalogue. Each and every document is placed on the shelf in a position relative to other documents. The Call Number of a book individualizes it and helps users to locate and search the document in the library.

The Call Number is made up of three components, viz. Class Number, Book Number and Collection Number. A document as an individual entity comprises of three types of characteristics. First type of characteristic i.e. thought content is represented by class number. The second types of characteristics are characteristics other than thought content of document, i.e. author, language, form, year of publication, edition, volume, supplement, number of copies, and so on; these are represented by book number. The third type of

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characteristic belongs to the collection that a particular document shows the collection to which it belongs; and represented by collection number.

Almost all the classification schemes, except Colon Classification, provide the schedules of Class Numbers only. They do not have any provision for Book Number and Collection Number. Colon Classification provides the mechanism to construct all these three numbers.

The main objective of classification is to fix the position of documents in relation to other documents. It is done with the help of class numbers provided by the scheme for classification. The Class Number of a book or document is the translation of the thought content or subject contained in it from natural language to classificatory language. Ranganathan defined the Class Number as: "The Class Number of a book is a translation of the name of its specific subject into the artificial language of ordinal numbers." Ordinal numbers are used for ordering or arrangement of things.

In the CC, the universe of knowledge is first divided into traditional broad classes or divisions, i.e. Natural Sciences, Humanities, and Social Sciences. Every broad class of the universe of classes has been further divided into several main classes.

The Book Number of a document individualises it among the documents having the same Class Number.Apart from CC book number, following important book number systems are used in libraries.

- Cutter's Table- C. A. Cutter devised this book number system. It has one and two alphabetical sequence of initial letters or surnames or words combined with decimal number.
- Cutter Sanborn Table- Kate E. Sanborn modified the two figures Cutter's Table into a three figure alphabetical sequence.
- Merril Book Numbers- W. S. Merril devised this book number for arranging documents of the same class number either in alphabetical order or in chronological order.
- Biscoe Book Number- W. S. Biscoe developed this book number system by using year of publication in abbreviated form. So books bearing the same class number arranged on shelves according to chronological order.

The above book number schemes have their own lacunas because they are based only one or two characteristics, i.e. author's name and year of publication. Only these two characteristics do not individualise each and every document in a library. Ranganathan observed this problem deeply and gave Colon Book Number which has a fixed formula. He

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further framed a Canon of Book Number, which says- "A scheme for book classification should include a scheme for book numbers in order to individualise the documents having the same subject as their Ultimate Class and to mechanise their preferred arrangement among themselves." A classification scheme should have the provision for scheme of book number to individualise the documents bearing the same class number.

The Book Number of a document individualizes it among the documents having the same Class Number. There is a facet formula for Book Number in CC, which is developed by Ranganathan. The Book Number is separated by Class Number by a double space whenever the two numbers are written in the same line. There are eight facets in Book Number facet formula, which are explained one by one:

[L] [F] [Y] [A] . [V] – [S] ; [C] : [Cr]

where, [L] = Language of the document
[F] = Form of the document
[Y] = Year of publication of the document
[A] = Accession part of the document
[V] = Volume number of the document
[S] = Supplement number of the document
[C] = Copy number of the document
[Cr] = Criticism number of the document

Language Number [L]

The schedule of Language isolates (CC Chapter 5, pages 2.26- 2.27) is used to make Language Number [L] of a document. The Language Number is got by translating the name of the language in which the document is written. This Language Number is not written in the Book Number in following few cases.

- When language of the document is in the favoured language of the library
- In the case of Literature (O) and Linguistics (P) main class, when the language of the book is the same as that of the personality facet [P] in Literature and Linguistics. This provision is made because language number is repeated in book number as it is already appeared in Class Number.
- In the case of periodical publications, the language number is not written.

Examples:

Title	Class Number	Book Number
Library cataloguing (in English Language)	2: 55	111
Pustakalay Suchikaran (in Hindi Language)	2: 55	152
Pustakalay Suchikaran (in Marathi Language)	2: 55	155
Prem Chand ki kahaniya (in Hindi Langauge)	O152, 3M80	
Stories of Prem Chand (in French Language)	O152, 3M80	122

Form Number [F]

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The Form Number shows the physical form of the document. This number can be taken from chapter 02 of CC on page number 2.3. Literature can be presented in various forms, like as poetry, drama, fiction, lectures, debates etc. Favoured form number is not written in book number formula. Favoured form is that form which the maximum number of documents has in the library, thus it removed from the book number. Generally, the favoured form of documents is prose. In Literature [O] main class, facet [P2] is form facet. Similar to Language facet [L], form facet [F] is not repeated in book number if the form of original work and form of book is same.

Examples:

Title	Class Number	Book Number
Anglo-American Cataloguing Rules, 1967	2: 55N67	qK7
Lectures on African Culture, 2012	Y: 1. 6	p1Q2
Prem Chand's Stories in poetry form, 2021 (in English Language)	O152, 3M80	111w1R1

Year Number [Y]

This is the most important feature for individualization of documents and represents the year of publication of the document. A special table from 1880 to 2139 for Year Number is designed by Ranganathan to make Year Number [Y] facet. This table, given in CC on page number 1.13, is for recent publication. Another table which is given in chapter 3, i.e. Time Isolate table, may also be used for constructing year number in book number formula. The year number made by time isolate table is three-digit, while the year number made by chronological table for book number is two-digit number. In most of the cases the Book Number starts with the Year Number. For the various editions of a book, publication year of each edition is given in the year number along with first edition. This chronological table for book number is as follows:

Table 1. Chronological Table for Book Number

A	Before 1880	K	1960 to 1969	U	2050 to 2059
B	1880 to 1889	L	1970 to 1979	V	2060 to 2069
C	1890 to 1899	M	1980 to 1989	W	2070 to 2079
D	1900 to 1909	N	1990 to 1999	X	2080 to 2089
E	1910 t0 1919	P	2000 to 2009	Y	2090 to 2099
F	1920 to 1929	Q	2010 to 2019	ZA	2100 to 2109
G	1930 to 1939	R	2020 to 2029	ZB	2110 to 2119
H	1940 to 1949	S	2030 to 2039	ZC	2120 to 2129
J	1950 to 1959	T	2040 to 2049	ZB	2130 to 2139 etc..

In this year table, every digit, except A, from B onwards shows a decade. For making a specific year number, add the year number of that decade to the decade digit. For instance, year 1889 is B9, 1947 is H7, 1999 is N9, 2022 is R2, and 2050 is U0. The Year Number digit A is used for the publication year of all the books which were published prior to 1880.

Accession Part [A]

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The Accession Part differentiates more than one document on a specific subject (having same class number) published in the same language, form and year. In order to make Accession Part [A], simply 1, 2, 3 etc. is added to the year number of the book number for 2nd, 3rd, 4th etc. document published in the same language, form and year in a given specific subject. Some examples are given below to understand Accession Part [A]:

A book entitled- 'Debated on History of Africa' (Published in Russian Language) in 2022. Three different books having the same title published in the same year 2022, in the same language and in the same form.

Class Number	Language	Form	Publication Year	Accession Part	Book Number
V6 (1st book)	Russian 142	Debate p5	2022 R2	not applicable	142p5R2
V6 (2nd book)	Russian 142	Debate p5	2022 R2	1	142p5R21
V6 (3rd book)	Russian 142	Debate p5	2022 R2	2	142p5R22
V6 (4th book)	Russian 142	Debate p5	2022 R2	3	142p5R23

Volume Number [V]

Several books are published in multivolume sets, and all the volumes of the set have to be placed together. For this arrangement, 1, 2, 3 etc. are added for 1st, 2nd, 3rd etc. volume after the accession part of year number or after year number if accession part is not applicable. The . (dot) is used as connecting symbol for volume number. Example is given below to understand volume number facet.

Example: A book entitled- 'Alphabetical Index on Medical Science Literature' published in German language in 4 volumes in 1998

Class Number	Language	Form	Publication Year	Accession Part	Volume Number	Book Number
L	German 113	Alphabetical Index b5	1998 N8	not applicable	1st volume .1	113b5N8.1
L	German 113	Alphabetical Index b5	1998 N8	not applicable	2nd volume .2	113b5N8.2
L	German 113	Alphabetical Index b5	1998 N8	not applicable	3rd volume .3	113b5N8.3
L	German 113	Alphabetical Index b5	1998 N8	not applicable	4th volume .4	113b5N8.4

In a multivolume set, always the year number of first volume is used in the year number of all remaining volumes, even if they published after first volume in later years.

Supplement Number [S]

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In order to correct the previous published document, or to update the document, or to add some latest content, a supplement is published to support original document. Sometimes one or more supplements may be published to support the original document. It is obvious that supplement(s) should be placed near to the original document for maximum and proper utilization of document. The year number of original document is used in the year number of the supplement document(s). It has no importance when the supplement(s) published. The connecting symbol – (hyphen) is used to connect supplement number. Example is given below to better understand the supplement number:

Example: A book entitled- 'Diagrams of Physics' (In French Language) published in 2009 and later in the years 2014 and 2021 two supplements were published.

Class Number	Language	Form	Publication Year	Accession Part	Volume Number	Book Number
C (Original book)	French 122	Diagram g6	2009 P9	not applicable	not applicable	122g6P9
C (1st Supplement)	French 122	Diagram g6	2009 P9	not applicable	not applicable	122g6P9-1
C (2nd Supplement)	French 122	Diagram g6	2009 P9	not applicable	not applicable	122g6P9-2

Copy Number [C]

When multiple copies of a book are acquired in the library, then these all copies of a book have to be placed together on the shelf in the library. For this purpose, Copy Number [C] in the Book Number is used. Copy number is placed after the supplement number with a connecting symbol ; (semicolon). The first copy has no copy number. Second, third, fourth etc. copies will be indicated as ;1, ;2, ;3 etc. copy number.

Example: A book entitled- 'Lectures on Chemistry' (in Tamil Language) published in 2 volumes in 2001. The library has three copies of each set of two volumes. The Class Number of this book is E.

Book detail	Lang.	Form	Pub. Year	Accession Part	Volume Number	Copy Number	Book Number
1st vol., 1st copy	Tamil 31	Lecture p1	2001 P1	not applicable	.1	No copy number	31p1P1.1
2nd vol., 1st copy	Tamil 31	Lecture p1	2001 P1	not applicable	.2	No copy number	31p1P1.2
1st vol., 2nd copy	Tamil 31	Lecture p1	2001 P1	not applicable	.1	;1	31p1P1.1;1
2nd vol., 2nd copy	Tamil 31	Lecture p1	2001 P1	not applicable	.2	;1	31p1P1.2;1
1st vol., 3rd copy	Tamil 31	Lecture p1	2001 P1	not applicable	.1	;2	31p1P1.1;2
2nd vol., 3rd copy	Tamil 31	Lecture p1	2001 P1	not applicable	.2	;2	31p1P1.2;2

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Dr. S. R. Ranganathan suggested that if successive editions of a book are brought together without eliminating the publication year of each of the successive editions then it may be helpful for users. For this, year number of successive editions is treated as copy number in conjunction with the publication year of the first edition of the book. For example:

	Book Number
First edition of Colon Classification in 1933	G3
Second edition of Colon Classification in 1939	G3; G9
Third edition of Colon Classification in 1950	G3; J0
Fourth edition of Colon Classification in 1952	G3; J2
Fifth edition of Colon Classification in 1957	G3; J7
Sixth edition of Colon Classification in 1960	G3; K0

Criticism Number [Cr]

The Criticism Number, also known as Evaluation Number, is similar to the Energy (PCI). This is the last facet of the book number. The symbol :g is used to show the criticism of a book. For more than one criticism of a single book, the Criticism Number :g1, :g2, :g3 etc. is used for second, third, fourth etc. criticism of a book. This works exactly as [A] does for [Y].

Example: 'Mother India' book was written by Katherine Mayo, originally published in 1927. The criticism of this book was published by Lala Lajpat Rai in the year 1928 entitled as 'Unhappy India.' Again in the same year 1928, Kamakshi Natarajan's criticism on 'Mother India' was published as 'Miss Mayo's Mother India: A Rejoinder.' Here, later two books are commentaries and criticism of first book; therefore later books will be placed together with the first book.

Title	**Class Number**	**Book Number**
Mayo: Mother India (1927)	Y: 4. 44	111F7
Lajpat Rai: Unhappy India (1928)	Y: 4. 44	111F7: g
Natarajan: Miss Mayo's Mother India: A Rejoinder (1928)	Y: 4. 44	111F7: g1

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A library has a variety of documents, such as books, conference proceedings, reference books, theses and dissertations, periodicals, out of print books, rare book etc. Several other kinds of documents may be available in the library, like small-sized books, over-sized books, Braille books etc. In a library, different kind of document is placed in a different collection based on the characteristics of the document.

Ranganathan defined collection number as: "The Collection Number of a book denotes the collection to which it belongs." Some symbols are used in books, in the library catalogue, and in other records for representing these collections. These collections are formed on the basis of following qualities:

- Physical forms of documents- Braille books, sound records, film strips, gramophone records etc.
- Size of documents- Under-size, over-size book
- Rarity and availability of documents- Rare books, out of print books, hand written manuscripts etc.
- Collection for prompt services- Reading room collection, textbook collection, Theses and Dissertations collection etc
- Collection based on departments- In some libraries, specific subject based collections may be formed.

Colon Classification is the only scheme for classification which has the provision for collection number. Ranganathan understood the importance of collection number, and formulated the canon for Collection Number as "A scheme for Book Classification may be provided with a schedule of Collection Number to individualise the various collections of special documents to be formed on the basis of the peculiarities of their gross bodies, or their rarity, or service exigency to facilitate use of readers." In CC6, the provision for Collection Number is given in chapter 04 on page number 1.18. According to this-

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a. Underline book number for under-sized book- $\underline{111P1}$
b. Overline book number for over-sized book- $\underline{152R1}$
c. Underline and overline for abnormal size- $\underline{\overline{P1}}$
d. Encircle book number for worn-out book-

Some separate collection numbers are:

a. Reading Room Collection- RR
b. Rare Books Collection- RB
c. Text Book Collection- TB
d. Periodical Collection- PC
e. Physics Department Collection- CD
f. Technology Department Collection- FD

Place of Writing of Collection Number

- On books, Collection Number is written on vertical line above the Call Number on tag of a book, for example- RR
  O152,1M80
  N5
- On catalogue cards, Collection Number is written above the book number as given here. TB
  O155,3N18 N8

Ranganathan has developed eight step methods to classify the subject of a book from natural language to classificatory language of ordinal numbers. This method is very helpful during the process of learning the construction of class number. The students are suggested to practice this method for better understanding the technique of facet analysis and synthesis. These steps are as follows:

Step 0: Raw Title
Step 1: Expressive Title
Step 2: Title in Kernel Terms
Step 3: Analyzed Title
Step 4: Transformed Title
Step 5: Title in Standard Terms
Step 6: Title in Focal Numbers
Step 7: Class Number

Step 0 to step 4 belong to the idea plane. Step 5 belongs to the verbal plane, and step 6 and step 7 to the notational plane.

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These steps in classifying of a document are carried out on the basis of postulates and selected principles. The documents classified by this method are arranged in the library in a helpful sequence.

The details of the eight steps are mentioned below:

Step 0: Raw Title
It is the title which is printed on the title page of a book or head of a document.

Step 1: Expressive Title
This title, as cleared by its name, covers all the facets of the subject of the document. If the raw title is not fully expressive, means basic subject or few isolate terms be missing, then raw title is converted into expressive title by adding the missing terms. This is not a simple task. This would need a perusal of the book. If the raw title is fanciful title, the expressive title is given by classifier after checking the contents of the document.

Step 2 : Title in Kernel Terms
It contains only the focal or kernel terms. All the apparatus words are removed from the expressive title. The apparatus terms includes- a, an, the, of, on, at, from, during, related to, Principles of, Introduction to, Textbook of, Problems of, A study of etc. The kernel terms are changed into nominative singular form. These terms are separated from each other by using a full stop mark (.).

Step 3 : Analyzed Title
In this title, each of the kernel terms is assigned abbreviated term to its concerned fundamental categories, i.e. [P], [M], [E], [S], and [T], along with their rounds and levels of manifestation.

Step 4 : Transformed Title
Here, all the kernel terms are rearranged in a fixed sequence. The sequence of kernel terms is decided by the canons, principles and postulates enunciated by Dr. S. R. Ranganathan for this purpose. According to postulates of helpful sequence, the sequence of kernel terms should be- [BC], [P], [M], [E] [2P], [S], [T].

Step 5 : Title in Standard Terms
In this step, the kernel terms are replaced by the equivalent standard terms mentioned in the schedule of the scheme for classification. For example- the terms 'Pediatrics,' 'Parliament,' 'Stamp collection,' and 'Birds' will be replaced by 'Child Medicine,' 'Legislature,' 'Philately,' and 'Aves,' respectively; If all the terms in kernel title are standard terms, then there is no need to any change. This step belongs to the verbal plane.

Step 6 : Title in Focal Numbers
Here, each and every standard term (i.e. basic subject and isolate terms) is replaced by respective focal numbers given in the schedules of the classification scheme.

Step 7 : Class Number
Here, all the levels (i.e. [BC], [P], [M], [E] [2P], [S], [T]) and full stops (.) in the title in focal numbers are removed and their proper indicator digits [, ; : . '] are attached to each isolate

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number. These indicator digits should be according to the scheme for classification. Here, [P] is added directly to the [BC] without any connecting symbol. Generally, no connecting symbol is used before the fundamental category personality [P].

Apart from the above eight steps one more step, step 8, is added to verify the Class Number, i.e. synthesized class number is translated into natural language.

Step 8 : Verification by Reverse Translation

Now take an example to understand the Eight Step Method for classifying document.

Title- Problem of Recruitment in money market of Norway during 2020

Step 0:Raw Title- Problem of Recruitment in money market of Norway during 2020s
Step 1: **Expressive Title**- Problem of Recruitment in money market of Norway during 2020s in Economics
Step 2: **Title in Kernel Terms-** Recruitment. Money market. Norway. 2020s. Economics.
Step 3: Analyzed Title- Recruitment [E] [2P]. Money market [P]. Norway [S]. 2020s [T]. Economics (BS)
Step 4: Transformed Title- Economics (BS). Money market [P]. Recruitment [E] [2P]. Norway [S]. 2020s [T]
Step 5: Title in Standard Terms- Economics (BS). Money market [P]. Recruitment [E] [2P]. Norway [S]. 2020s [T] (all the kernel terms are standard terms)
Step 6: Title in Focal Numbers- X (BS). 64 [P]. 952 [E] [2P]. 573 [S]. P2 [T]
Step 7: Class Number- X64: 952. 573 'P2

In the facet formula given in the Economics main class, [P] facet is connected to the Basic Class X without any symbol. Hence the indicator digit of personality , (comma) is removed from the class number.

Step 8: Verification by Reverse Translation-

X	Economics
X6	Credit in economics
X64	Money market in economics
X64: 9	Labour problems in money market in economics
X64: 95	Employment and service in money market
X64: 952	Recruitment in money market
X64: 952. 5	Recruitment in money market of Europe
X64: 952. 573	Recruitment in money market of Norway
X64: 952. 573 'P2	Recruitment in money market of Norway during 2020s

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In this unit, we have seen meaning of the concept call number, which consists of three parts, viz. class number, book number and collection number. We also discussed the facet formula for book number, and collection number developed by Ranganathan. He also developed an Eight Step Method of constructing a Class Number. This supports in analysis and synthesis of a Class Number in a systematic way. In CC, construction of class number involves several steps, which are:

- Identification of the five fundamental categories (PMEST) in a subject
- Recognition of rounds and levels of manifestation of these five fundamental categories
- Arrangement of the isolate ideas in a helpful sequence according to a set of rules and principles
- Searching the isolate numbers for every isolate idea from the given schedules in a classification scheme
- Synthesis of these isolate numbers with the help of connecting symbols of specified for each fundamental category

Call Number: It is a number showing the relative position of a document in a library and the position of its entry in the catalogue.

Book Number: It is an ordinal number which fixes the position of a document in a library relative to the other documents having the same ultimate class.

Class Number: The class number of a document is the translation of the subject embodied in a document from natural language to classificatory language.

Collection Number: Collection number of a document shows the collection to which it belongs.

Basic Class: It means Main Class or a Canonical Class in a scheme of classification of the universe of knowledge.

Canonical Class: Traditional subclass of a Main Class, enumerated in the scheme of classificationfor the universe of knowledge and not derived on the basis of definite characteristics.

Notation: The use of ordinal numbers (digits) to represent classes in a classification scheme.

Connecting Symbol: Any digit in a Class Number prefixed to a facet number other than the Basic number.

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Ordinal Value: Number indicating position or order in a set.

Universe of Subjects: The totality of subjects embodied in documents.

1. **Q7: 21 113A**
2. **L: 52354. 4481 111p5R1**
3. **2: 51M76 111qL9.1-L9.3;3**
4. **O153, 3N19, 22 142w2Q8**
5. Title- Cataloging of theses in university libraries in Israel in 1995.

Step 0:Raw Title- Cataloging of theses in university libraries in Israel in 1995
Step 1: **Expressive Title**- Cataloging of theses in university libraries in Israel in 1995 in Library Science
Step 2: **Title in Kernel Terms-** Cataloging. theses. university libraries. Israel. 1995. Library Science.
Step 3: Analyzed Title- Cataloging [E] [2P]. theses [M]. university libraries [P]. Israel [S]. 1995 [T]. Library Science (BS).
Step 4: Transformed Title- Library Science (BS). university libraries [P]. theses [M]. Cataloging [E] [2P]. Israel [S]. 1995 [T].
Step 5: Title in Standard Terms- Library Science (BS). university [P]. thesis [M]. Cataloguing [E] [2P]. Israel [S]. 1995 [T].(standard term are used in place of the kernel terms)
Step 6: Title in Focal Numbers- 2 (BS). 34 [P]. 494 [M]. 55 [E] [2P]. 4653 [S]. N95 [T]
Step 7: Class Number- 234; 494: 55. 4653 'N95
Step 8: Verification by Reverse Translation

2	Library science
23	Academical, Library science
234	University libraries in library science
234; 494	Thesis in university libraries
234; 494: 5	Technical treatment of thesis in university libraries
234; 494: 55	Cataloguing of thesis in university libraries
234; 494: 55. 4	Cataloguing of thesis in university libraries in Asia
234; 494: 55. 4653	Cataloguing of thesis in university libraries in Israel
234; 494: 55. 4653 'N95	Cataloguing of thesis in university libraries in Israel in 1995

Construct Book Numbers for the following title.

1. Translation of Bible in German, 1919

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2. International Encyclopedia of Social Sciences. Volume 1 published in 1925, Library has the full set of 20 volumes
3. 2011 Census of India: a data book published in 2013 on population growth.

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Krishan Kumar. (1988). Theory of Classification. 4th ed. New Delhi: Vikas Publishing House.

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Satija, M. P. (2011). A guide to the theory and practice of Colon Classification. New Delhi: Ess Ess Publications.

Satija, M. P. & Agrawal, S. P. (1990). Book Numbers: some Indian methods. New Delhi: Concept Publishing.

Krishan Kumar. (1993). *Theory of Classification*. New Delhi: Vikas Pub. House.

Mann (M.). (1943). *Introduction to Cataloguing and the Classification of Books*. Ed. 2. Chicago: ALA.

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Ranganathan (S. R.). (1989). *Prolegomena To Library Classification*. Ed 3. Bangalore: Sarada Ranganathan Endowment For Library Science.

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Sayers (W. C. B.). (1975). *Manual of Classification for Librarians*. Rev. By Arthur Maltby. Ed. 5. London: Andre Deutsch.

Sayers (W. C. B.). (1958). *Introduction to Library Classification*. Rev. By Arthur Maltby. Ed. 9. London: Grafton.

Wynar (B. S.). (1985). *Introduction to Cataloguing and Classification*. Ed 7. New York: Libraries Unlimited.

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LESSON – 5.3

COLON CLASSIFICATION (CC)

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STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 Genesis of Colon Classification
  5.3.1 Editions of Colon Classification
5.4 Versions of Colon Classification
  5.4.1 Version 1 (1933-1950): Rigidly faceted era
  5.4.2 Version 2 (1950-1963): Analytico-Synthetic era
  5.4.3 Version 3 (1963-1987): Freely faceted era
5.5 Basic Principles in Colon Classification
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  5.5.2 Array
  5.5.3 Facet
  5.5.4 Fundamental Categories
  5.5.5 Planes of Work
  5.5.6 Rounds and Levels
  5.5.7 Postulates of Facet Sequence
5.6 Notation
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  5.6.2 Empty Digit
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5.7.1 Chronological Device

5.7.2 Geographical Device

5.7.3 Subject Device

5.7.4 Alphabetical Device

5.8 Phase Relation

5.9 Systems and Specials

5.10 Merits and Demerits Of Colon Classification

5.11 Practical Work in Colon Classification

5.12 Summary

5.13 Glossary

5.14 AnswerstoSelfCheckExercises

5.15 References

5.16 Suggested Readings

5.1 LEARNING OBJECTIVES

You gain knowledge about the Colon Classification in this lesson (CC). You will be capable of the following after reading this lesson:

- Understand how colon classification works and why it was formed.
- Understand the fundamental ideas behind the plan and
- Arrange documents into Colon Classification categories.

5.2 INTRODUCTION

Dr. S. R. Ranganathan developed the colon classification (CC) system of classification. The scheme's seventh edition is the most recent, and the first edition was published in 1933. The 6th edition is widely used, whereas the 7th edition is not. Due to this, we'll be using CC's sixth edition, which was released in 1960.

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The sixth edition of the Colon Classification (CC) is a single volume with roughly 430 pages. The book is divided into three sections:

Part 1: Rules

Part 2: Schedules

Part 3: Classics and sacred books

The First part briefly describes the important principles, concepts and canons of classification on which the classification system is based. It is also used with the rules and examples for constructing the class numbers.

The second part has all the subject schedules. At the end of Part 2, an index is given for all the isolates listed in various schedules.

The Part 3 comprises the schedules of classical works and sacred books.

The third paragraph of the introduction will serve as a studyguide by which the learner will relate the lessonto real-life/learning experiences. It will help the learner as an aid in comprehend the lesson properly.

5.3 ORIGIN OF COLON CLASSIFICATION

ShiyaliRamamrita Ranganathan (1862-1972), a mathematician turned librarian and the father of library science in India was the creator of colon classification. It wasfirst published in 1933.Subsequently the other editions appeared in 1939, 1950, 1952, 1957, 1960 and 1987In some libraries in India, CC is used. Newly emerging libraries are not attempting to use it because there are no updated editions. However, LIS specialists continue to be interested in CC. According to "Ranganathan's citation analysis, the CC is one of his three most frequently cited books, along with Prolegomena to Library Classification and Five Laws of Library Science (Hari narayana and Raju, 2009)." This shows the librarians' and information specialists' ongoing interest in the CC. Very few editions of the CC have been published, and its growth has been extremely constrained due to a lack of institutional support. However, it can and must be revitalised (Singh, 1999). Singh's (1999) article is a good place to start for a new researcher who wants to gain a basic understanding of the CC. The author talks about the background, key characteristics, and restrictions of CC.

5.3.1 Editions of Colon Classification

The Colon Classification (CC) first designed from 1924 to 1928 and published first in 1933 by the Madras Library Association is now in its 7th edition released in 1987. The sixth edition still the most popular one was published in 1960. A reprint with some amendments contained in an annexure was issued in 1963. This manual aiming to be a guide to the use of CC -6, explains the construction of class numbers by this edition (1963) which was reprinted in 1964 and 1969 by its publishers Asia Publishing House Bombay. Since 1989 this edition with annexure has been reprinted many times by the Sarda Ranganathan Endowment for Library Science.

A fairly significant discovery was that there could only be five elements in any subjectThis led to the Postulate of Five Fundamental Categories, which was made up of the concepts of personality, matter, energy, space, and time (PMEST). Additionally, the postulate stated that

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all these five fundamental categories fit into the PMEST order. Asillustrated below, an identifier digit (connecting symbol) was provided to each fundamental category:

Fundamental Category	Indicator
Personality	, (comma)
Matter	; (semi-colon)
Energy	: (colon)
Space	.(dot)
Time	' (Apostrophe comma)

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IN-TEXT QUESTIONS

l) Why does CC refer to itself as an analytical-synthetic classification?

2) What does the publication of prolegomena mean in terms of library classification?

Note: i) Fill out the space provided below with your answer.

ii) Check your answer with the answers given at the end of this lesson.

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3) In what way was the fourth edition of Colon Classification important?

Note: I) Write your answer in the space given below

II) Check your answer with the answers given at the end of this lesson..

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5.4 VERSIONS OF COLON CLASSIFICATION

In the convenient line of development of the system's facetization, Gopinath (1972) divided the seven editions in to the three versions:

5.4.1 Version 1 (1933-1950): Rigidly faceted era

During this period the facet formula was rigid and pre-determined. Colon was the only connecting symbol for all the facets. That is until the fourth edition(1952) only connecting symbol was the colon; even the absent facets had to be indicated by thedummy colons, e.g., 2:::P Libraries in the 21st century. Here the first two colons indicate the absence ofmatter and space facets, the third is the connecting symbol for the Time facet, i.e. 21st Century. Itmade the class numbers unwieldy, and even slippery. An extra colon could land the book in alienareasThe only connection between any two facets was the colon. During this whole time, the facet formula has been rigid and predetermined. In plenty of other words, until the fourth edition (1952), the only connecting symbol was the colon, and even the missing facets had to be indicated by fictitious colons, such as 2: N for "libraries in the 20th century." The first three colons in this sentence represent the absence of the matter, energy, and space facets, while the final colon serves as a connecting symbol for the time facet, or the "twentieth century." As just a result, the class numbers became awkward and even slippery. The book could be lost if a careless extra colon unintentionally sends it to an unfamiliar location. Some adversaries made fun of the excessive use of colons.

5.4.2 Version 2 (1950-1963): Analytico-Synthetic era

Classification systems that are almost freely faceted , The fourth, fifth, and sixth editions of CC are included in this version. The reason this version is referred to as an almost freely faceted version is because it used numerous facet indicator digits for different facets, as well as:

Facet	Indicator digit used
i. Personality	, (Comma)
ii. Matter	; (Semi-colon)
iii. Energy	: (Colon)
iv. Space	. (Dot)
v. Time	‘ (Single inverted comma)

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5.4.3 Version 3 (1963-1987): Freely faceted era

Such a period of time was devoted to changing the traits and make-up of the universe of subjects. Property of Matter, Method of Matter, and Material of Matter are the three subcategories that make it up the matter category. The emergence of a very friendly and hospitable sector notation, tools for developing and improving class numbers, the discovery of new common isolates, and the idea of speciators to further separate a facet into species are some examples of recent developments., and other factors made CC more adaptable. Ranganathan described it as a freely-faceted analytico-synthetic scheme as a result, which would be essentially a self-sustaining system. A self-perpetuating framework consists of one that requires the least quantity of revision and that enables the creation of new isolates as necessary with the aid of built-in tools. With the assistance of hospitality devices for the formation of young isolate numbers, The new version provides an almost infinite capacity to add new subjects where those who belong.. However, history has shown that no classification can be self-perpetuating, despite the fact that CC is a truly postulate-based analytico-synthetic classification with many facets. The idea of a self-replicating KO system is erroneous.

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IN-TEXT QUESTIONS

4) illustrate in a few words the features of Colon Classification Version Note.

Note: (i) write down your response in the space given below.

(ii) verify your answer with the answers given at the end of this lesson.

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5) What are the necessary new characteristics of Colon Classification Version 2?

Note: i) Write your answer in the space given below

ii) Check your answer with the answers given at the end of this lesson.

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5.5 BASIC PRINCIPLES OF COLON CLASSIFICATION

Like some of other classification schemes, the CC begins with a set of primary classes that make up the first order array of classes. Facets are separated into each main class. It is believed that all aspects are different manifestations of the five fundamental categories.

Let's focus on the definitions of the terms introduced in the previous paragraph before moving on. The phrases are (i) main classes, (ii) array, (iii) facet and (iv) fundamental categories.

5.5.1 Main Classes: The Main Class, according to Dr. Ranganathan 1967, is "the fairly homogenous conventional regions of knowledge, which together form the first order array of classes which are mutually exclusive and totally exhaustive of the field of knowledge". A document must go through two steps to be classified in a library. The "aboutness" of the material is determined first, and then it is given a class number based on the classification scheme used in the specific library using the system's notation. It's possible that the primary classes in every classification scheme differ. The primary classes in that classification scheme are those that appear as the principal divisions of the field of knowledge.

5.5.2 Array: A universe's classes are deduced from it on the basis of a single characteristic, and they are arranged among themselves according to their ranks to form an array. The definition of array in the dictionary is "a systematic orderly arrangement of numbers or symbols." It has the same meaning in CC as it does in dictionaries. However, the arrangement is known as the preferred sequence. Numbers in a classification denote a subject's division based on a single characteristic. The human body's organs, for instance, make up the array of organs in medicine.

5.5.3 Facet: Each main class is divided into facets to represent the entire series of arrays based on a set of related characteristics of division. A facet is a characteristic by which a class is divided/grouped. All of the listed languages, from which the national literatures are named, make up the language facet of the main class Literature in DDC. All literary genres (poetry, drama, fiction, etc.) make up another facet of the same class. It could also be said.

Example is emphasized in the language component of the literature course.

5.5.4 Fundamental categories: To comprehend the fundamentals of CC You must first comprehend a few of the guidelines Ranganathan set forth. He refers to them as postulates. According to one postulate, there are five basic categories (FC), abbreviated PMEST for personality, matter, energy, space, and time.

An assertion or assumption that is never put to the test is called a postulate. Since it serves as a foundation for the argument, it is inappropriate to query the validity of the assumption. That is what a postulate means. Ranganathan asserts that there can only be a maximum of five fundamental categories in any given subject. Less is possible, but never more than five. In accordance with their escalating concreteness, they also appear in the PMEST

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order. Any subject can be categorized if you can determine the basic categories for that subject. You must therefore have a distinct understanding of each of the five fundamental categories. The five fundamental categories will be addressed one at a time in reverse order.

Time and Space- Those very same two have the familiar meaning for you because these two. Time units include a century, a decade, a year, a month, a day, and an hour. You can recognise the time component in the subject if it is stated as "Economic conditions of India in the 19th century." In some subjects, it might not be stated explicitly, for example, the economic situations in life under Akbar's rule.
Similar to this, it is not difficult to find the space element in a subject. You can find the spatial component, i.e. India, in the previous title, Economic conditions of India in the 19th century. Terms like continent, country, city, village, etc. denote space. These are all included in the facet space.

Energy: Energy is the following essential category. Energy alludes to a specific kind of action. Treatment or diagnosis fall under the facet energy of the study of medicine. It displays motion. In sociology, aid work is energy, teaching is energy in education, and ploughing is energy in agriculture. Due to these two, those exact same two have a familiar meaning for you. A century, a decade, a year, a month, a day, and an hour are examples of time units. If the subject is "Economic conditions of India in the 19th century," you can tell that it is historical. It might not be stated explicitly in some subjects, such as the economic circumstances of life under Akbar's rule. Due to these two, those exact same two have a familiar meaning for you. A century, a decade, a year, a month, a day, and an hour are examples of time units. If the subject is "Economic conditions of India in the 19th century," you can tell that it is historical. In some subjects, such as the economic conditions in life under Akbar's rule, it might not be stated explicitly. energy, etc.

Matter: The fundamental category matter has undergone a significant alteration in the seventh edition of CC. Matter was only included in a select few primary classes up until the sixth edition. In the seventh version, everything is reversed. In certain instances, what was once thought of as energy is now a component of the matter aspect. Additionally, there have been some additional changes to the basic category matter. The terms Matter Property [MP], Matter Material [MMt], and Matter Method [MM] are used to differentiate them.

Only the feature of matter has come close to replacing the basic category of energy. Anatomical, physiological, and medical conditions are seen as manifestations of matter properties in order to provide a specific example of matter. Similar to how they are handled as manifestations of matter property in the primary class of agriculture, soil, manure, propagation, etc. Paintings in pencil, ink, and cartoon form are all understood to be manifestations of the matter approach in the primary class of fine arts. Products and substances are expressions of matter material in technology and biology. Thus, it is simple to identify the basic categories of time, space, energy, and matter together within particular topic.

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Personality: Personality is a basic concept that has eluded description. Ranganathan discovered a way to identify personality using the residue technique, which assigns it to personality when it cannot be placed in any other basic category.
It is feasible to identify a core idea in compound topics that goes with a fundamental subject, like "Human Body" in medicine, according to experience in the construction of depth programmes. Such a notion of caring is said to represent "Personality."

IN-TEXT QUESTIONS

6) Determine the main class and the basic categories represented by the following titles:

a) Geography of India.
b) Psychology of Flowering Plants

c) Evaluation of Indian college students' ability in the 1980s.

d) French landscape watercolor paintings from the 17th century.

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Note: i) Write your answer in the space given below

ii) Check your answer with the answers given at the end of this lesson.

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5.5.5 Planes of Work

A library classification scheme, in Ranganathan's opinion, must pass through three distinct work planes. The three planes are Idea, Herbal, and Notational.A library classification scheme first must list the universe of subjects, define how they are related, and determine their order. The thought plane is used for this. The thought plane's results must be presented in concrete language. The linguistic plane of the piece is this. Lastly, a notation is created from these words. The notational plane is the last plane of the work. As a result, there are three types of work: conceptual, verbal, and notational.

5.5.6 Rounds and Levels

Five essential categories were uncovered, and it was discovered that some of them, including personality, matter, and energy, appear more than once in a topic. The postulates of rounds and levels were introduced to address this problem. Consider the topic of Radium Therapy for Treatment of Brain Tumors. The basic categories of brain FET tumour [A], treatment [ER]-, and radium therapy [El., 11 (E)] are present in this and repeat themselves. The term "round of basic category" refers to this repetition of any one of the three fundamental categories (R, M, and E). The round numbers for these are [IPI], [2PI], [113], [2E], [1Mi], [2M1], and so on.

Take Shakespeare's King Lear as another example. You must first determine what the subject's essential categories mean. Obviously, the fundamental courses; literature. Language, literary genre, author, and their respective works are the isolates. I fall into the basic category of personality together with all these isolators. They consequently fall within the category of personality. These events are categorized as personality levels, and they all belong to the first round. Therefore, they are designated as [1P1], [1P2], [1P3], and [1P4]. First level, first round, second level, third level, and fourth level are read in that order.

5.5.7 Postulates of Facet Sequence

Postulate of level cluster: The last postulate for the sequence of facets states that different levels of the same fundamental category within a round should be kept together. Let us take an example like Succession rights of minors in Hindu law. In this, the facets, succession, minor and Hindu law are all manifestations of personality. When arranged, they will be Law (BF),Hindu law [1P1], Minor [1P2], and succession [1P3].

This postulate is known as the postulate of level cluster. Whatever we have studied so far in this lesson can be put in a nutshell as follows:

- Because of facetisation, CC differs than other schemes to a very great extent.
- Each successive edition of CC displayed improvement in analysis over the previous edition.
- The basic principles worked out in CC axe

i. Three planes of work.

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ii Five fundamental categories.
iii Rounds and levels.
iv Facet sequence.

IN-TEXT QUESTIONS

7) What is the importance of fundamental categories?

8) What are the linking digits for different fundamental categories?

Note: i) Write your answer in the space given below

ii) Check your answer with the answers given at the ending of this lesson.

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5.6 NOTATION

You are already aware with the three levels of work notion presented by Ranganathan in his theory of library classification. Of these, the notational plane faces a number of challenges. Many studies have been conducted in this area, and various advancements have been produced. You are already familiar with the definition, purpose, and types of notation. The notation in CC will now be the focus of our attention.

5.6.1 Mixed Notation---Indicator Digits.

It employs mixed notation in CC. It is consists of

1)Indian Arabic Numbers, 1–9.

2) Roman alphabet, from A to Z in both capital and lowercase letters.

3)Parentheses (}

4)Indicator digits

Details on the indicator digits used in the 7th edition of CC are provided in the table below.

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Digit/Symbol	Name Of the indicator digit	Role Of The Indicator Digit
*	Asterisk	indicates agglomeration and interpolation
←	Backward Arrow	indicates backwards range
"	Double Inverted Comma	Indicates Common Isolates

('Theabovethree indicator digits have anterior ising value).

&	Ampersand	indicates phase relation
‘	Singleinvertedcomma	indicatestime facet
.	Dot	indicates spaceface
:	Colon	indicates energy facet
;	Semi-colon	indicatesmatterfacet

contd

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,	Comma	indicates personality facet
-	Hyphen	indicatesspectatorof kind1
=	Equal Sign	indicatesspeciatorofkind2
+	Plussign	and,addition
-->	Forwardarrow	indicates forward range

For the arrangement of the class numbers, all the notations and digits used in the scheme have been given values, and, in the ascending sequence, they stand in the following order:

)&‘.;:,-= → a to z 01to 9A toZ

(asterisk), + (plus), " (double inverted comma) and <,- (backward arrow) haveanteriorisingvalue.

5.6.2 EmptyDigit

A new concept known as an empty digit has been developed by CC to expand an array's capacity. Although an empty digit has no semantic significance, it nonetheless has an ordinal value. With the aid of an example, let's examine the significance of the empty digit. A maximum of nine numerals may be used when employing Indo-Arabic numerals (I to 9). If a topic is to be split, we are only able to divide it up to nine places; any more divisions beyond that are not possible. To get around this problem, CC only utilises the digits I through 8, leaving the digit 9 as an empty space. It has little worth on its alone, but when utilised in combination with items such as 91, 92, 93, and 98, it regains its full value.

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5.7 DEVICES

As we've seen, new subjects are always emerging, and a categorization scheme should be able to include these new subjects in the right locations. Ranganathan supplied the necessary number devices. Such a device's function is to create a fresh isolate or to hone an existing isolate in an array. The size of the design has been significantly decreased using this way.

The following are the four main CC devices:

1) Chronological Device

2) Geographical Device

3) Subject Device

4) Alphabetical Device

we will Discuss Each Of These In Brief.

5.7.1 Chronological Device

This device purpose is to make a facet number sharper. It might make an isolation more focused or create a new isolate. A chronological number taken from the schedule of time isolates is used for this. Through the use of this mechanism, all numbers for authors in the category of literature are obtained. It would be impossible to list every author. However, the chronological device has already addressed this possibility. Rabindranath Tagore's number, for instance, is 0,157,1M61. Here, M61 stands for Rabindranath Tagore's birth year of 1861. This technique has been employed in a variety of major subjects, including economics, mathematics, medicine, fine arts, and psychology. Anywhere that is warranted, this gadget can be employed. The chronological device is used to derive the fundamental class of systems.

5.7.2 Geographical Device

As was already said, all of these tools serve to create or enhance a single number inside a timetable. Another method for achieving this is by using a geographical number from the list of space isolates. It has been utilised in a variety of subjects, including history, linguistics, theology, fine arts, and library science. When utilising this device, an isolate forms like follows:

152 = d4437 means Rajasthani Hindi, where

152 is Hindi

= is the connecting symbol
d is the symbol for dialect
4437 is Rajasthan from the schedule of space isolates.

Another example of the geographical device'

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Early Egyptian religion for which the number is Q,8677.

Here, Q, 8 is other religions, and

677 is Egypt from the schedule of space isolates

5.7.3 Subject Device

A facet is formed or sharpened by adding another class number from another place in the scheme using the subject device. This tool has been employed in several train classes. Parentheses should be used to denote the portion of the number that was obtained using the subject device (circular brackets). As an illustration, the Medical College Library is 2, J3 (L)

In the aforementioned example, J3 stands for college libraries in library science, to which (L) from the main class L Medicine is joined to create a medical college library by topic device. Take yet another subject device as an example. Hindu Women Law is expressed as Z, while Hinduism is expressed as (Q, 2) in the major class of religion, Q.

5.7.4 Alphabetical Device

An isolation number can also be formed or sharpened using an alphabetical device. The tool is utilised by taking the initial, first two, or first three letters of the names of people, things, or goods that are commonly recognised as such. Anywhere that is justified, the gadget can be utilised. Here are some instances when the gadget is used:

0,157,3 M61,G Gora, a novel by Rabindranath Tagore

Here, G stands for Gora 0,157,3 M 61, H+W Home And The World, a novel by Tagore.
Here, the initial letters of the two words in the title are connected, using the plus sign (+).
(H for Home and W for World)

D93CM Maruti motor car. D93C is for motorcars and M stands for Maruti

J,381B Basmati rice,where J,381 is rice' and Bis- for Basmati.

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IN-TEXT QUESTIONS

9) Give and explain one example each of chronological, geographical and subject devices

Note: i) Write your answer in the space given below

ii) Check your answer with the answers given at the ending of this lesson.

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5.8 PHASE RELATION

These days, there are many transdisciplinary topics. The interaction of two or more topics led to this outcome. A tool called Phase Relation has been offered by CC for this purpose. A phase connection can exist between two or more main classes, as well as between identical faces of the same main class or identical array isolates. Inter-subject, intra-facet, and intra-array phase relations are the names given to these three categories.

Additionally, CC indicates six different types of phase interactions. These six types include:

1) General relation phase.

2) Biasphase.

3) Comparison Phase.

4) Difference phase.

5) Tool phase:

6) Influencing phase.

The connecting symbol for a phase relation is composed of an ampersand (&) and a relation indicator as shown in the table below:

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Kind of phase relation	Inter-subject	Infra-facet	Intra-array
General	a	j	t
Bias	b	k	u
Comparison	c	m	v
Difference	d	n	w
Tool	e	p	x
Influencing	g	r	y

Following are a few examples to show the use of different kinds of phase relations in CC:

1) A general study of special and university libraries - Type: intra-facet, Kind : general, No. 2,14&jK

2) Psychology For Teachers-

Type: Inter-subject, Kind:Nat,No.S&bT

3) Comparison of Jainism and Buddhism - Type: intra-facet, Kind: comparison,No.61,3&m4

4) Difference between undergraduate and postgraduate education Type: intra-array, Kidd: difference, No.T,181&w2

5) Statistical analysis in library management - Type: inter-subject, Kind: tool,Nio.2:8&eBT

6) Influence of music on literature - Type: inter-subject, Kind: influencing,No.O&gNR.

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5.9 SYSTEMS AND SPECIALS

Up to the sixth edition of CC, systems and specials were enumerated along with the concerned main classes. In the seventh edition, they have been listed in the schedule of basic subjects. However,they have been separately defined.

Systems: The term system basic subjects denote a division of a main class expounded after a school of thought. A school of thought is a group, or succession of persons devoted to some cause or philosophy. The class number for a system is derived by the chronological device. Some Examples Of System Facets are:

B6-M8 Hyperbolic geometry, where B6 is geometry and M8 means the1880s.

The number stands for a system of geometry expounded in the1880s.

L-B Ayurveda. B is 999 to 1000 BC - a system of medicine that came into being prior to1000 BC

S-N14 Individualistic psychology. It means a school of psychology that came into being in 1914.

X-NI Communism. The number stands for a system of economics that came into being in the 1910s.

Specials: The term special basic subjects denotes a division of a main class in which the subject of study is restricted in some special manner. The class number of specials are derived by enumeration. Some of the examples of special basic subjects are:

5.10 MERITS AND DEMERITS OF COLON CLASSIFICATION

Due to a sound theory and the provision of a hospitable notation, CC is capable of giving a unique number for almost every subject. The systematic order and the degree f detail due to analysis and synthesis are two great virtues of CC. As a result, it has achieved two objectives: i) provision of a helpful order in each class, and ii) facility in locating a given topic whether it is simple, compound or complex. It is claimed that CC can be effectively used in a computer- aided document finding system.

The major drawback of CC is that there exists no machinery to keep up the revision work as in the case of DDC and UDC. The guidance provided in the recently published seventh edition is not enough and lacks clarity at places. It calls for a manual with numerous

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examples to explain the application of various rules. Andaboveall, it's far from simple,the virtue most cherished by the users.

5.11 PRACTICAL WORK IN COLON CLASSIFICATION

In chapters BB and BC of the seventh edition of CC, a few numbers are worked out.You are advised to go through these examples, worked out step by step. Followingare three examples given for your guidance in identifying the fundamental categories and assigning them to appropriate facets.

1.1.1 TransplantingriceseedlingsinIndiainthemonsoon

Agriculture - J(main class

BS/BF)Rice - Plant[1PI]- 381
Seedling - Organ [IP2] -
91 Transplanting - Action or energy [E] -
D India- S - pace [S]- 44

Monsoon - Time[T]-v

You also know the connecting symbols for each fundamental category. The number is,therefore, J,381,91:D.44 `v

1.1.2 Treatment For Headaches

Medicine - L (BS/BF0
Head - Organ [1P1]
Disease - Property [MP]-4
Ache - Pain (part of the disease)-17
Treatment - Action[E]-6
Hence, the final number is L,18;417:6
William Shakespeare : **Merchant of Venice**
Literature - O (BS/BF)

Language - English '[IP1]-III(from the language schedule)

Form - Drama [1P2]-2

Author - Shakespeare, 1564 [1P3] - J64(chronological device)
Work - Merchant of Venice [1P4] -
M+V(alphabetical device

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The Final Numbers,therefore,0,111,2J64,M+V

Follow the facet formula given at the beginning of each main class and you can not go wrong.

5.12 SUMMARY

Colon Classification is a flexible and analytically- derived classification technique. It has been built upon a solid theoretical framework. Prior to the creation of postulates and principles, much study was conducted. The foundation for analysis in CC is the five primary categories (P M E S T). In CC, facetization serves as the foundation for synthesis. We have covered three versions of colon classification systems. The facet sequence has been developed using a number of ideas. The tools utilized in CC—chronological, geographic, topic, and alphabetical—have a great potential for producing novel isolates and honing those that already exist. Thus, hospitality is quite abundant in the CC notation. All This lesson covers the CC's salient qualities that were mentioned.

5.13 ANSWERS TO SELF CHECK EXERCICES

1 Two basic operations involved in number building in CC are

(1)Subject Analysis on the basis of five fundamental categories, and (2) Synthesis. Theformer results in the facetisation of the subject. Synthesis consists of bringing together the facets manifest in the subject to represent as completely as possible the description of that subject. Synthesis also consists of adding to the subject those other aspects, which it shares with other subjects. Because of the operations of analysis and synthesis, CC is called an analytico-synthetic scheme.

2) When CC was first evolved it was not based on any principle except that the idea was struck by the demonstration of the meccano set that Ranganathanhappened to see in London. There was no theory to build up the scheme further.This led Ranganathan to do research in this area and the years between 1:933and 937 were spent in evolving a theory of classification. The results of this research were first published in the year 1937 in hisProlegomena to LibraryClassification. This, then, is the significance of the publication. TheProlegomena is the first publication where Ranganathans work of a general theory of classification was published.

3) The strenuous research carried on in the thirties and forties bore fruit to a large extent. The postulate of five fundamental categories was evolved. The common connecting symbol (colon) was creating difficulties in building class numbers.Hence, in the fourth edition of CC, for each fundamental category a separate connecting symbol was provided except for space and time. It was no longer necessary to represent those facets in the number that were not manifest in the document. CC, thus, became an almost freely faceted scheme and there lies the importance of the fourth edition. It ushered in the dynamism hitherto not obvious in CC.

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a) Geography - main class India space
b) Botany - main class Physiology
- matter (property) Flowering

Plants - personality

c) Education - main classAssessment - energy

Aptitude - matter(property)

College students - personality

1980s - time

d) Paintin - mainclass

Landscape - personality

Watercolor - matter(property)

17th Century - time

France - space

5.14 GLOSSARY

Adjunct : Something incidental or not necessarily essential that is added to the core.

Analytico-Synthetic :A Scheme Of Classification Based On The Analysis Of a subject into different facets. The facets are arranged by the prescribed postulates and the facet terms replaced by facetnumbers. The facet numbers are finally synthesized in class numbers with the aid of appropriate connecting symbols.

AnteriorisingValue :The value that enables the number possessing it to precede other numbers not possessing it.

Array :A set of numbers displayed in a row or column derived from the application of a single characteristic.

Basic Facet :The main class or basic class.

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Empty Digit **:**A digit,which retains its ordinal value without having any semantic value(see ordinal value).

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5.15 SUGGESTED READINGS

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LESSON 4

CURRENT TRENDS IN LIBRARY CLASSIFICATION

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STRUCTURE

5.1 Learning Objectives
5.2 Introduction
5.3 Three Different Time Periods
5.4 Origination in DDC
- 5.4.1 Editions 18th and 19th
- 5.4.2 Editions 20th and 21st
- 5.4.3 DDC's Computerization

5.5 Origination in UDC
- 5.5.1 Both IME 1985 and 1993
- 5.5.2 UDC in Information Retrieval Systems Using Computers
- 5.5.3 The UNISIST and UDC
- 5.5.4 UDC's Computerisation

5.6 Origination in CC
- 5.6.1 Publication of the Seventh Edition
- 5.6.2 CC's Computerisation

5.7 International Conferences
- 5.7.1 FID/CR - International Study Conferences on Classification Research (ISCCR)
- 5.7.2 International Conferences of ISKO

5.8 Organisations, Societies and Research Groups
- 5.8.1 Library Research Circle (LRC)
- 5.8.2 FID/CR
- 5.8.3 Classification Research Group (CRG)

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5.8.4 Documentation Research and Training Centre (DRTC)
5.8.5 International Society for Knowledge Organisation (ISKO)
5.9 Testing of Classification Systems
5.10 UNISIST and Broad System of Ordering (BSO)
5.11 FID Manifesto for Standard Reference Code (SRC) and BSO
5.12 Special Schemes of Library Classification
5.13 Library Classification and Computer
5.14 Internet: Library Classification Schemes
5.15 Summary
5.16 Glossary
5.17 Answers to Self Check Exercises
5.18 References
5.19 Suggested Readings

5.1 LEARNING OBJECTIVES

- Explain areas discussed in international conferences on classification and knowledge organisation organised by FID/CR and ISIS;
- Evaluate the contributions of organisations, societies and research groups for the development of library classification and its attainment of an international perspective; and
- Recognize the major advancements in DDC, UDC and CC;
- know the publication of special schemes of library classification and contribution of CRG and DRTC.

5.2 INTRODUCTION

History, trends and developments in library classification can be traced from the *epoch-making* year of 1876 when Melvil Dewey published *Decimal Classification.* Over the previous twelve decades (1876-1996) advancements have taken place in the field of library classification. During that time many general as well as special schemes have been published. Several of the most important general schemes, *viz., Dewey Decimal Classification, Universal Decimal Classification* and *Colon Classification* have witnessed major developments.

Various national and international organisations and eminent classificationists took the cause of library classification. Many international, regional and national conferences

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were organized to discuss diverse elements of classification. Output of literature covering various facets of the library classification in terms of both macro and micro documents is very important. The following parts briefly deal with trends and developments especially throughout the previous fifty years.

5.3 THREE DIFFERENT TIMES PERIOD

meantime tracing the trends and developments over the hundred years of classification, Ranganathan recognize 3 different time periods, viz.,

1. The Pre-facet Era (1876-1896)
2. Transformation to Facet Era (1897-1932)
3. Facet Era (1933-1972).

The Pre- facet Era Melvil, Dewey's *Decimal Classification* (1876) and C.A. Cutter's *Expansive Classification* (1879) was published. Transformation to Facet Era *Universal Decimal Classification* (1897-1905) and *Library of Congress Classification* (1902) were published. The Facet Era looks at the publication of Ranganathan's *Colon Classification* (1933), ILE. Bliss's *Bibliographic Classification* (1935), *Library Bibliographic Classification* (1960) and Fernmont Rider's *Rider's International Classification (1961). Several of* these classifications have organisations to take *up the* duty for their revision, development, application, preservation and conservation.

In the following section major trends and developments that have taken place in DDC, UDC and CC are introduced.

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IN-TEXT QUESTIONS

1) Identify the three periods that S.R. Rangarathan recognised as separate.

Which time frame did CC appear?

Note: i) Write your opinions in the box provided below.

ii) Compare your answers to the solutions provided at the conclusion of this lesson.

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5.4 ORIGINATION IN DDC

Different editions of the Dewey Decimal Classification (DDC) were released seldom up until the 1958 release of the 16th edition. Benjamin Custer, who edited the 16th edition, established the seven-year cycle. In this edition, an effort was made to achieve a balance between both the competing objectives of introducing new topics and preserving the notation's authenticity. The 17th edition was released in 1965 in two volumes, V.1: Tables; V.2: Area Table; and the Relative Index. Every edition demonstrated a trend into stronger synthesis when compared to previous editions. The primary objective of the 17th

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edition was to eliminate numerous contradictions between the usage of form dividing with zero as well as subject dividing with the assist of zero.

5.4.1 Editions 18th and 19th

The three volumes of the 18th edition, which was released in 1976, were V.1. Tables, V.2 Schedules, and V.3 Diagrams Index. Table 3 is one of the first five additional auxiliary tables. Individual Literatures' Subdivisions, Table 4. Individual Languages Division, Table 5. Groups by Race, Ethnicity, and Nation, Table 6. linguistics and Table 7. There were more people. These were extra to the Table 1 that already existed. Table 2 and Standard Subdivisions Aims. Three volumes of the 19th edition were released in 1979. This edition continued the policy that was started in the 17th edition. The following are the salient characteristics of this 3rd edition . A very thorough set of step-by-step instructions for creating numbers in the main class 1. A picture illustrating how hierarchical classification in DDC moves from the general to the specific. 800 literary works

5.4.2 Editions 20th and 21st

The 20th edition, edited by John P. Comaromi et al., was released in 1989 in 4 volumes: Volume 1, Introduction and Tables; Volume 2, Schedules (000-500); Volume 3, Schedules (600-900); and Volume 4, Relative Index and Manual. The primary objectives of this edition are: user comfort, clear instructions, more explanations, greater ease of access through enlarged summary and elimination of matching facilities for classifying single subjects.

Edited by Joan S. Mitchell and others, the 21st edition was released in four volumes in 1996. The comfort of readers is the main focus of this book, which includes: The following changes have been made:

1. Strategically inserted additional data is used to help the classifier..
2. For the sake of removing unclear headings, many captains have been revised..
3. "Example" and "Contain notes" have been replaced with "including notes".
4. There are more entries in the relative index than in the index to the 20th edition.
5. The manual has been updated..
6. Reducing Christian and American bias has received particular emphasis.

5.4.3 DDCs Computerization

The Online Computer Library Center acquired Forest Press, formerly the publishers of DDC, in July 1988. (OCLC). DDC adopted this modification and adopted the computer generation.. Since 1911, when Melvil Dewey first began using the name as an imprint, Forest Press has been the producer of DDC. Forest Press was a division of the Dewey-founded Lake Placid Educational Foundation up until 1988. In 1979, DDC's 19th edition was published from the computer tape.. In the years that followed, a highly sophisticated editorial support system as well as a database that was developed to generate DDC 20 and 21 editions came into use. DDC 21 was accessible in two modes: print and

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Dewey for Windows, a version running on Microsoft Windows TM that was launched in August 1996. (CD version). The Dewey Decimal Classification is currently covered on the Dewey webpage. It can be found on the Internet at the following address: http://wvvvv.oclc.org/fp/.

IN-TEXT QUESTIONS

2) Identify the DDC 21st edition's editor.

3) Which department has Forest Press been elevated to?

4) Identify the two formats that the 21st edition of DDC took.

Note: i) Fill out the space provided below with your replies.

ii) Verify your answers against those provided at the conclusion of this lesson.

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5.5 ORIGINATION IN UDC

The Decimal Classification served as the foundation for the creation of Universal Decimal Classification (UDC), which was originally published in 1905 under the title Classification Decimale Universalle.International Federation for Information and Documentation periodically revises and updates the scheme (FID).

The British Standards Institution (BSI), the official organisation, is publishing shortened copies in response to a demand from many sources for thorough short editions in English. the abridged edition, BS1000A first was made accessible in 1948. The second abridged edition had a substantial revision in 1957. The third abridged edition was released in 1961.

5.5.1 Both IME 1985 and 1993

To replace abbreviated English editions, the International Medium Edition (IME) has been printed with more comprehensive parts. The IME, English Text is separated into two parts: Part II, an alphabetical subject index, was published in 1988, and Part I, systematic tables, which were both published in 1985.This edition imply about a third of the material in the full editions brought out in English, French and German. The Abridged English Editions (ABE) already have a variety of signs and symbols, but two additional have been added: -4 (the arrow) indicating "see also," for example, 159.9 Psychology —4 (301.151; 591.51; 621.821; 616.89, and = meaning "subdivision as."

e.g. 611.3 mechanism for digestion. Available canal

In 1993, a second IME in English was split into two sections. The linguistics divisions have been moved to class 8 and the numeral 4 previously used for linguistics has been frozen.

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5.5.2 UDC in Information Retrieval Systems Using Computers

UDC's suitability for "mechanical sorting" was first suggested in 1934. TIt was noted at the 1948 Royal Society Scientific Information Conference that UDC's potential for automated retrieval should be investigated. The research projects conducted in the 1960s in the United States, Great Britain, Germany, Denmark, and Switzerland made UDC a useful indexing language for the computerised control and processing of knowledge-related information. The American Institute of Physics UDC Project under Freeman and Atherton was the most significant research project in this regard.

5.5.3 The UNISIST and UDC

For those who prefer a uniform UDC-based system, FID came up with the idea of creating a "Roof Scheme" on which to hang the relevant special categories, thesauri, or word finder lists in addition to the more thorough UDC divisions themselves. The efforts to have UDC adopted as the changing language for UNISIST (United Nations World Science Information System), a joint initiative of ICSUJ UNESCO, provided encouragement for the idea. According to an ASLIB evaluation for UNISIST, UDC was deemed to be the "least disappointing" of the major extant systems. UDC has been successfully utilised in computerised bibliographical and abstracting services for more than three decades, serving not only the purpose of creating subject indexes but also SDI and information retrieval. Rigby has been at the forefront of UDC mechanisation since he first displayed the printouts of Meteorological and Geo Astrophysical Titles at the Conference in Elsinore in 1964, marking the beginning of the use of computers for author and subject indexing. Rigby created a more complete analysis of computer usage with the UDC using the descriptions of over sixty experimental or operational systems in fifteen countries and four international efforts.

5.5.4 Computerisation of UDC

UDC has been successfully utilised in computerised bibliographical and abstracting services for more than three decades, serving not only the purpose of creating subject indexes but also SDI and information retrieval. Rigby has been at the forefront of UDC automation since he first displayed the printouts of Meteorological and Geoastrophysical Titles at the Conference in Elsinore in 1964, marking the beginning of author and subject indexing using computers. With the help of the UDC, Rigby undertook a more extensive study on computer usage, describing more than sixty operational or experimental systems across fifteen nations and four international projects.

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IN-TEXT QUESTIONS

5) The two components of UDC IME (1985).

6) What two more symbols were added to IME (1985)?

Note: I Fill out the space provided below with your replies.

ii) Compare your responses to the solutions provided at the conclusion of this lesson.

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© DDC

5.6 ORIGINATION IN CC

Everyone is aware that S.R. Ranganathan's Colon Classification (CC) first appeared in literature in 1933.. It continued to exist as a Rigidly Faceted Scheme up to 1952. It wasn't until 1950 that an attempt was made to loosen the constraints of a predetermined facet

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formula. After then, in Edition 4 of the classification scheme, CC was introduced as an almost-freely faceted scheme (1952). Since the 1950s, CC has evolved in a direction that is increasingly more in line with science. After the fourth edition, notably, the analytico-synthecity characteristic became more prominent. The Schedules of Isolates and the Basic Subject Schedules make up the bulk of the Common Core. Personality Facet is the schedule that is more unique to a fundamental subject.

5.6.1 Publication of the Seventh Edition

The seventh edition of CC was published in 1987. It was introduced to be brought out in 3 volumes, viz., V.1 Schedules for Classification; and 3 Index and Worked-out Examples. But only MI Schedules for Classification was brought out in 1987. Numerous people have criticized the seventh edition (7th ed.) for its illogical structure and inconsistent notation. It was published posthumously (after the death of the author, Rangnathan), and edited by Professor M.A. Gopinath, who had been his long term research assistant. Overall, the Indian library profession has abandoned this version. The other two volumes were never published. In this edition, A few additional indicator digits, including & (ampersand), +, and the currently used indicator digits from the 6th edition (1960), are also included (plus),

There are now three additional symbols: = (equals), * (asterisk), and °'. (double inverted comma). Renamed as Matter Method (MM), Matter Property (MP), and Matter Material from Matter [M] (MMO). This version also included sections on the environment (chapter DD). The timelines for basic subjects have been greatly expanded. Isolates of Common Matter Property are also a part of it. The timelines for language, time, and space have been greatly expanded.

5.6.2 CC's Computerisation

Facet analysis is having an impact at Case Western Reserve University in Ohio. Facet analysis was employed in Dr. Fugman's chemical analysis system (ISKO, Germany). Facet analysis is also utilised for shelving in online information searches; PMEST was used in the computer-generated indexes at Syracuse University in New York.

In India, the DRTC developed several computer programmes based on aspect analysis and investigated the use of CC in computers to generate class numbers in 1967. In computer programming, CC was also applied to chain indexing, cyclic indexing, and SDI services. The Western Ontario School of Library and Information Science is a school in Canada.created a thesaurus using CC scheduling.

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IN-TEXT QUESTIONS

7) List the new indicator digits in the 7th edition of CC.

8) Which agency created computer programmes based on facet analysis in 1967?

I Fill in the blanks with your answers.

ii) Compare your answers to the answers provided at the end of this Lesson.

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5.7 INTERNATIONAL CONFERENCES

As was already said, significant advancements and trends in library classification over the past 12 decades have given it a global perspective when compared to other traditional areas of library science like cataloguing, indexing, and abstracting. Numerous conferences on library categorization and knowledge have been organised internationally over the past 40 years, or more precisely from 1957, under the auspices of FID/CR and the International Society for Knowledge Organization (ISKO). In the ensuing subsections, these are briefly discussed.

5.7.1 FID/CR - International Study Conferences on Classification Research (ISCCR)

6th International Study Conferences on Classification Research have been held by FID/CR since 1957. (ISCCR). Dorking, England hosted the first ISCCR from May 13–17, 1957. In his

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welcome speech, Ranganathan focused on "Library Classification as a Discipline." The suggestions made during this session addressed:

1. Scope of Classification

2. Various schemes of Classification

3. Necessity of Research

4. The use of classification schemes.

5. Development and implementations of Library Classification Schemes.

6. Notation for systems that use visual scanning, like the card catalogue.

7. machines system

8. Researches Projects

9. creation of classification schemes

10. Development of Research.

11. A general classification Schemes

Elsinore, Denmark hosted the second ISCCR from September 14 to September 18, 1964. "Library Classification Through a Century'' was the topic of Ranganathan's presidential address. The papers presented at this conference were divided into five groups:

1. General classification theory

2. Research in mechanised classification

3. Selected and particular schemes

4. Evaluation methodologies

5. Future work directions

The third ISCCR took place in Bombay from January 6 to 11, 1975. This conference's suggestions focused on;

1. General characteristics of building global information network ordering systems; 2. Use of empirical methodologies and theoretical models for designing global information network ordering systems;

3. System analysis

5. Education; 4. Interdisciplinary content;

6. Developmental countries' needs and difficulties

Augsburg, Germany, hosted the fourth ISCCR from June 28 to July 2, 1982. "Universal Classification, Subject Analysis, and Ordering Systems" was the conference's theme.

The fifth ICSSR was held in Toronto, Canada, from June 24 to 28, 1991. The conference theme was "Classification Research for Knowledge Representation and Organization."

Three categories have been established for the papers presented at this conference.

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categories:

1. general rules and guidelines;

2. Structure and Logic

The theme is "Knowledge Organization for Information Retrieval." The International Society for Knowledge Organization, ASLIB, Classification Research Group (CRG), and University College London sponsored this conference (ISKO). At this conference, the following subjects were discussed:

1. Classification's function in information management

2. Research on classification to retrieve electronically published content

3. Approaches for automatic classification

4. The study's findings and the real world

5. tools for classifying things and tools for classifying things

6. Data modelling

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IN-TEXT QUESTIONS

9) Specify the topic of the fourth ICSSR conference.

10) Where did the sixth ICSSR take place?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Lesson.

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5.7.2 International Conferences of ISKO

Since its inception in 1989, the International Society for Knowledge Organization (ISKO) has hosted four international conferences on knowledge organisation. The following paragraphs provide a synopsis of these sessions and deliberations.

On August 15-17, 1990, the first International ISKO Conference was held at Darmstadt Technical University in Germany. 'Tools for Knowledge Organization and Human Interface' was the topic chosen. The following topics were covered in the papers delivered at this conference:

1.General knowledge organisation issues;

2. Algorithmic text analysis;

3. Terminology;

4. Knowledge organisation in universal systems;

5. Thesaurus problems;

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6. Online retrieval;

7.Knowledge organisation in special schemes;

8. Retrieval from universal systems;

9. Retrieval technologies and indexing.

Knowledge organisation in specific schemes; online retrieval Retrieval from global systems; Indexing and retrieval technologies

On August 26-28, 1992, Madras hosted the second International ISKO Conference. The conference's theme was 'Cognitive Paradigms in Knowledge Organization.' The following categories apply to the papers that were submitted to this conference:

1. Knowledge and knowledge organisation

2. Knowledge seeking in information retrieval

3. Knowledge seeking in issue resolution

4. Taxonomic approach to knowledge organisation

5. Analytico-Synthetic approaches to knowledge organisation

6. Cognitive paradigms and their application

7. Cognitive paradigms in knowledge bases.

On June 21-24, 1994, the third International ISKO Conference was held at the Royal School of Librarianship in Copenhagen, Denmark. The conference's theme was "Knowledge Organization and Quality Management." The papers submitted at this conference were classified as follows: 1. Knowledge organisation quality; 2. Knowledge organisation theory; 3. Future prospects for categorization schemes and thesauri; 4. Knowledge organisation in specific fields; 5. Concept representation in system design; 6. Linguistics in knowledge organisation

Communication and knowledge organisation; and 8 New technologies and knowledge organisation.

On July 15-19, 1996, the fourth International ISKO Conference was held at the James Madison Memorial Building, Library of Congress in Washington, DC. The conference's principal focus was 'Knowledge, Organization, and Change.' Papers were presented on the following sub-themes: I. Library of Congress Classification; 2. Change Management in Knowledge Organization; 3. Knowledge Organization in Online Environment; 4. Impact of Technologies on Bibliographic Elements; 5. Users' Focus in Knowledge Organization; 6. Inter-disciplinary Approaches to Knowledge Organization; 6. Natural Language Processing; and 8. Dewey Decimal Classification.

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IN-TEXT QUESTIONS

11) **What was the first ISKO conference's theme?**

12) **Which conference selected the theme "Knowledge Organization and Quality Management"?**

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Lesson.

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5.8 ORGANIZATIONS, SOCIETIES AND RESEARCH GROUPS

Over the last five decades, various organisations, societies, and research groups, as well as individuals, have taken up the cause of library classification. They have conducted numerous research efforts in order to provide library categorization a new orientation and develop it into an effective instrument not only for shelf arrangement but also for knowledge organisation. The activities of these institutes are summarised in the sections that follow.

5.8.1 Library Research Circle (LRC)

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S.R. Ranganathan founded this in 1951 in Delhi. This group used to gather on Sundays at Ranganathan's house to conduct study on various aspects of classification, particularly colon classification. Its members focused on fundamental categories, indicator digits, rounds and stages of manifestation, zone analysis, and depth classification requirements. Depth Classification, issued by the Indian Library Association in 1953, bears adequate witness to the efforts made by LRC members. Its activity dwindled after 1954.

5.8.2 Fl/DCR

In 1950, at the request of Ranganathan, FID established a Committee on Classification Theory (FID/CA). FID/CA was renamed the Committee on Classification Research (Fill/CR) later that year. This Committee has promoted categorization research. FID/CR operations are conveyed through a serial publication called FID/CR Newsletter, which is produced four times a year and lists classification research initiatives in progress. FID/CR has previously organised six international conferences, as mentioned in section 15.6.1. Dr. I. C. Mcllwaine is the current chairman of FID/CR.

5.8.3 Classification Research Group (CRG)

This group was founded in 1952 in London. Sayer's Memorial Volume documents the early efforts of CRG members (London, Library Association, 1961). In 1953, the CRG gave a brief summary of its views on faceted classification, and in 1955, it issued a memorandum titled "The Need for Faceted Classification as the Basis of All Methods of Information Retrieval." From 1952 to 1960, CRG members focused on the development of special library classification schemes. CRG believed that there was no general classification suitable for computer retrieval. As a result, it was decided to collaborate with the MARC Project to create a broad classification scheme for an automated retrieval system. CRG has been actively involved in the following areas since the 1970s: 1. Revision of I LE. Bliss's Bibliographic Classification by 3. Mills; 2.Formulation of the Broad System of Ordering (BSO); 3.Classification Scheme on LIS; and 4. PRECIS

5.8.4 Documentation Research and Training Centre (DRTC)

S.R. Ranganathan founded the DRTC in Bangalore in 1962. It actively pushed various levels of library classification research. These are: I. Development research to create depth schedules; II. Fundamental research to create postulates and principles; and III. Systematic testing of depth schedules created by DRTC faculty and alumni. It has held annual symposia on the topics of Library Classification and Information Science, as well as short-term courses and workshops. It is publishing a quarterly publication called "Library

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Science With a Slant on Documentation and Information Studies" in partnership with the Sarada Ranganathan Endowment for Library Science (1964-).

5.8.5 International Society for Knowledge Organisation (ISKO)

In 1989, this society was created in Frankfurt, Germany. Dr. Ingetraut Dahlberg is the organization's founder and president. This society's overarching goal is "to promote research, development, and use of all methods for knowledge organisation in general and in specific disciplines, particularly by merging conceptual approaches from categorization research and artificial intelligence. For conceptual objects, the society emphasises philosophical, psychological, and systematic techniques ".The society facilitates personal interaction and opportunity for the global community of colleagues who devote themselves to the creation, expansion, modification, and implementation of instruments for knowledge organisation from a conceptual standpoint. Four worldwide ISKO conferences have previously been organised by the society. Section 15.6.2 contains a summary of the proceedings of these sessions. The society also publishes a quarterly publication called "Knowledge Organization," which was previously known as International Classification. This section is dedicated to the study of concept theory, classification, indexing, and knowledge representation.

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IN-TEXT QUESTIONS

13) Who established the Li1,r°ay Research Circle?

14) Who is the current chairman of the BID/CR?

15) Who amended the Bibliographic Classification of H.E. Bliss?

16) Describe the various levels of research that the DRTC supports.

17) When was ISKO founded?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Lesson.

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5.9 TESTING OF CLASSIFICATION SCHEMES

Several research studies have been conducted to find the best and most successful methods of classifying and indexing. The majority of the research did not examine categorization schemes in and of themselves, but rather their implementation in information systems. The most well-known research were conducted in the early 1960s at Cranfield, England, under the guidance of C. Cleverdon.

5.10 UNISIST and Broad System of Ordering

UNESCO launched the UNISIST (United Nations World Science Information System) programme as an intergovernmental effort in 1971. The programme was established in response to the proposals made during the first international meeting in 1971.

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The study includes a chapter on technical developments, which suggests that a common list of broad subject categories, rather than specific document data, may be effective for locating and transferring big blocks of information.

ASLIB was asked to investigate if existing classification schemes would suffice. An ASLIB committee determined that none of the schemes were appropriate. As a result, UNISIST has concluded that an entirely new scheme should be designed as a Standard Reference Code (SRC). It was then abbreviated as BSO.

5.11 FID MANIFESTO FOR STANDARD REFERENCE CODE (SRC) AND BSO

FID/CCC (International Federation for Information and Documentation/Central Classification Committee) had been working on the feasibility of transferring UDC as a `roof scheme' for other classification systems before it entered into a contract with UNESCO on the development of BSO in 1971-72. But at the FID conference held in 1972 at Budapest, Hungary, it was decided to enlarge the size of the FID/CCC panel formed in 1971 to serve as a working group called FID/SRC for the purpose of preparing a Standard Reference Code (SRC) which could serve as the BSO as desired by UNESCO.

A small committee known as FID/BSO was constituted to develop the proposed new scheme. After two and a half years of study, the Committee presented a draft scheme called BSO, which consisted nearly two thousand subject fields in a brief hierarchical order but without a notation. FID published the *"BSO - Broad System of Ordering: Schedule and Index" in* 1978.

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IN-TEXT QUESTIONS

18) Which organisation promoted BSO?

19) When was BSO first published?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Lesson.

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5.12 SPECIAL SCHEMES OF LIBRARY CLASSIFICATION

Over the last five decades, a number of specific schemes of library classification have emerged and been published to fulfil the needs of special libraries and information centres. The issue of developing special schemes has been thoroughly investigated, particularly by members of the CRG and DRTC. The invention of faceted schedules has largely overcome major problems in the construction of special schemes. Classificationists, particularly S.R Ranganathan's Design of Depth Classification Methodology, developed the rules and procedures for developing depth schedules (1964). CRG members have devised a number of multifaceted unique plans. Between 1963 and 1975, the DRTC produced fifty depth schedules to classify a wide range of topic areas. Another 71 depth schedules were developed between 1967 and 1973. The following are some notable special schemes:

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1) *Soil Earth Science,* by B.C. Vickery.

2) *Classification of Social Sciences, 1961, by* B.F. Kyle.

3) *British Catalogue of Music Classification, by* E.J. Coates.

4) *Organising the Arts,* 1968, by Peter F. Broxis.

5) *Classification of the Performing Arts,* 1968, by Anthony Croghan.

6) *A Classification for the Literature of Jazz,* 1970, by D.W. Langridge.

5.13 LIBRARY CLASSIFICATION AND COMPUTER

The electrical age began with World War II. The computer is a powerful instrument that may relieve us of much tedious everyday work while also allowing us to be creative. Can we rely on computers to classify documents?

Ranganathan believes "Classification entails judging the subject of the paper in all of its sides and arrays. This cannot be accomplished through statistical analysis of the words in the document, which only the machine can perform. At the moment, computers can accomplish a lot of work that does not require judgement. However, classification will have to be done by humans until the computer can be programmed with the ability to make decisions ".

However, since the 1970s, K.P. Jones, Rigby, R. Freeman, and others have been conducting research on automatic classification. Jones claims that "Computers have favoured statistical approaches to classification over conceptual ones. The computer can be more exhaustive than the human classifier, which is a significant distinction between automatic and manual categorization." Jones went on to say that the prospects for automatic classification in libraries are not promising. Appropriate classification methods and applications have yet to be identified.

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IN-TEXT QUESTIONS

20) What exactly does subject representation entail?

21) Who said categorisation requires judgement?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Lesson.

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5.14 INTERNET : LIBRARY CLASSIFICATION SCHEMES

The Internet, the world's largest repository of knowledge, contains approximately 100 million pages of information. Finding the needed information on the Internet is a difficult task. Attempts have been made to use library classification techniques for retrieving information from networks. The following are the advantages of using library classification schemes:

a) Enhanced subject search capabilities;

b) the capacity to provide multilingual access;

c) interoperability with other services; and

d) the ability to partition huge databases.

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Furthermore, if the Internet service provider employs an established and popular classification scheme, it is more likely to be up to date because it is reviewed at regular intervals and is well-liked by consumers.

A list of Internet sites that use library classification systems or subject headings may be found at:

<URL: http://www.iastate.edul-CYBERSTACKS/CTW.html

The following resources are organised:

SITES USING DDC

C'yberDewey: A catalogue for the World Wide Web. David A. Mundie (Pittsburgh, Penn.) <URL: httpilivory.1m.coml-mundie/DDHC/CyberDewey.htmI>

Canadian Information by Subject. Ottawa: National Library of Canada. <URL: http://www.nlcbnc,caIcaninfo/esub.html>

PICK: Quality *Internet Resources in Library and Information Science.* Aberystwyth: University of Wales Aberystwyth, Thomas Parry Library. <URL: httpl/www.aber.ac.uk/etplwww/et pick.htmI>

NetFirst. Dublin, Ohio: OCLC. SITES USING UDC

BURL Subject Tree attempts to provide complete coverage of UK Internet resources in all subject areas. The BUBL Information Service is a national service for the higher education community financed by the UK's Joint Information Systems Committee (JISC).

The NISS Directory of Networked Resources is a selective service that includes all subject areas. It makes extensive use of UDC, and browsing through NISS entails moving through UDC hierarchies with the numbers displayed on the screen above each part.

OMNI (Organising Medical Networked Information) is a narrowly focused subject service that catalogues medical resources. It usually makes browsable searches with UDC. They do, however, generate discrete browsing areas using a subject-based classification approach.

Because manually classifying the millions of papers available on the Internet is time-consuming and expensive, a number of research initiatives on automatic classification of Internet resources have been initiated. These projects are investigating the process to be used for translating subject phrases (found by searching a database) into categorised notation. OCLC's Project Scorpion, for example, employed DDC while the Nordic WAIS/WWW Project (Lund) and

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Project Gerhard (Oldenburg) used UDC. A number of research are also underway to investigate the potential of neural networks and automatic conversion between classification schemes.

5.15 SUMMARY

The history, trends, and innovations in library classification can be traced back to 1876, when Melvil Dewey released his Decimal Classification, an epoch-making year. Ranganathan meticulously examined the evolution of classification over a century, identifying three distinct phases. Pre-facet Period (1876-1896), Transition to Facet Period (1897-1932), and Facet Period (1932-1936). (1933-1972). main systems, edition (1979), twentieth edition (1989), and twenty-first edition (2001) (1996). Forest Press, formerly the publisher »f DDC, became an OCLC branch in July 1988. DDC's 21st edition was available in two formats: I. print and II. Dewey for Windows (CD version). In response to the needs of user libraries, UDC has released an Abridged English Edition (AEE). In 1985 and 1988, the IME was published in two volumes. IME was released again in 1993. Two new symbols were included in these editions: -4 (indicating see also) and -a (meaning parallel division). The digit 4, which had previously been employed in linguistics, has been frozen. Linguistics divisions have been moved to 8. UDC has proven to be quite effective in computer-based information retrieval systems.

The seventh edition of CC was released in 1987 without an index. Several adjustments were made with the addition of five more indicator digits, namely, & (ampersand), + (plus), = (equals), * (asterisk), and ' (single inverted commas). CC has been tested in computer-generated indexing services.

There were several international conferences to explore various aspects of classification and knowledge organisation. Until 1997, FID/CR hosted six international conferences. Until 1996, ISKO hosted four international conferences on knowledge organisation.

Organizations, clubs, and study groups have been formed for the purpose of library classification/knowledge organisation throughout the last five decades, beginning in the 1950s. The Library Research Circle was founded in 1951, followed by CIt8 (1052), FID/CR, and others (1961). ISKO and DRTC (1962). (1989).

These organisations conduct study and contribute to the advancement of library classification/knowledge organisation.

Several studies have been conducted to discover the best and most successful classification and indexing systems. After starting the UNISIST programme in 1971,

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UNESCO took the initiative to develop the Broad System of Ordering with the assistance of FID, ASLIB, and CRG.

In addition to changes in the major schemes, the last five decades have seen the formation and publishing of unique classification schemes. CRG members and DRTC professors have developed a number of specific classification schemes and lepth schedules for several subjects based on CC.

In the 1970s, research was conducted to investigate the use of computers for document classification.

Automatic categorization pioneers include K.P.S. Jones, R. Freeman, and Rigby. Jones has concluded that the prospects for automatic classification in libraries are not promising.

To conclude, in the context of the rising information society, library classification/knowledge organisation will have increasing relevance and importance, as well as a specific function to play in the twenty-first century. Because of the activities of FID/CR and ISKO, these two factors will remain the primary focus of fora.

5.16 GLOSSARY

AEE : Abridged English Edition

ASLIB : The Association for Information Management

BSI : British Standards Institution

BSO : Broad System of Ordering

CC : Colon Classification

CRG : Classification Research Group

DDC : Dewey Decimal Classification

DRTC : Documentation Research and Training Centre

FID/CR : International Federation for Information and Documentation/ Committee on Classification Research

FID/CCC : International Federation for Information and Documentation/ Central Classification Committee

ICSU : International Council of Scientific Unions

IME : International Medium Edition

ISCCR : International Study Conference on Classification Research

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ISKO : International Society for Knowledge Organisation
LRC : Library Research Circle
OCLC : Online Computer Library Center
UDC : Universal Decimal Classification
UNESCO : United Nations Educational, Scientific and Cultural Organisation
UNISIST : United Nations World Science Information System

5.17 ANSWERS TO SELF CHECK EXERCISES

1) 1. Pre-facet Period (1876-1896); 2. Transition to Facet

Period (1897-1932); and 3. Facet Period (1933-1972).

2) Facet Period (1933-1972).

3) Joan S. Mitchell.

4) OCLC

5) a) In print.

b) Dewey for Windows.

6) Part I: Systematic Tables, Part II. Index.

7) , ≅

8) &, +, =, *

9) OCLC.

10) Universal Classification, Subject Analysis and Ordering Systems.

Study of Selected Schemes of Classification

11) Toronto, Canada.

12) Tools for Knowleage Organisation and Human Interface.

13) Third International ISKO Conference.

14) S. R. Ranganathan.

15) *Dr.* LC. Mcllwaine.

16) J. Mills.

17). 1. Development Research; *2.* Fundamental Research; *3.* Systematic Testing.

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18) 1989.

19) UNESCO/UNISIST

20) 1978.

21) K. P. Jones, R. *Freeman and* Rigby.

22) S. *R.* Ranganathan

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Svenonius, E. (1992). The impact of computer technology on knowledge representation. In Cognitive Paradigms in Knowledge Organisation. Second International ISKO Conference, Madras 26-28 August 1992 (pp. 1–14).

Ranganathan, S. R. (1944). Library Classification: Fundamentals & Procedure: With 1008 Graded Examples & Exercises. Madras library association.

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5.19 SUGGESTED READINGS

1. **Ranganathan, S. *R.* (1965). Library *Classification* Through *a* Century. *Library Science With Slant to Documentation. 2(1), 1-30.***
2. ***Knowledge Organisation* (Quarterly *issues).***

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LESSON 1.1

Introduction, Structure and Organisation

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1.1 Learning Objectives
1.2 Introduction
1.3 Background of Colon Classification (CC)
1.4 Analytico-synthetic Scheme
1.5 Notation in CC
1.6 Structure and Layout
1.7 Index in CC
1.8 Summary
1.9 Glossary
1.10 Answers to In-text Questions
1.11 Self-Assessment Questions
1.12 References
1.13 Suggested Readings

After reading this lesson, you will be able to:

- get an overview of Colon Classification;
- explain the analytico-synthetic process of Colon Classification;
- enumerate the notation used in CC;
- describe the basic plan of the scheme; and
- use the Index of CC.

Colon Classification (CC) was devised by the late S.R. Ranganathan. The first edition of the scheme was brought out in 1933. So far, seven editions of the scheme have been published. The 7th edition does not have an index as yet. So, the construction of Class Numbers with the

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help of this edition becomes difficult for a learner. For this reason, we will use the 6th edition of CC. The sixth edition was first published in 1960 and then reprinted in 1963, 1964, 1969, 1976, 1989 and 1990. Its bibliographic details are as follows: •

Colon Classification devised by S.R. Ranganathan - 6th edition- 4th reprint - Bangalore; Sarada Ranganathan Endowment for Library Science, 1990.

To get a better understanding of the scheme, it is necessary to have this edition in hand while studying the scheme.

The idea behind the Colon Classification took its root in 1924 when Ranganathan saw the demonstration of a meccano set in a toyshop in London. The meccano set .consisted of several slotted strips, rods, wheel screws, and nuts and bolts with which several different models could he made. The same principle was applied by Ranganathan in his Colon Classification scheme where the standard units resembled the strips of a meccano set and the connecting symbols were like the screws and bolts. The standard units constituted the schedules and colon was used initially as the connecting symbol for constructing class numbers.

First Edition (1933)

The first edition of CC was published in 1933. It had three parts: Part 1 contained Rules explaining the underlying principles; Part 2 had the Schedules and Part 3 was the index. Mixed notation was used comprising 26 Roman capital letters denoting main classes, Judo-Arabic numerals and Roman lower case letters. Each main class was provided with a facet formula. • Colon was used as connecting symbol for joining different facets.

Second Edition (1939)

The second edition was published in 1939. In this edition, two new concepts of octave principles and auto-bias device were introduced. A new Main Class - Spiritual Experience and Mysticism was added. Apart from the earlier three parts, a fourth part was added which contained about 3,000 examples illustrative of the rules given in the first part.

Third Edition (1959)

Third edition appeared in 1959, which was based on Dynamic Theory of Library Classification. It was based on the postulate of five Fundamental. Categories, - Personality [P], Matter [M], Energy [E], Space [S} and Time [1]. Each fundamental Category was assigned an Indicator Digit (Connecting Symbol): comma (,) for Personality; semicolon (;) for Matter, colon (:) for Energy, and dot (.) for Space and Time.

Fourth Edition (1952)

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In the fourth edition (1952), the indicator digit for Time was changed into single inverted comma (`). Ordinal value for the indicator digits was also determined in this edition. Many Greek letters were added in this edition to expand the base of the Main Classes.

Fifth Edition (1957)

Fifth edition published in 1957 made many changes both in the rules as well as in the schedules. Empty and emptying digits replaced the Greek letters introduced in the fourth edition. The second level of space and time facet was also introduced.

Sixth Edition (1960)

The sixth edition of CC was published in 1960. The chapters of the Part 'Rules', was rearranged and partly rewritten in this edition. Chapter 6 on contractions, Chapter 7 on Classification and Chapter 8 on Principles and Postulates were added. In the Schedule Part, schedules for Phase, Mira-facet and Intra-array relations were added. Changes were also made in some of the schedules of main classes. Sixth edition was reprinted in 1963, which added Annexure before the rules section.

Seventh Edition (1987)

The seventh edition of Colon Classification was published in 1987, long after the, death of Ranganathan in 1972, substantial changes were made in this edition. However, the index for this edition has not been brought out so far and hence it is difficult to use.

Theory behind CC

Ranganathan was the first classificationist to give a detailed account of the theory behind a scheme of classification. The theories are described in his book "Prolegmenena to Library, Classification" first published in 1937. The 'Prolegomena' has undergone three major revisions. The 3rd edition was published in 1967. Ranganathan developed Colon Classification scheme on the basis of Canons, Principles and Postulates propounded by him. The canons of classification are provided in the 'Prolegomena' and the principles of helpful sequence are given in the 'Prolegomena' and in his hook, "Elements of Library Classification. The postulate of fundamental category, which forms the basis of Colon Classification, is a result of his dynamic theory of classification.

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Colon Classification (CC) is an analytico-synthetic scheme and in this respect is different from the enumerative schemes of classifications like the Dewey Decimal Classification or the Library of Congress Classification schemes. In CC, ready-made class numbers are not given to the subjects. The schedule of CC consists of certain standard unit schedules. By combining the numbers in different unit schedules on the basis of the rules and principles, class number for all possible subjects can be constructed. The process is akin to the use of meccano set. The number building in CC involves two major steps:

1) Analysis of the subjects into facets and transforming them into five Fundamental Categories; and
2) Synthesis of the facets.

The process of analysis and synthesis for construction of class numbers in CC can be explained with the help of the following example:

Example

Title: Circulation of periodicals in college libraries in India in 1996.

It is clear from the above title that the book belongs to the Main Class 'Library Science'. Thus% M.C. = Library Science,. Further analysis reveals the different facets of the title, which are

i) Circulation
ii) Periodicals
iii) College Libraries
iv) India
v) 1996

Each of the above facets constitutes different fundamental categories. Circulation is a process, therefore, it constitutes the Energy facet [E], Periodicals being a material will come under the category of Matter facet [M], College Libraries constitutes the Personality facet [P], India is the Space facet [S] and 1996 is the facet [T]. Thus, by arranging the facets in the decreasing sequence of concreteness, i.e., PMEST we have

Library Science (MC.), College Libraries [P], Periodicals [M], Circulation [E], India [S] and 1996 [1]. Now the next step would be the identification of the notations denoting the different facets.

Library Science	(M.C.)	= 2
College Libraries	[P]	= 33
Periodicals	[M]	= 46
Circulation	[E]	= 6

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India	[S]	= 44 (Taken from Space Isolate Schedule Page 2.18 to 2.17)
1996	[T]	= N96 (Taken from Space Isolate Schedule Page in 2.17)

By synthesizing the different facets with the help of indicator digits, we get the class number for the above title as:

2 (M.C.) 33[P]; 46[M]: 6[E]. 44[S] 'N96 [T]

= 233; 46: 6.44'N96

Note : you will notice in the above class number that before the personality facet the indicator digit comma has not been used. -

This has been done according to the facet formula (2 [P]; [M]: [E] [2P]) given in the Main Class '2 Library Science'. Thus, we see that the analysis of a given subject results in facetisation of the subject of a document on the basis of the five fundamental categories and the synthesis brings together the facets in a subject to represent the thought content of the document as far as possible.

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Notation means the symbols used in the scheme to represent classes in a scheme of classification. Before we learn to use the scheme, it is necessary to understand the notational symbols used in this scheme.

The Indo-Arabic numerals (1-9) and the Roman alphabets (both capital and small letters) are known as substantive digits in CC. The Roman capital letters and the Greek letters A (delta) and E(sigma) are used to denote the Main and Canonical Classes and also as Time isolates in CC. The Indo-Arabic numerals are used to represent different facets of the subject. The numerals are used as decimal fractions. The Roman small letters are used as common isolates, second level of time isolate and also for phase relations.

The digit o, the punctuation marks and the arrows are used as connectives or conjunctions. The starter and arrester brackets are used for the Subject Device.

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In Colon Classification each of the ,digits have been given Ordinal value and the sequence of their arrangement in ascending order is as follows:

)←→‘:;,-abcdefghjkmnpqrstuvwxyz123456789ABCDEFGHI
JKLMANOPQRSETUVWXYZ(

The book has been divided into three parts:

Part 1: Rules

Part 2: Schedules

Part 3: Classics and Sacred Books

Part 1: this part relates to rules, which gives definitions, explanations and examples.

Chapters 01-04 deal with Call Number, Class Number, Book Number and Collection Number, respectively.

Chapter 05 introduces the concept of Facet, Focus and the Devices by which Foci may be formed in the Facets of Class Number.

Chapter 06 deals with contractions.

Chapters 07 and 08 explain the Canons of Classification and the Principles for securing helpful sequence.

Chapters 1-5 deals with Main Classes, Common Isolates, Time Isolates, Space Isolates and Language Isolates, respectively.

Chapter 6 introduces the concepts of Phase, Intra-facet and Intra-array relations.

Chapter 7 deals with Classic Device, which helps, in organizing Classics in Indology and other fields.

The remaining Chapters in this part are devoted to each one of the Main Classes dealing with rules and peculiarities involved therein and also the worked out examples.

At the end of this part, there is an Index.

Part 2 This part consists of the schedules of Classification as follows:
Chapter 02: schedule of Form Divisions for construction of Book Number.

Chapters 1-5: the schedules of Common Isolates, Time Isolates, Space Isolates and the Language Isolates, respectively.

Chapter 6: Schedules for the Phase, the Intra-facet and the Intra-array relations. In the remaining chapters, the schedules of all the Main Classes are given.

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The alphabetical Index to the Schedules of Space Isolate (Chapter 4) and of the Personality Isolates in Botany (Chapter I) and Zoology (Chailer. K) are given immediately after the respective schedules. Index to all the fundamental constituent terms in the schedules is given in one alphabetical sequence at the end of Part 2. Before the Index starts, general instructions on how to use the Index are given.

Part 3: This part provides worked out Class Numbers of Classics in Indology. It also provides schedule of Sacred Books with special names, followed by an index.

Tile pagination of each part runs in separate sequences. Avo blocks separated by a dot represent
the page number. The number appearing to the left of the dot represents the part and the number to the right indicates the page number in that part; for instance 1.7 means page 7 in part1; similarly 2.123 and 3.53. At the beginning of the book, after the preliminary pages, there is an Annexure containing some corrections of misprints and a few minor changes.

As indicated to you already in the above sections, Alphabetical Index; to the schedules is provided at page no. 2.124 of CC. This is an Index to the fundamental constituent terms in the Schedules of Classification contained in Part 2 of C. This Index helps in recognizing the Main Class and facet of a given isolate term which you are expected to classify. But you must know how to use this Index.

At the beginning of the Index, instructions to use the Index and Key to the Contractions are given. You have to Understand the meaning and implications of a given entry in the Index. Here is a sample entry from the Index:

Epidermis G [P], K [P2], L [P], 871

It means the isolate term epidermis occurs in Biology as personality [P], in Zoology as second level personality [P2] and in Medicine as personality [P]. The isolate number for epidermis in all these cases is 871 and the Class Numbers is:

G 871 K, 871

L 871

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You have to make use of this Index in order to know the main classes and the facets of a given isolate term of subject. The Index also helps you to know in what context is an isolate term used and its appearance in various facet.; of main classes and the relevant isolate number.

CC uses mixed notation, which has the property of incorporating as many new classes as possible. The Colon Classification has undergone several revisions. The latest edition is the Seventh, which does not contain an index. Thus, it is the sixth edition which is still being used by many libraries.

Analytico-Synthetic	A scheme of classification based on the analysis of a subject into different facets and the synthesis of facet numbers into class numbers with the help of connecting symbols.
Canonical Class	Any digit in a class number prefixed to a facet number other than the basic number.
Facet	A group of isolates identified on the basis of a single fundamental category.
Focus	Term used to denote an isolate idea or a basic class.
Notation	The use of ordinal numbers (digits) to represent classes in a scheme of classification

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1. Dr. S.R. Ranganathan 2. True 3. d) Seven 4. Library Science (MC.) = 2 Research Libraries [P] = 36 Map [M] = 17 Classification [E] = 51 Madras [S] = 4411 1976 [T] =	6. b) CC 7. Three 8. c) Third

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N76 **Class No. 236; 17: 51.441'N76** 5. Library Science (M.C.) = 2 Government Libraries [P] = 48 Reference Books [M] = 47 Accession [E] = 84 Bombay [S] = 4431 1966 [T] = N66 **Class No. 248; 47: 84. 4431'N66**	

1. Explain the Organisation of Colon Classification with the help of suitable examples.
2. Explain the major changes made in the 6th Edition of CC.

Ranganathan, S.R. (1990). *A Descriptive Account of the Colon Classification.* reprint. Bangalore: Sarada Ranganathan Endowment for Library Science.

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LESSON 1.2

Steps in Classification

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Three Plane of Work
  1.3.1 Idea Plane
  1.3.2 Verbal Plane
  1.3.3 Notational Plane
1.4 Eight- Step Method
1.5 Solved Examples
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- Explain the three planes of work in classifying documents;
- Describe the eight-step method of classifying documents enunciated by Ranganathan; and
- Classify subjects of different levels of complexity with the help of the eight-step method.

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1.2 INTRODUCTION

You have been so far introduced to the structure of classification in CC. In this lesson, you will be familiarized with the three planes of work, i.e., Idea Plane, Verbal Plane and the Notational Plane and the various steps of classification carried out in these three planes of work. The 'Eight-Step Method' enunciated by Ranganathan provides a systemic method of classifying documents. It helps in simplification of the classification process. The solved examples in this Unit will help you in understating the entire process of classification.

1.3 Three Planes of Work

According to Ranganathan, there are three planes of work through which a scheme of Library Classification passes. The three planes are Idea Plane, Verbal Plane and Notational Plane., The work of analysis of a subject begins at the Idea Plan. The next step is to transform the name of a subject by rearranging the word groups representing the subject. into a meaningful sequence and replacing these word groups into its focal or isolate terms. The work carried out at this stage is the work in the Verbal Plane. Finally the basic subject and all the isolate terms identified in the verbal plane is translated into notation. These notation are then synthesised with the help of connecting symbols to the basic class and the isolate ideas and the synthesis of these notation to form the class number is known as Notational Plane. Therefore, the analyticosynthetic process of classification in CC is carried out at three levels:

1. Idea Plane- Analysis of the Subject

2. Verbal Plane- Identification of the Basic Subject and the Isolate terms and re-arranging them; and

3. Notational Plane- Translation of the Basic Subject and Isolate term into Notation and finally synthesizing the notations.

1.3.2 Idea Plane:

A scheme of library classification has to first enumerate the universe of subjects, state their interrelation and fix their order. This is done in the idea plane. Idea plane also known as the invisible plane, as the ideas lie hidden behind the numbers representing them and the words denoting them. The work of analysis of the subject of a document is carried out in the Idea Plane. The first task in the Idea Plane is to identify the name of the Basic Class (BC). The Idea Plane involves study and analysis of universe of subjects, and isolates in order to arrange them in a helpful sequence.

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The work of Idea Plane is not only limited to the analysis and arrangement of existing known subjects and their isolates, but also includes the recognition of newly emerging and unknown subjects, and determination of their proper places among the already existing subjects without disturbing the infrastructure of the scheme.

The Idea Plane is the most vital, and controlling plane because the degree of finesse of analysis in this plane is reflected in other two planes.

The following steps are carried out in the Idea Plane:

1) Breaking up derived composite terms;

2) Full expression of the Name of the Subject;

3) Analysis in Facets;

i) Time and Space manifestation;

ii) Energy manifestation;

iii) Matter manifestation; and

iv) Personality manifestation, and finally

4) Synthesis of the analyzed facets.

The above mentioned steps could be better explained with the help of an example.

Example

TitleCirculation of Newspapers in Research Libraries in India in 1995

Step 1Circulation, Newspapers, Research, India, 1995

Step 2Circulation, Newspapers, Research Libraries, (Library Science) India, ,1995

Step 3	Library Science	Basic Class
	India	Space facet\
	1995	Time facet
	Circulation	Energy facet
	Newspapers	Matter facet
	Research Libraries	Personality facet*

Step 4Library Science (Basic Class), Research Libraries [P], Newspapers

[M], Circulation [E], India [S], 1995 [T]

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1.3.2 Verbal Plane:

The next phase of classification in done at the Verbal Plane. After analysis and synthesis of Basic Class and the isolated ideas, the next step transforms them into standard terms in natural language or in technical terminology. The work in this plane involves the expression of concepts in a natural language or in technical terminology provided in the schedule of classification. The Verbal Plane, however, has certain problems due to the following reasons:

i) Vagueness in the meaning of ordinary words;

fi) Incidence of homonyms and synonym; and

iii) Continuous creation of new terms makes it difficult to maintain currency.

Example: Library Science, [B.C.], Research Libraries [P], Newspapers [M], Circulation [E], India [S], 1995 [T].

1.3.3 Notational Plane:

The final phase of classification is done in the Notational Plane. In this plane, the results derived in the Verbal Plane are transformed into classificatory language. Ordinal numbers are used to represent various subjects and isolate ideas. The system of ordinal numbers used to represent classes in a scheme of classification is called Notational System and the work of classification involved in this stage is known as Notational Plane.

The Notational Plane provides the most helpful arrangement of classes and isolate ideas. However, it is important that classification scheme should be flexible enough to accommodate new classes that emerge at a fast pace.

The first step in this plane is to represent the Basic Class and isolate ideas into notation. The notation used for the subject is known as Class Numbers and the ones used for isolate idea is known as Isolate Number.

There are two steps involved in the Notational Plane.

The **first step** is to translate the Basic Class and the isolate numbers into appropriate numbers . taken from the scheme of classification, and the second step is to synthesis, the numbers with the help of appropriate connecting symbols in accordance with the facet formula provided in the schedule.

Example

Step 1: Library Science	=	2
(M.C.)Research Libraries [P]	=	36

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Newspapers	[M]	=	.44
Circulation	[E]	=	6
India	(S)	=	44
1995			N95

Step 2: = Synthesis:

Facet Formula = 2[P]; [M]: [E] [211

2 36 ; 44 6 44 'N95

(B.C.) [M] [E] [S] T

Therefore, the Class Number is:

236; 44 : 6.44 'N95

1.4 Eight- Step Method

Ranganathan has advocated eight steps to classify the subject of a document from natural language to classificatory language, i.e., the language of ordinal numbers. In the earlier section, you have seen how classification is done in three planes that is Idea Plane, Verbal Plane and Notational Plane. After combining all the steps in these three planes, we get the eight-steps of classification. The steps as per Ranganathan's enunciation are:

Step 0 Raw Title

Step 1 Full Title

Step 2 Kernel Title

Step 3 Analyzed Title

Step 4Transformed Title – 4

Step 5Title in Standard Terms Verbal Plane

Step 6 Title in Focal Numbers Notational Plane

Step 7 Class Number

The further details about these steps are given below:

Step 0 : RAW TITLE

The actual title of the document.

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Step 1: FULL TITLE

To determine the subject of a book as a preliminary to translating it into classificatory language, we have first to examine the title, contents page and preface or the whole book in this sequence as far as maybe necessary. The work of the classifier falls into two parts, viz.

1 Determining the subject of the book, and
2 Translating its name into class number, just as any other translator must first understand his text and then express the meaning in another language

In most modern scientific books the title is reliable to infer the subject. But in other types of books, i.e., works of literature and older classics in other domains as well (especially Oriental once), the title is often (1) Fanciful,(2) oblique, i.e., indirect or allusive, i.e., not fully expressed, (3) Partial, (4)Ambiguous, (5) understated, (6) Overstated, (7) Elliptical, i.e, having some important words omitted, or (8)Misleading in other ways.

Example
1 . Anaemia
This is a derived composite term. Its fundamental constituent terms are:
1 blood; and 2 Atrophy.
2 . Asthma
This is also a Derived composite term, Its Fundamental constituent term are:
1 Bronchi: and 2 complicated functioning.

Step 2: KERNEL TITLE

The kernel Title is to be derived from the Expressive Title by:
Omitting all the auxiliaries and puffs
The various articles (a, an, the) prepositions(like, in, from ,to, out of on behalf of etc); conjunctions (like, introduction, elements, story of ,primer, advanced ,etc) are to be omitted.
Example

i. A primer of physics and chemistry

In this title 'A' is an article; ' primer' is level of presentation; ' of' is a preposition; and 'and' is a conjunction. These are to be omitted. Then we will have foci: ' physics'-' chemistry' [however, it is to be noted that sometimes the' level of presentation' etc will have to be represented in the book number].

ii. Prospecting of Diamonds

- In this title the (BS) is not figuring. The (BS) Geology is to be added to make the title expressive.
- *Geology. prospecting of diamonds*

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In this title ‘of’ is a preposition. It should be omitted.

- *Geology, Prospecting. Diamonds*

Replacing in the nominative singular from all the substantive words retained.

Example

Geology, Prospecting, Diamonds

The plural from ‘diamonds’ is to be replaced by the nominative singular form ‘diamonds’. Then we will have: Geology, Prospecting, Diamond

Step 3: Analysed Title

Find out the fundamental category to which each of the kernel terms belongs as well as rounds and levels of manifestation. 'Put the symbols of the fundamental category manifestation along with each of the kernel terms. It is important to note that the derived composite term has to be taken into its fundamental constituent terms which would render analysis easier operation.

The Analysed title is to be derived from the kernel title by:

1 Analysing the (BF) and (IF).

Example

Let us take the title:	Diseases of rice plant in India
Expressive title will be.	Agriculture disease of rice plant in India
Karnal title will be.	Agriculture disease rise plant india

Now

The BF is Agriculture

There are 3 (IF),: 1 Diseases; 2 Rice plant; and 3 India

2 Correlating with (FC)

‘India’ belongs to the (FC): Space

‘Diseases’ belongs to the (FC): Energy

‘Rice plant’ belongs to the (FC): Personality

3. Indicating of facet Symbols

Agriculture	Diseases	Rice plant	India
[BC]	[E]	[P]	[S]

Step 4: TRANSFORMED TITLE

The transformed Title is to be derived from the Analysed Title by:

1 Keeping the (BF) as the first fact

Continuing the above example

Agriculture

(BF)

2 Rearranging the (IF) in the sequence of PMEST

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Agriculture.	Rice plant.	Disease.	India
(BF)	(P)	(E)	(S)

Step 5 : TITLE IN STANDARD TERMS

The title in standard terms is to be derived from the transform the title by:
1. Verification of the terms given in the title with the standard terms given in the schedule
Agriculture:
(BC)
Standard term given in the Chapter 1 (p 2.4) of mc:
Agriculture
Rice plant:
[P]
Standard term given in Chapter 3 (p.2.64) under [P]: Rise
Diseases :
Diseases:
[E]

Standard term given in chapter J (p 2.65) under [E] cum
[2P] : Diseases
India:
[S]

Standard term given in Chapter 4 (p 2.8) of space isolates
[SI]: India
Inference: The term in the title are the same accepted standard term of the schedule of (CC) except in case of the term 'Rice plant' The standard term used in the schedule of (CC) is 'Rice'.
2. Replacing

Agriculture	Rice	Diseases	India
(BF)	(P)	(E)	(S)

Step 6
TITLE IN FACET NUMBERS
The title in facet Numbers from the title in standard Terms is to be derived by:
1 Translating the (BF) and (IF) into (BCN) and (IN).
The basic Facet and the isolate facts are to be translated in to Basic class Number and Isolate numbers.
Agriculture:
(BC)

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The (BCN) given in chapter 1 (p 2.4) of (MC): J
Rice:
[P]
The (IN) given in chapter J (p 2.64) under (P): 381
Diseases:
[E]
The (IN) given in chapter J (p 2.65) under [E] cum [2P]: 4
India:
[S]
The (IN) given in chapter 4 (p 2.8) of [SI]: 44
Putting in a line:

J	381	4	44
(BF)	(P)	(E)	(S)

2 Terms not found in the schedule are to be translated mnemonically.
Example
Repair of stringed instruments
Expressive title will be : Music, Repair of stringed instruments
Kernel Title will be : Music, Repair, stringed instrument
Analysed Title will be : Music, Repair, Stringed
(BF) [E]
Instrument
[M]
Transform title will be : Music, Stringed instrument.
(BF) [M]
Repair
[E]
Note: There is no Energy Facet enumerated under the (BC) Music. Hence we do not find the term 'repair' in the schedule.

Title in facet Number will be:	NR	3	5
	(BF)	[M]	[E]

Note: Here the digit '5' is used mnemonically to represent the (IF) Repair. (The Mnemonic Device (MD) will be discussed in detail in the Chapter (CN).

Steps 7

CLASS NUMBER

The Class number is derived from the title in Facet Numbers by:
1 Removing symbols after each facet.
1 For example under Step 6;1

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J 381 4 44
2 For example under Step 6 : 2
NR 3 5
2 Inserting the (CS)
I J 381: 4.44
Note : The (IN) 381 is added directly to the (BCN) J according the Rule: 05503 (p 1.26) of Ed 6 of (CC). It reads as follows:
Unless as amplifying Facet (a system of a special) precedes it the first Personality (IN) of any (BC) need not be preceded by a comma.
2 NR; 3:5

Step 8

VERIFICATION

The Class Number is to be retranslated into natural language by digit- by- digit interpretation and should be verified with regard to its correctness.

1	J	=	Agriculture
	J3	=	Food, Agriculture
	J38	=	Seed, Agriculture
	J381	=	Rice, Agriculture
	J381:	=	(CS)
	J381: 4	=	Disease, Rice, Agriculture
	J381: 4.4	=	Asia, Disease, Rice, Agriculture
	J381: 4.44	=	India, Disease, Rice, Agriculture
2	N	=	Fine Arts
	NR	=	Music
	NR;	=	(CS)
	NR; 3	=	Stringed instrument, Music
	NR; 3:	=	(CS)
	NR;3:5	=	Repair, Stringed instrument, Music

The Eight-Step Method has been found to be very useful during the process of learning. It is not implied here that in practical classification in libraries, a classifier has to classify documents writing out each one of these steps. In fact, it is not necessary. But, the practice the person gets in the method of systematic thinking in applying the technique of facet analysis and synthesis will be essential. The students are advised to cultivate this method of learning.

1.5 SOLVED EXAMPLES

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These are some of the example on the basis of which you will learn how to classify the subjects having different levels of difficulty by using the eight-step method.

1. The Christian concept of prayer

Step 0: Raw title	- The Christian concept of payer
Step 1: Expressive title	- Religion. The Christian Concept of Prayer
Step 2: Kernel title	- Religion. Christian. Prayer
Step 3: Analysed title	- Religion. Christian. Prayer (BF) [P] [E]
Step 4: Transformed title	- Religion. Christianity. Prayer (BF) [P] [E]
Step 5: Title in Standard terms	- Religion. Christianity. Prayer (BF) [P] [E]
Step 6: Title in Focal Number	- Q 6 4146 (BF) [P] [E]
Step 7: Class Number	- Q6: 4146
Step 8: Verification	- Q= Religion Q6= Christianity, Religion Q6:= (CS) Q6:4= Religious practice, Christianity, Religion Q6:41= Personal, Religious practice, Christianity, Religion Q6: 414= Worship, Christianity, Religion Q6:4146= Prayer, Christianity, Religion

2. Alcoholism in Indian villages

Step 0: Ram Title	- Alcoholism in Indian villages
Step 1: Expressive title	- Sociology, Alcoholism in Indian villages
Step 2: Kernel Title	- Sociology, Alcoholism, Indian village
Step 3 : Analysed title	- Sociology. Alcoholism. Indian. Village (BF) [E] [S] [P]
Step 4 : Transformed title	- Sociology. Village. Alcoholism. (BF) [P] [E] Indian [S]
Step 5 : Title in Standard terms	- Sociology. Rural. Alcoholism. (BF) [P] [E]

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	India [E]			
Step 6 : Title in Focal Number	- Y (BF)	31 [P]	411 [E]	44 [S]
Step 7 : Class Number	- Y31 : 411 . 44			

Step 8 : Verification-Y = Sociology

Y3	= By residence, Sociology
Y31	= Rural, Sociology
Y31:	= (CS)
Y31:4	= Social Pathology
Y31:41	= Intemperance, Rural Sociology
Y31:411	= (CS)
Y31:411.4	= Asia, Alcoholism, Rural, Sociology
Y31:411.44	= India, Alcoholism, Rural, Sociology

IN-TEXT QUESTIONS

1. Classify the following Title using eight step method
   i. Audio-visual Aids in Higher Education
   ii. Treatment of Eye Diseases in Children

1.6 SUMMARY

In this lesson, you have been familiarized with the process of classification, which is carried out in the three planes of work. The entire process of classification is carried out in eight major steps. The three planesof work are : Idea Plane, Verbal Plane and the Notational Plane. By further breaking down of these three planes of work, we get the eight-steps for classification. The eight-steps as enunciated by Dr. Ranganathan are: Raw Title, Full Title, Kernel 'Title, Analysed Title, Transformed Title, Title in Standard Terms, Title in Focal Numbers, and finally, the Class Number, by using these eight-steps of classification one can classify systematically all type of subjects simple to complex.

1.7 GLOSSARY

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Focal Number	Notation representing an isolate idea or a basic class.
Kernel Title	Title without the apparatus words, viz., prepositions, conjunctions and articles.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Audio-visual Aids in Higher Education

Step 0: Raw Title	Audio-visual Aids in Higher Education
Step 1: Full Title	Audio-visual Method of Teaching Used in Higher Education
Step 2: Kernel Title	Audio-visual. Method of Teaching, Higher Education
Step 3 : Analysed Title	Audio-visual [21], Method of Teaching [E], Higher [P], Education (M.C,)
Step 4 : Transformed Title	Education (M.C.), Higher [P], Method of Teaching [E], Audio-visual [2]
Step 5: Title in Standard Terms	Education (M.C.), :,University [P], Teaching Technique, [F], Audio-visual [21
Step 6: Title in Focal Number :	T (M.C.), 4[P],. 3[F], 1[2P]
Step 7 : Class Number :	T4:31

2. Treatment of Eye Diseases in Children

Step 0: Raw Title	Treatment of the Diseases of the Eye of Children in Medicine
Step 1: Full Title	Treatment, Diseases, Eye, Children Medicine
Step 2: Kernel Title	Treatment [2E], Diseases [E], Eye [P], Children (Specials under Medicine), Medicine (M.C.)
Step 3 : Analysed Title	Medicine (M.C.), Children (Special Facet), Eye [P], Diseases [E], Treatment [2E]
Step 4 : Transformed Title	Medicine (M.C.), Child (Special Facet), Eye [P], Diseases [E], Therapeutics [2E]
Step 5: Title in Standard Terms	Medicine (M.C.), Child (Special Facet), Eye [P], Diseases [E], Therapeutics [2E]
Step 6: Title in Focal Number :	L (M.C.), 9C(Special Facet), 185[P], 4 [B], 6[2E]
Step 7 : Class Number :	L9C, 185 : 4:6

1.9 SELF-ASSESSMENT QUESTIONS

1. Classify the following Title using eight step method.
   a) Atlas of Natural Resources in the World
   b) Audio- Visual method of teaching algebra in secondary schools.

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1.10 REFERENCES

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1.11 SUGGESTED READINGS

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LESSON 1.3

CLASSIFICATION OF DOCUMENTS WITH BASIC AND COMPOUND SUBJECTS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Basic Subjects with example
1.3.1Main Basic Subject
1.3.2 Non Main Basic Subject
1.4 Compound Subject
1.4 Summary
1.5 Glossary
1.6 Answers to In-text Questions
1.7 Self-Assessment Questions
1.8 References
1.9 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson you will be able to:

- Identify the base Class according to Colon Classification
- Classify Compound Subjects of the document

1.2 INTRODUCTION

Ranganathan categorized all the subjects in the universe of knowledge into three categories namely, Basic, Compound and Complex.

Main classes are basic subjects postulated in a classification system. Compound subjects, virtually infinite in number, are basic subjects with a focus such as agriculture of wheat, or rural sociology. Complex subjects are two phased subjects such as psychology for nurses. However, he divides main classes which he terms them as Basic Subjects (BS) into the following categories: Primary (BS) and Non-primary (BS).

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1.3 BASIC SUBJECTS

It is a subject without any isolate idea. A main class is a broad assumption into which all the modern library classifications are divided.It is assumed that a main class represents an accepted broad field of broader specialization which provides a context to a subject. It is a coherent field of specialization. These basic subjects are postulated a priori by the classification system.

There are two Kinds of Basic Subjects:

(A) Main basic subject or
(B)Non- main basic subject-

1.3.1 Main Basic Subjects:

Ranganathan defines main class as the " fairly homogenous, conventional region of knowledge which together form the first Oder array of classes which are mutually exclusive and totally exhaustive of the field of knowledge".

The order of Main Class is according to some rule. The purpose of Library classification is to arrange various subjects ina sequence helpful to majority of the readers. The readers refers books in terms of subjects known and established by tradition. This may be reason why all the classificationist divided knowledge by conventions established by scientist and educator.

The Main Class (MC) in CC are scheduled in Chapter 1 of Part 2. This schedule is often known as the layout of the scheme. (Please refer and have a look at schedule)

Basic subject is the subject without any isolate ideas a component. Any idea or Idea complex to form a component of a subject. But not by itself fit to be a subject it is the concept being studied in the subject. Basic subject and simple subject both are same concept.

Zones in Main Classes

The main classes in CC have been grouped into four zones. Each zones comprehends a set of MC having distinct character and being represented by one species of digits. The zones are represented as follows:

Zone	Kinds of Main Class	Kinds of Notation
Zone 1	Gerneralia (Main Class) and its anteriorising isolates	Small Letters of the Roman alphabets
Zone 2	Recently recognised (Main Classes)	Indo- Arabic numerals

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Zone 3	Traditional Main Class	Capital letters of the Roman alphabets
Zone 4	Newly emerging Methodologies	Packed Notation

For Examples:

	Title	Main Class
1.	Basics of Chemistry	E
2.	Study of Life	G
3.	Philosophical Practice	R
4.	Educational System	T
5.	Librarians	2
6.	Study of Domestic Animals	Kz
7.	Introduction to Society	Y
8.	A book on Useful Arts	M
9.	Textbook of Economics	X
10.	Social Works	Yz

1.3.2 Non- main basic subject

I. **Canonical Divisions-** Right from the Ed. 1 of CC Ranganathan used canonical divisions (CaD) in certain Main Classes for representing their agreed branches. These are the traditionally recognised sub-fields within the area of a main class and as such conventional. The following main classes in CC6, which are divided on Canonical divisions.

Sr.No.	Subject	Class Number
1.	Mathematics	B
2.	Physics	C
3.	Geology	H
4.	Pharmacology	LX
5.	Fine arts	N
6.	Philosophy	R

Except in the N- Fine Arts the CaD are represented by Indo-Arabic numerals (Zone 2) and Fine Arts is represented by Roman Capitals (Zone 3).
Sequence of Cad is determined by:

1. Tradition
2. Some principal of Helpful sequence

Location

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The Canonical Divisions are enumerated before (i.e. in the beginning) of the schedule for the several facets of a MC

Role of Canonical Division

i. As a bundle of Main Class: As stated by Jack Mills the list of Main Class in various schemes of classification are usually reflections of the notational base used, and its allocation. Every classificationist right from Dewy to Rider tried to restrict the number of main class to their notational elasticity. Even CC had suffered a lot on account of this notational rigidity. The CaD is one way helped in mapping certain main class in CC. The N- Useful Arts is one classic example.

ii. To accommodate New Main Class: Most of the newly emerging MC have differing affiliation with traditional MC till there is sufficient literary warrant the newly emerging main class can conveniently group under a traditional main class as a CaD.

For Example:

1. Light
2. Trigonometry
3. Topic in Algebra
4. Sound Waves
5. History of American Painting
6. Toys you can build

II. Systems: Certain subjects have been of a great concern to humanity right from the beginning. For example philosophy, medicine mathematic etc. The lack of communication and interaction among the various groups in the part regulated in

The end of all the systems are and the same, only the means very. If we take medicine, the various systems like Ayurveda, Union Homeopathy, Allopathy etc. Concerned with human health. But means under each system differ Ranganathan said that the term‘system’events a clear cut definition and hence it is assumed Term. A system facet is also termed as amplified facet kind- 1.

The following means subject having systems

Sr. No. Subject Class Number
1. Mathematics B
2. Physics C
3. Agriculture J
4. Medicine L
5. Psychology S
6. Education T
7. History V
8. Economics X

The systems of a man class are given at the end of the schedules

Examples :

1. Homeopathy	LL
2. Ayurveda and unani	LA
3. Psycho analytic psychology	SM9
5. Cooperative economics	XM

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6. Behaviouristic Psychology SN1
8. War Economics XB

III. Specials

The class of people doing specialization are called specialist. Their field of activity is restricted but more intensified. It will be helpful for them if all the documents of their field of specialization are in close proximity. This necessitated a special treatment for the special. Ranganathan define special as 'restriction' of the field of exposition of a subject to a particular range of the incidence of any of its characteristics likely to belong to the unrestricted state of a subject. A special fact is also termed as amplifier fact kind 2.

The following main classes are having special :

Sr. No.	Subject	Class Number
1.	Mathematics	B
2.	Physics	C
3.	Chemistry	E
4.	Biology	G
5.	Agriculture	J
6.	Medicine	L
7.	Economics	X

The specials of a main class are enumerated at the end of the schedule before systems.

Example

In a Main Class M

Child Medicine – L9C

The place value of a special is after the system and before the facets of a Basic Class (BC).

Uses of both System and special

In case of subject Amplified by a system facet as well as a special- facet, the special facet (SPF) should come after system facet (SMF), with a connecting symbol Comma (,).

Example :-

Child medicine according to Homeopathy

LL, 9C (L removed from L9C)

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IN-TEXT QUESTIONS

1. Identify the Base Class of the following titles:
   i. Study of Domestic Animals
   ii. Introduction to Society
   iii. A book on Useful Arts
   iv. Textbook of Economics
   v. Social Works

1.4 COMPOUND SUBJECTS

Compound subjects:

These subjects are composed of a **basic class** and one or more **isolates.**Compound subjects are also known as **Compound Class** In a faceted classification these are constructed by the classifier. A compound subject comprises of a basic subject and facets arranged in some systematic order.

Example:

1. Rural Sociology- In this example Sociology is the BC; and Rural is an Isolate
2. Rural Alcoholism in India.

   In this example the BC is not figuring. There are 3 Isolates. They are: Rural; Alcoholism; and India. The BC here also is Sociology. Such of these titles are called 'Elliptical Titles'.

Note: A Basic class with one Isolate is said to be of the Order 1; one with 2 Isolate is said to be of the Order 2; and so on.

L 1015
L – Medicine
1015 – An organ isolate for eye
Examples:

1. University libraries in India – 234.44
   Analysis - Library Science (MC) – 2
   University - (Isolate) – 34
   India - (Isolate) 44
2. Rural Sociology - Y31

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Analysis - Sociology - Y
Rural - 31

Other Examples:

vertibratepalentology	-	H69
Hindi drama	-	01S2,2
Indian cartle Art	-	NA44, 37
Harvesting	-	J:7
Floriculture	-	J16
Road signals	-	D411,94
History of India	-	V44

IN-TEXT QUESTIONS

2. Identify the Class number of the of the following compound titles:
   i Higher Education
   ii Teaching Technique
   iii Family Ethics
   iv Hotel Architecture
   v Sulphuric Acid
   vi Microbiology
   vii Public library
   viii Rice agriculture
   ix Flora & fauna
   x Hindu religion
   xi Bibliographic of Periodicals

1.6 SUMMARY

In the universe of knowledge, there are three kinds of subjects -- Basic, Compound and Complex. The complex subjects which are interdisciplinary in nature are formed by loose assemblage mode of formation. These are two or multiphase subjects. Complex subjects have interacting foci from two or more basic or compound subjects.

1.7 GLOSSARY

Universe of knowledge: An assumed term referring collectively to everything knowledge and about knowledge.

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Basic subject: A subject which is usually a main class or the first facet in the facet formula. It is a subject without an isolate idea. Main classes together form the first array of the division of the universe of knowledge. Basic subjects are postulated by the classification system. Their number and boundary varies with time.

Complex subject: An interdisciplinary subject comprising of at least two phases. Complex subjects are formed by Loose Assemblage mode of subjects formation.

Compound subject: A subject composed of a basic class and one or more isolates. Number of isolates attached to a basic class determine the depth/intension of the subject. Number of compound subjects is infinite in the universe of knowledge.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Base Class		
i	Study of Domestic Animals	Kz
ii	Introduction to Society	Y
iii	A book on Useful Arts	M
iv	Textbook of Economics	X
v	Social Works	Yz

2	Class Number
i	T4
ii	T:3
iii	R42
iv	NA, 44
v	E3616
vi	G91
vii	22
viii	382
ix	G:12
x	Q2
xi	Q46

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1.11 SUGGESTED READINGS

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LESSON2.1

INTRODUCTION, STRUCTURE AND ORGANISATION

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STRUCTURE

1.1 Learning Outcomes

1.2 Introduction to the DDC

1.2.1 Text of Three Volumes: DDC

1.2.2 Instructions common for a series of numbers

1.3 Structure and Organisation of DDC

1.3.1 Notation and Division of Main Classes

1.3.2 Chain Structure

1.3.3 Array Structure

1.3.4 Patterns in the DDC

1.3.5 Hospitality

1.419th (1979) to the 23rd Editions of DDC: A Journey

1.4.1 Salient Features of DDC-19 (1979)

1.4.2 The DDC-20th Edition (1989)

1.4.3The DDC-21st Edition (1996)

1.4.4The DDC-22nd Edition (2002)

1.4.5 The DDC-23rd Edition (2011)

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1.6Summary

1.6 Answers to Self-Check Exercises

1.7 Key Words

1.8 References and Suggested Readings

1.1 LEARNING OUTCOMES

The introductory part of this unit explains the basic structure, organization, and notational features of the major three volumes of the Dewey Decimal Classification (DDC) system. This unit further describes the important features of the scheme and properties of the decimal fraction notational system.

1.2 INTRODUCTION

Broadly we can say that classification provides a system for organizing knowledge and modern library classification systems only begin with the Dewey Decimal Classification (DDC) which was developed by Melvil Dewey in 1873. Soon after its publication in 1876, its popularity was admired across the globe and is still the most popular one."At present, it is in its 23rd edition (2011) and constantly keeps itself abreast of the ever-advanced frontiers of knowledge to cater to the increasing demands of its varied users. In every revision, it has been expanded, modified, rectified and made more modern in methods by applying the results of the latest research in library classification".

1.2.1 Text of Three Volumes

The very first edition (1876) of the DDC was a thin pamphlet of 44 pages, and the second edition (1885) was seven times as large as that. The bulky size of the 14th edition (1942) became a cause of concern for all concerned. "The 15th edition (1951) was an exercise to trim the system to a standard edition. To deal with the disturbingly increasing size, the sixteenth edition (1958) was issued in two volumes. The second volume contained the form divisions, areas table and the index. First time only the eighteenth edition (1971) was issued, for the first time, in three volumes" (Comaromi and Satija, pp.17-18).

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The nineteenth (1979) edition contains three volumes, volume 1 contains the introduction and related aspects and the various auxiliary tables. "The second volume contains the schedules and the entire third is dedicated to the relative index. A companion volume to DDC-19 is the Manual on the Use *of Dewey Decimal Classification Edition 19* (Forest Press, 1982, 551p. ISBN: 0-910608-32-6. The purpose is to provide a tool for uniformity in interpretation based on the Library of Congress practice. For a skilful operation and efficient use of the DDC, it is a measure to understand the physical structure of the text of three volumes as it stands in the 19th edition"(Comaromi & Satija 1998, pp.19-20).

- **Volume 1:** The first comparatively thinner volume of 482 pages contains the prefatory material by the Publisher (pp. xi-xiii), the Chairman DCEPC (xv-xvii) and "the most important of all "Editor's Introduction" (pp. xxi-xxv). It also contains a (pp. xxvii-xxxii), a valuable feature of the DDC introduced in the eighteenth edition. "The Glossary sufficiently explains all the technical terms used in the Editor's Introduction, as well as implicit in the making and understanding of the system. The second part of this volume contains the seven auxiliary tables. End material contains a list of relocations and reused numbers are given in a classified sequence" (Chan Lois & Mitchell 1997, pp.8-10).

- **Volume 2:** The second volume of 1574 pages contains the Schedules of class numbers given in numerical order from 001 to 999.

Self Check Exercise

1.Write down the ten main classes of DDC?

2. What contains the second part of the first volume of DDC contain?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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"There are a variety of notes of "explanations and instructions" under each class to locate and build a new class number". Some of them are as under:

- **Definition Notes**

This type of note defines the scope and jurisdiction of the class number.

For example,

379.11 Financial administration in public education

This class number contains a note: "Costs, expenditure, allocation and management of funds, budgets, budgeting, financial reports". This scope note connotes the areas which may not be too obvious from the heading given against the class number. Some definition notes are explained through examples under 343.0742 specific kinds of (economic) assistance, one reads the note: "Example: loans, price supports, subsidies, mortgage insurance".

- **Inclusion Notes**

Sometimes some subtopics are not necessarily part of a given number but are given a standing room, maybe temporarily, with the broader number.

For example,

530.41 Solid-state physics contains the note: "Including thin films, electron theory of metals". It means that the topics such as thin films are not essentially a part of solid state physics and yet these do not have a separate number of their own. "No standard subdivisions are to be added to such class numbers. However, such notes do not apply to the subdivisions of the topic (Mortimer,1998,p.88).

- **"Class Here" Notes**

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The “Class here..." notes are placed for some convenience and usually violate the canon of helpful sequence.

For example,

343.08 Regulation of trade (Law), one reads the instruction: "class here commodity exchanges and exchange transactions".

- **"Class Elsewhere" Notes**

These "Class Elsewhere" notes are in direct contrast to "class here" notes. This is in direct contrast to class here notes. "When a topic seemingly forming a part of a broader class is granted an independent class number, the broader class number affixes a note in the form: "Class ... in ...".

For example,

181.12 Philosophy of Japan contains a note "Class into philosophy in 181.095 61".

Similarly,

379.11 Financial administration in public education contains a second note: "Class sources of funds in 379.13. Such a note may also be given for related topics having independent class numbers.

For example,

181.4 India (philosophy of), one reads a note "Class Philosophy of Pakistan and Bangladesh in 181.95". Such a note corresponds to the "See also" cross reference in an alphabetical index".

- **"Formerly" Notes**

As we know the library is a growing organism and when a new edition came into existence this note marks the changes because the main purpose of this note " Formerly" is to mark the changes between two successive editions. The former class number is enclosed within square brackets with the prefix "Formerly".

For example,

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287.5 Methodist Churches in the British Isles, also contain a note within square brackets [*Formerly* 287.97).

This note has a dual purpose first it explains the changes between the previous edition and the new editionand second, it provides clarity of information 'that there has been no mistake or omission in printing but the number has been surely reallocated'. "The vacant sections have also been enclosed in square brackets, indicating the previous edition when the number was filled with some subject meaning in the schedules" (Satija,2007, p.206)

- **The Centered Headings**

Sometimes a subject instead of being assigned a single class number is spread throughout numbers, the two terminal numbers are connected by a hyphen. These are always given in the centre of the page and on the left margin, a pointing triangle indicates a centered heading.

For example,

> 383-384	Specific kinds of communications.
> 384.1-384.7	Telecommunication

Under> 384.1-384.7, one reads the instruction "Class comprehensive works in 384" Hence the single class number for telecommunication is 384. The device of centered headings is very useful for the hospitality and brevity of notation.

- **Dot and Spaces**

"This dot is only a pause and must not be misunderstood as the decimal point. It has no purpose except to psychologically break the monotony of numerals. These spaces and dots give relief to the eyes and facilitate short while retention of the class number in the memory during the passage from the catalogue to the stacks" (Mortimer,1998,p.88).

For example,

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"Bose-Einstein Statistics" is rendered as 530.133 2 and not as 530.1332.

- **Number Building Notes or Instructions**

Almost every class number in the DDC can be further extended whether there are instructions or not. For example, Table 1, of Standard Subdivisions may be added to any class number. In addition to such intrinsic provisions many class numbers are provided "Add..." notes which may further be subdivided into two kinds:

- **Individual Instructions**

Under many, a class number is provided instructions for extending a given number with some other full number or part thereof a class number existing elsewhere in the schedules.

For example,

547.35 "Quantitative Chemistry" is given the instructions "Add to base number 547.34 the number following 544 in 544.01-544.98".

1.2.2 Instructions common for a series of numbers

Sometimes a series of cognate class numbers is further extendable by another number. "Instead of providing individual instructions, "for convenience and simplicity, as well as for briefness of the schedules, instructions are provided in one place, while the headings of the class numbers to which such instructions apply are marked with an asterisk". Then at the foot of that page, a footnote is given reminding the meaning of the asterisk.

For example,

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547.4	*Aliphatic compounds
547.41	* Hydrocarbons
547.411	*Paraffins (Alkanes)
547.412 *Olefins (Alkenes)	
547.413	*Acetylenics (Alkynes)

In the footnote on the same page is given the instruction: "Add as instructed under 547". On going to class 547 one reads the detailed instructions: "Add to notation for each term identified by as follows" *

04	Special topics of general applicability
044	Theoretical Chemistry
045	Physical chemistry
046	Analytical Chemistry
0464	Qualitative
0465	Quantitative

Synthesis

Theoretical Chemistry of Hydrocarbons

547.41+044 547.410 44

Analytical Chemistry of Hydrocarbons

547.41+046 547.410 46

- **Volume 3** Comprising 1217 pages contains exclusively the Relative Index. Brief instructions (p. x) and a key to the abbreviations used in the Index (pp. xi-xiii) precede the columns of the index.

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ACTIVITIES

I. Visit University/College library of your area and list the sources and services provided by them.
II. Visit a few college and university libraries on your campus and find out which classification scheme is used by them

Self Check Exercise

3.What do you understand by Centered Headings in DDC? Explain with examples.

4. What class 500 and 600 are devoted for?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

1.3 STRUCTURE AND ORGANISATION OF DEWEY DECIMAL

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We can classify any format of documents (area of knowledge) with the help of DDC. As we all know that the Universe of Knowledge is divided into three subjects mainly a) Sciences, b) Social Sciences and c) Arts/Humanities. These three great divisions of subjects are divided into nine main areas of knowledge that are themselves divided into disciplines or sub-disciplines, for example, notations 0 to 9, from 0000001 to 9999999.

The ten main classes of DDC are as follows:

0.0 Generalia

0.1 Philosophy and related disciplines

0.2 Religion

0.3 Social sciences

0.4 Language

0.5 Pure sciences

0.6 Technology (Applied sciences)

0.7 The arts

0.8 Literature (Belles-lettres)

0.9 General geography, history and their auxiliaries.

1.2.1 Notation and Division of Main Classes

The division of main classes is as under:

000 Generalia

100 Philosophy and related disciplines

200 Religion

300 Social sciences

400 Language

500 Pure sciences

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600 Technology (Applied sciences)

700 The arts

800 Literature (Belles-lettres)

900 General geography and history and their auxiliaries.

So, we have 10 main classes and 90 divisions.

For example,

600 Technology (Applied sciences)
610 Medical sciences
620 Engineering and allied operations
630 Agriculture and related technologies
640 Home economics and family living
650 Management and auxiliary services
660 Chemical and related technologies
670 Manufactures
680 Manufacture for specific uses
690 Buildings

Each of the 90 divisions has been further divided into nine Sections. For example, in 610 Medical sciences, Medicine has been divided as:

610 Medical Sciences, Medicine
611 Human anatomy, cytology, tissues
612 Human Physiology
613 General and personal hygiene
614 Public health and related topics
615 Pharmacology and therapeutics

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616 Diseases
617 Surgery and related topics
618 Other branches of medicine
619 Experimental medicine

Continuing the decimal pattern, each section can be divided Into what we may call Subsections, all being four-digit numbers.

614.1 Forensic medicine (Medical jurisprudence)
.4 Incidence, distribution, control of disease
.5 Incidence, distribution, and control of specific diseases
.6 Disposal of dead
The subsections may be divided into Sub-subsections:
614.51 Salmonella, bacillary, enteric, influenza) diseases
.52 Eruptive diseases (Exanthemas) and rickets) diseases
.53 Protozoan diseases
.54 Miscellaneous diseases
.55 Parasitic diseases
.56 Zoonoses
.57 Bacterial and viral diseases
.59 Other diseases

Self Check Exercise

5.Identify two numbers most recently used in the 16th Edition of DDC.

6. Write down the properties of a decimal fraction. Enumerate with some examples.

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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1.2.2 Chain Structure

As noted above, the scheme is hierarchical. It not only collocates the related material but also depicts through its notation the whole-part relations of subjects.

For example,

300	Social Sciences
330	Economics
332	Financial economics
332.1	Central banks
332.11	Banks and banking
332.110952	Central Bank of Japan

So, the subjects denoted from 300 to 332.110952 build a chain of concepts, as they are in progressive subordination and specificity. In the schedules, the chain of decimal digits is not depicted typographically, as it is otherwise quite visible through the increasing length of the class number at each step.

1.2.3 Array Structure

An array is a sequence of mutually exclusive cognate entities of equal rank arranged in some chosen order". The Main classes. Divisions and Sections of the DDC are three different arrays of classes. Array formations can be carried forward to any depth.

For example:

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The class numbers 531.1 to 531.9 form the array of 531 Mechanics.

Self Check Exercise

7.What Chain Structure in DDC? Explain with some examples.

8. What Array Structure in DDC? Explain with some examples.

Note i) Write down your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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1.2.4 Pattern in the DDC Structure

The first subdivision of an array is generally given over to generalia topics, and the last division usually either expounds on the historical and geographical treatment of the subject or is reserved for the rest of the un-accommodated topics, which are dumped together as "others". Thus the 9 "others" is a great hospitality device with the scheme.

For example,

320, we see that the 320.0 array represents the generalia topics of political science, and the 320.9 represents the historical and geographical treatment of the subject.

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1.2.5 Hospitality

"The hospitality of classification is defined as its ability to accommodate the emerging topics in their proper places without dislocating the already existing ones" (Shokeen & Kaushik, 2003,p. 72).

For example,

510 Mathematics and 520 Astronomy

Here the problem is to allot a proper place for a new discipline. To handle such types of problems and to avoid a situation, one way is to leave some gaps in the notation that describes an array.

For example,

511-519 of Mathematics, 517 and 518 have been left unassigned. "In the Third Summary (the third level of subdivision in the DDC) there remain 86 unused classes; these are shown in the schedules by having their three-digit figures enclosed in square brackets" (Satija,2013,p.19).

Self Check Exercise

9.What is the pattern of DDC? Explain with some examples.

10. What do you understand by Hierarchy in DDC?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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1.4 19TH (1979) TO THE 23RD EDITIONS OF DDC: A JOURNEY

The DDC is one of the most popular systems for classification. It is not only used in academic libraries but also public and special libraries across the globe. Moreover, it strongly holds this position because of its defined revision policy, sound revision machinery and proactive marketing network. Since 1885 it is constantly and regularly been revised. The latest edition always incorporates new topics at appropriate places that have emerged since the previous edition and also deletes some of the obsolete subjects.

1.4.1 Salient Features of DDC-19 (1979)

- **The Phoenix Schedule**

The 19th edition (1979) of the DDC was the last edition edited by Mr Benjamin A Custer (1912-1997), who first edited DDC-16 (1958). "The DDC-19 (1979) carried forward the trends of the last three decades, though it did not bring up as many changes as were seen in the DDC-18 (1971). The major revision (Phoenix Schedule) was a new Schedule of 301-307 "Sociology" (Mitchell, 2003,p.17).

- **Changes in Tables**

There were some changes in the Standard Subdivisions, especially in the discontinuation of the *ss*-08; and an extremely useful "Table of Precedence provides standard guidance in case of choice between two, standard subdivisions There was a 17-18% increase in the Area Tables (Table 2). As a major change, the area number of the UK as a whole was shifted to 41 from 42" (Satija,2013,p.26).

- **The DDC Manual**

A landmark for the DDC practice standardization came in 1982 with the publication by the Forest Press of the *Manual on the Use of Dewey Decimal Classification, Edition 19. "*It guides classifying in difficult areas and distinguishes one number from other related numbers. The Manual is a blue colour book on the DDC numbers interpretation and application policies. With maps, flow charts and elaborations in detailed form point by point. It has been incorporated into the system since the DDC-20 (1989)(Mitchell, 2003, p.18).

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- **Computerisation of the DDC**

The DDC-19 was published for the first time through computerized photocomposition. Later from the electronic tapes and then in 1984 from these tapes a computerized Editorial Support System (ESS) was developed by Inforonics, Inc for the Forest Press.

- **The Relative Index**

The relative index continued only exception was that the bold typeface for entries that were subdivided in schedules was eliminated.

1.4.2 The DDC-20th Edition (1989)

The DDC -20 came into existence in 1989 with several changes which proved to be a trendsetter. Since July 1988 ownership of the Forest Press has been transferred to the OCLC, Dublin, Ohio. "For the first time, DDC was published in 4 Volumes running to 3383 pages compared to 3361 pages in DDC-19. Also splitting the schedules into two volumes.

- **New Changes**

The DDC-20 contained more changes as compared to the previous two editions. The changes are as under:

- A new schedule for 780 Music was incorporated.
- Incorporated 004 -006 Data processing and computer science, which was earlier issued as a "separate" between DDC-19 and DDC-20.
- Minor changes took place in subjects like Christian religion, Television, Adult education, Electronics, Civil rights, Civil history and Gymnastics" (Singh & Rai, 2019).

- **Major changes in the Tables**

The new Area table reflected changes in the administrative and political setup of different countries and their units. "Table 3 was further refined, modified, and spilt into three subtables: T3A, T3B, and T3C. Table 3C is used on instructions from Table 3B or in 808-809 in the Schedules" (Satija, 2013.p.23)

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- **The Dewey in Electronic Format**

The DDC-20 came into existence as *Electronic Dewey* on CD-ROM in 1993. It was the first CD-ROM version available commercially. It contained the Schedules, Tables, Index and Manual as well. It could be searched by words or phrases, numbers, index terms and Boolean operations.

Format and Presentation of DDC 20th Edition

The format and presentation of the DDC-20 text were improved. Some changes are as follows:

- ❖ Three main summaries were relocated to the second volume.
- ❖ Many more multilevel summaries were introduced, for example, schedules such as 370 Education, 620 Engineering and 630 Agriculturica.
- ❖ Area tables of Europe and North America were also changed.
- ❖ Centred headings were indicated typographically by the symbol ">" in the number column.
- ❖ Optional numbers were given in parenthesis, for example, (828.9935).
- ❖ The "Editor's introduction" was simplified and brief.

- **The Index**

The DDC-20 introduced a simplified and trimmed index with 730 pages. All the " See" references had been replaced by direct entries.

1.4.3 The DDC-21st Edition (1996)

In July 1996 the new edition (21st) of DDC was released. Soon after is known as *Dewey for Windows (Dfw).* Presently it is available on the internet http://www.oclc.org/fp. The text in four (4 volumes) has been edited by a new editor Ms Joan S Mitchell.

- **Structure of DDC-21 :**

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- ❖ **Volume 1:** Prefatory material, Editor's introduction Glossary, Table 1-7 and information on the changes in the new edition.
- ❖ **Volume 2:** Schedules 000-599
- ❖ **Volume 3:** Schedules 600-999
- ❖ **Volume 4:** Relative Index, Manual

The above-given four volumes contained 4126 pages into nine sections marked A/I.

- **The Schedule**

The major new schedules are as under :

004-006	Data processing
296	Judaism and 297 Islam
342-349	Branches of Law
350-354	Public administration
368	Insurance
370	Education
376	Education of Women
377	Schools of religions
420-490	Specific languages
560-570	Life sciences
790	Theatre
810-890	Literature of specific languages
940-990	General history of the modern world

1.4.4 The DDC 22nd Edition (2003)

The 22nd Edition was introduced in 2003. It is the first edition in the web environment.

- ❖ Its electronic versions WebDewey (2003) and Abridged WebDewey (2004) are now available on the internet only for licensed users.

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- The content of Table 7 persons has been shifted to the standard subdivisions T111-08 and for the rest use of add from 011-999".

Some Examples,

Artwork by scientists changed as 704.08 704.08 + 8 (from 088 T1) + 5 (001.999) = 704.0885 earlier it was 704+5 (T7) = 704.5.

Ethics of historians 174.9 + 9 +90720 (from 907.20) + 2(T2) =174.9907202 earlier it was 174.9 + 97(T7) =174.997

Collection of English poetry about lawyers 821.008035208834 earlier was 821.0080352344

1.4.5 The DDC 23rd Edition (2011)

The entire gamut of changes in the 23rd edition of DDC is as listed on pages xxv-xiii, volume 1 Some major changes are as under:

004-006	Computer science and parallel provisions in 621.39 Computer engineering, and 025.04 Information storage and retrieval;
155	Differential and development psychology;
160 and 513	Logic and Symbolic logic
200	Religion updated for 281.9 Orthodox church and 297 Islam.
390	Social sciences and a few languages have been updated in Table 6
400 and 800	have been incorporated as
491.489	Divehi (Maldivian languages)
491.42	Eastern Hindi languages
491.496	Pahari languages

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- The headings for the three main summaries have been edited, for example, 500 Natural Sciences and mathematics appear simply as Science;
- 600 Technology (Applied Science) appear as Technology in the first summary;
- 320 political science (politics and government) appear only as 320 political science in the second summary" (Singh & Rai, 2019).
- The uneven span of numbers has been balanced such as 420.1 -428 has been changed to 420.1 - 420.9. Similarly, 305.805-.89 is now rendered as 305.805-809 and 305.81-.89.
- Elimination of dual headings, for example:

532	Fluid Mechanics	Liquid Mechanics
570	Life Sciences	Biology
954	South Asia	India

- Table 1 is used differently in the schedules, for example, 331.01 Philosophy and theory (of labour economics) Notation 01 from Table 1 is modified as :

331.01	Rights and position of labour
331.0112	Industrial democracy

1.5 SUMMARY

This Unit deals with the introductory part of Dewey Decimal Classification and further explained the structure and organization of the three volumes of DDC. Next, it presents a long journey of different editions of DDC (1979 -2011).

Some specific points discussed in the present Unit are as under :

1. The first edition (1979) of DDC was a thin pamphlet of 44 pages.
2. The sixteenth edition (1958) of DDC was issued in two volumes.

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3. The eighteenth edition (1971) of DDC was issued, for the first time in three volumes.
4. The first part of Volume 1 contains 42 pages and a glossary and the second part contains seven auxiliary tables.
5. The second Volume of DDC is 1574 pages. It contains schedules of class numbers given in numerical order from 001 to 999.

1.6 GLOSSARY

Classification: It is a scheme of arranging materialsaccording totheir degree of similarity to one another. It is also an arrangement based on systems and logic.

Chain System: It is a method of hierarchy. Every progressive step of the unpeeling of a topic is go along with the addition of a least one digit to the immediately superior number.

Digit: The smallest individual unit in a notation system. For example, the notation 559 has three digits, 5,5 and 9.

Ordinal Symbols: The symbols which simply indicate the order and are devoid of any fundamental value.

1.7 ANSWERS TO IN-TEXT QUESTIONS

1. See part 1.2.1 of this unit for the Ten main classes of DDC.

2. The second part of this volume contains the seven auxiliary tables. End material contains a list of relocations and reused numbers given in a classified sequence.

3. The centered headings or entries may occur at the section level or its subdivisions. These are always given in the centre of the page and on the left margin, a pointing triangle indicates a centered heading.

4. Class 500 is devoted to the natural sciences ad mathematics. Class 600 is devoted to technology.

5. 006 and 007

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6. Constant place value of the digits, superfluity of the right and terminal zero.

7. See the" chain structure" part of this unit. It will give you the definition of both terms.

8. See "the array structure" part of this unit. It will give you the definition of both terms.

9. The array of the Ten Main classes (the first division of the universe of knowledge in the DDC) well illustrates this pattern, as the first division of 000 denotes generalia subjects and the last 900 represents the geography, history, and other subjects. Pattern at the macro level is repeated at the micro level.

10. Hierarchy in the DDC is expressed through structure and notation.

1.8 REFERENCES AND SUGGESTED READINGS

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LESSON 2.2

CLASSIFICATION OF DOCUMENTS USING TABLE 1 AND TABLE 2

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STRUCTURE

1.1 Learning Outcomes

1.2 Introduction

1.3 How to Assign Numbers in DDC

1.3.1 Subject Analysis

1.3.2 Locating Class Numbers

1.4 Summary

1.5Answers to In-text Questions

1.6Summary

1.7 Glossary

1.8 Answers to In-text Questions

1.9 References and Suggested Readings

1.1 LEARNING OUTCOMES

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This unit will describe the instructions through which you can classify documents in the library.

It will help you to arrive at a specific number. After reading this unit you will be able :

- to identify the subject and to explain the meaning of various types of notes and instruction while doing classification;
- to describe the concept and utility of different instructions and centred headings in the schedule; and
- to reach your final destination of classifying different documents accordingly.

1.2 INTRODUCTION

Classifying any document or an entry is a self-contained unit in the schedule. It is mentioned in the seven tables, volume 1. Several times it seems easiest, as to the designated base number it is required to add another whole number from the schedules.

1.3 HOW TO ASSIGN CLASS NUMBERS IN THE DDC?

Work of practical classification consists of two distinct phases: intellectual work in sorting out the specific subject of the document under classification; and the craft of assigning the appropriate notations to the ascertained specific subject-yes, it is a craft, a mechanical work.

1.3.1 Subject Analysis

The specific subject of a document may be determined by examining the document under classification through its title, sub-title, preface, blurb, table of contents, and the text Itself. The name(s) of the author(s), subject index and the cited references may also provide some valuable clues. After determining the subject,the classifier must then select the proper discipline or field of study.

1.3.2 Locating Class Numbers

To enter the Decimal Classification, the better way is through its structured ladder. Many a time we straightway reach the section concerned through our knowledge of the scheme

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bypassing the scanning of Ten Main classes and its 100 Divisions. Class a work dealing with interrelated subjects/disciplines that is being acted upon. This is called the rule-of-application and takes precedence over any other rule.

For example:

To illustrate this, say our subject is "Money". In the first instance, we need to determine the discipline, by examining whether the core subject of the book is the minting of money or the economics of money. On going to 330 Economics in the Third Summary (Volume 1. p. 476) we see that it pertains to 332 Financial economics. At this stage, we shift to the schedules proper at class number 332 (Volume 2, p. 261). Examining the summary of subsections 332 (Volume 2. p. 263) we find that subsection 332.4 Money matches squarely with the subject of the given document. By assigning, class number 332.4 to the document our search for the appropriate and specific class number ends successfully.

"Anatomy of human lungs. The book deals with a human body organ, so in a twinkling, a practised classifier can tell that it belongs to the main class Applied sciences, and then to its Division medicine, which deals with the human body machine, its parts and functions. Looking through Division 610 Medicine, we find that Anatomy (which is the science of human organs) is 611, which is the desired section. At this stage, we shift our search to the schedules at 611 (Volume 2, p. 828). Looking through the summary of the subsections of 611 (on page 829) we find that 611.2 Respiratory system is the next appropriate choice. Examining the further divisions (subsections) of 611.2 (page 830) we find the "Lungs enumerated at 611.24, which is our specific number. If the subject is "Study and teaching of lungs anatomy" the Dewey classifier will know that "Study and teaching" is an auxiliary aspect of the core subject "Lungs anatomy", and the notation for the auxiliary aspect is to be taken from the Table 1: Standard subdivisions. Both the notations are to be combined as per the rules.

" If two subjects receive equal treatment, and are not used to introduce or explain one another, class the work with the subject whose number comes first in the DDC Schedules". This is called the first-of-two rule" (paragraphs 7.16 and 7.20 -7.21.).

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Self Check Exercise

1.What is the rule of application in DDC?

2. What is the first-of-tworule in DDC?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

_____

_____

_____

_____

_____

1.3.3 Practical Number Building

Synthesis through "Add to...." Instructions from the schedules.

(a) Add from 001 to 999

(b) Add to from a designated base number taken from some other small portion of the schedules.

(c) Add to from the same division/section.

(d) Add to through special provisions (facet indicator) including the 04 General special:

1.3.4 Addition of any number from the whole schedule, Viz, 001-099

It seems easiest, as to the designated base number it is required to add another whole number from the schedules. It is as easy as that025.46 is the Library classification of specific disciplines and subjects. For library classification of any discipline, one finds that to the base number 025.46 add 001-999. It means we are to add the class number of that subject to the class number 025.46,for example, classification of books on Mathematical analysis:

025.46+515-025.46515

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(515 is the class number of Mathematical analysis) Similarly, "Library Classification of Indian Philosophy" will get the

class number

025.46+181.4 =025.461 814

(181.4 is Indian philosophy)

Similarly, 026 libraries devoted to various specific disciplines are to be further subdivided into 001-999 for the class number of any library devoted to any specific subject

Science Libraries

026+500 026.5

Terminal zeroes being redundant in a decimal figure have been removed in the ultimate class number.

Libraries of library and Information Science

026+ 020 026.02

Libraries devoted to Indian Philosophy 026+181.4 = 026.181 4

069.9 Museums devoted to specific discipline and

subject are subdivided into 001-099 as per instruction for a museum devoted to specific subjects.

Museums of Zoology

069.9+590=069.959

Museums on Space flight

069.9+629.41 069.962 941

Science Journalism

070.449+ 500-070.449 5

331.124 Job vacancies and opportunities (Labour economics)

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331.1241 Job opportunities in occupations other than extractive, manufacturing and construction industries. For Job opportunities in Military service: to the designated base 331.1241, as per Instructions, we are to add the class number of Military science taken from the schedule.

33 1.124 1+355 - 331.124 135 5

Job opportunities in Library and Information Science

331.1241+020 331.124 102

Job opportunities in Public Libraries

331.1241+027.4 331.12410274

Student Organizations in specific fields

371.84

It is to be further subdivided by 001-999 for student societies on specific subjects. We are to add the class number of that subject to the base number 371.84.

Students Chemical Societies

371.84+540 = 371.845 4

Society of Library Science students.

371.84020-371.8402

Literary Societies formed by students

371.84+ 800= 371.848

Educational Curriculum

375

As per instructions under 375.01-09, curriculum for any specific subject is to be got by adding to the base number 375 any appropriate number falling between 010-990

Curriculum in Library Science

375+020-375.02

Curriculum in Dewey Decimal Classification

375+ 025.431 375.025 431

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Take another example:

778.53 Motion Pictures photography

778.538 Photography of specific subjects To this base number we are required to add the class number of the subject concerned for its Cinematography.

Motion-picture Photography of Birds

778.538+598 778.538 598

One thing quite obvious is that whenever a class number admits further division from 001-999,Standard subdivision(SS), if required, for that subject is added with three, zeroes, as two zeroes may be used sometimes for a subject class number. In such cases, instructions exist for the addition of a standard subdivision with the required number of zeroes.

Curriculum in Library Science

375.02

Directory of Curricula

375.000 25

Here directory is a standard subdivision.

Similarly,

History of libraries disciplines devoted to various specific

026.0009

General libraries: A Journal

027.005

Adding to some designated base a portion of the class number from some smaller area of the schedules

Instead of admitting a whole class number from somewhere in schedules, a designated base may require addition from some specific part of the schedules, from a single Main class or Division or a Section or even smaller than that. It is only a specialized extension of instructions "Add to ...from 001-999. In such a case instead of adding the whole class number

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to the specified base number, a portion of a smaller number is added to avoid ambiguity. For example,

181 Oriental Philosophy

181.04-09 Oriental Philosophy is based on specific religions.

To derive the class number for any specified religious philosophy, we are instructed under 181.04-.09 to add the number following 29 in 294- 299 to the base number 181.0. For example,

Buddhistic philosophy The number for Buddh religion is

294.3

Here the digits after 29 are "43". These are to be added to

181.0

The derived number thus is:

181.0+ 43 181.043

Similarly,

Confucious Philosophy

Confucianism is a religion having the class number:

299.512

Hence the Confucious philosophy will get the class number

181.0+ 9512-181.095 12

Let us take another example:

331.2 Wages... of labour

331.204 In specific industries

331.2042-2049 In extractive, manufacturing construction Industry.

For a class number for wages/condition of working in any specified Industries related to manufacturing, extractive or construction, we are required to add to the base number 331.204 the number following 6 in 620-690

Wages of Agricultural Labour

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The number for Agriculture is 630 and the digits which follow 6 are 30. So 30 is to be added to the base number 331.204. Hence

331.204 +30 331.204 3

Working conditions in Mines

331.204 +22 331.204 22 (The class number for mining is 622)

395 Etiquettes

395.1 Etiquette for specific ages and sexes.

The class number for Etiquette of a specified sex or age group is to be got by dividing 395.1 (Base number) by 170.2022 170.2024 It means we are to add to the base 395. 1, the number following

170.2102 in 170.2022 170.2024

Etiquette for Men

395. 1+232 = 395.123 2

Etiquette for Children

395.1+22 395.122

Whereas the class number for Ethics of Men and Ethics of Children are

170.202 232 and 170.202 22 respectively.

Classwork on three or more subjects that are all subdivisions of a broader subject in the first higher number that includes them all (unless one subject is treated more fully than the others). This is called the rule of three. For example, a history of Portugal (946.9).

Take another example:

578 Microscopy in Biology

578.4 Use of Microscopes:

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For the use of specific types of Microscopes, we are to extend 578.4 like the subdivisions of 535.332. which enumerates the kinds of microscopes:

535.332 Microscopes

535.3322 Simple Microscopes

535.3323 Compound Microscopes

535.324 Ultramicroscopes

535.3325 Electron Microscopes

Therefore, the corresponding numbers of Microscopes in Biology are:

578.4+2 578.42 Use of Simple Microscopes in Biology)

578.4+3578.43 Use of Compound Microscopes

578.4+4 578.44 Use of Ultramicroscopes

578.4+5= 578.45 Use of Electron Microscopes

Some more examples: Wheat trade

380.141+311 (from 633.11 wheat) = 380.141 311

Air conditioning in Secondary School Buildings

697.93+72 (from 727.2)= 697.937 2 Air conditioning in law school buildings

697.93+7434-697.937434 Reviews of documents in Microforms

028.13+6 (from 011.36) = 028.136

Reviews of Braille books

028.16+3 (from 011.63)= 028.163

Self Check Exercise

3.What do you understand by "add to" instructions?

4. What is rule-of-three? Explain with an example.

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Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

_____

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_____

- **"Add to..." from the same Division**

There is a slight difference between "add to instruction from the same Division/Section, and the number being added from some remote part of the schedules. "This difference lies not in the method, but in the part of the number added. These personality facets from sections XX3-XX9 are further divisible by the facets of XX1 or XXX2; thereby giving the general citation order as personality followed by action. Exceptions are however there to this citation order. Therefore, it is an addition of a secondary facet. One can say without reservation that this technique has made the scheme multifaceted. There seems not much difficulty in adding such a facet. It is quite easy because one has not to flip many pages of the schedules. Frequently occurring characteristic of such a facet is that this "add to..." Instruction occurs not alone but one finds instructions to add a part of particular numbers to a series of topics. Therefore, instead of repeating instructions at every class number, the editors give instructions in one place, and the class numbers or base numbers in this context susceptible to such a facet are marked with an asterisk. The meaning of asterisk (*) is explained in the footnote of every page where asterisked base numbers occur"(Mitchell,1994.p.8).

For example,

take the title: Cotton Harvesting. Here cotton is the concrete subject, so will form the base number. This is a subject of agriculture: going to 630 Agriculture we find the number for Cotton at

633.51 Cotton (Gossypium)

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It is marked with an asterisk which at the page footnote explains: "Add as instructed under 633-635". Going back to the instructions given on page 1041, we find a series of Instructions. The very first instruction is relevant to our purpose. We are asked to add to the base class number the digits following 631.5 in 631.51-631.57. The class number for Harvesting is 631.55. It means that as per instructions we are to add to 633.51 the number following 631.5 Le. 5 only. Therefore, the complete class number for Cotton Harvesting is: 633.51 +5= 633.515

Similarly, we can add to 633.51 the whole series of numbers from 631.51-57

Soil preparation for Cotton

633.51+1-633.511

Cotton Seeds

633.51+21=633.512 1

New varieties of Cotton 633.51 +23 = 633.512 3 Cotton Yield

633.51+58 633.515 8

Cotton Storing

633.51 +68= 633.516 8 Take another example:

Reproduction in Protozoa

In this case, protozoa with class number 593.1 will form the base number. Here we are told to add as instructed under 592-599 (p. 795). Instruction relevant to our purpose is 04 General Special, it means for general principles 1.e. (action facet) we are to first add 04 to the designated base and further add the number following 591 in 591.1-591.8.

In 591 the number for reproduction is 591.16. Therefore we are to add only "16" to the above compound. number

593.1+04+16= 593.104 16

Here "04" acts only as a facet indicator. The general principle that emerges is that we can add all the subdivisions of 591 to all the class numbers from 592-599 through a facet indicator either 0 or 04.

Reproduction in invertebrates

The class number for Invertebrates is

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592

The general principle of Invertebrates

592.01-.08

For a specific general principle, we are asked to add to 592.0 (Zero being, a facet indicator) the number following 591 in 591.1-591.8. Class numbers for "reproduction" is

591.16

Thus we are required to add 16 to 592.0. The complete class number therefore for Invertebrates Reproduction is

592.0+16 592.016

Similarly, we can build a series of class numbers on the base 592.0 for general principles of invertebrates.

Physiology of Invertebrates

592.0+1 592.01

Biophysics and Biochemistry of Invertebrates.

592.0+ 19 (from 591.19) 592.019

Evolution of Invertebrates

592.0+ 38 (from 591.38) 592.038

Anatomy of Invertebrates

592.0+4 (from 591.4) 592,04 and so on.

It may be noted that since 0 is a subject facet indicator, so all the standard subdivisions from Table 1 should be added with a double zero:

Dictionary of Invertebrates

592.003

Journal of Invertebrates

592.005

Experimental Research in Invertebrates

592.007 24

But wherever the General Principle facet is added through "04" the standard subdivision can be added with the normal zero:

Dictionary of Protozoa

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593.103

Study and teachings of Protozoan Zoology

593.107

Take another example: Chemical Kinetics of Alkaloids

The basic number for Alkaloids is

547.72

Here, we are asked to add, as per the footnote, as instructed under 547 (on page 697). Since Chemical Kinetics is a topic of Physical Chemistry, so the third instruction Le. 045 Physical Chemistry is relevant to us. Here, we are asked to add to 045 the number following 541.3 in 541.34-541.39.

It means 045 is a compounded facet indicator. The number for Chemical Kinetics is

541.394

The digits following 541.3 are "94" in this case. Thus the complete class number for the title in question is

547.72 +045+ 94 547.720 459 4

In this manner, we can extend any class number in 546 and 547. For Example

Optical properties of Alkaloid solutions

547.72 +045+ 414 547.720 454 14

Thermodynamics of Chemistry of Alkaloids

547.72 +045+ 69 547.720 456 9 Facet indicator for adding from the subdivisions of 541.2 is 044 as per the same instruction.

Stereochemistry of Alkaloids,

547. 72 +044 + 23 (from 541.223)

=547.720 442 3

Quantum Chemistry of Alkaloids

547.72+ 044+8= 547.720 448

Similarly, in 294.4 Jainism, General Principles of Jainism have been placed in 234.41-48. These General Principles can be further individualised as in 291: for this, we are asked to add to the base 294.4 the number following 291 in 291.1. 291.8. Let us take an example.

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Sacred books of Jains Our base number is 294.4 and the number for sacred books In 291 is 291.82. Thus to the base 294.4, we will add "82" Hence the class number for "the sacred books of Jains" is 294.4-82-294.482

Similarly, Jain Eschatology

294.4+23 (from 291.23)=294.423

Sacred places for Jains

294.4+35-294.435

Jain Saints

294.4+61 294.461

Some of the most important examples of such a synthesis occur, however. In 350 Public Administration where 351 is Central Governments (theoretical principles). All the Central Governments of various countries except the US Government, have been put at 354.3-9. For the Central Government of a country, we are asked to add to the base number 354 the area notation for that country from Table 2. For example:

Union (Central) Government of India

354+ 54 (12) = 354.54

Central Government of Italy

354+45=354.45

For specific organs or aspects of the executive of the Central Government, we are required to add to the resulting class number, zero and further add the digits following 351.00 In 351.001-351.004.

For example:

Powers of the US President

353.03+22 (from 351.00322) = 353.032 2

Powers of the President of the Republic of India

354+54 (Area Table)+0+313 (Prom 350.00313)

= 354.540 313

This is the class number for the President of India, as further extension is not possible. Term of Office of the Prime Minister of India (the Chief Executive)

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354+54+0+34 (from 351.0034) 354.540 34 Ministry of Finance, Government of Punjab

354+545 52 (Area Table)+06+2 (From 351.02)

= 354.545 520 62

Problems in Acquisition of Government Publications

025.28+34 (from 025.173 4) = 025.2834

Book Selection in National Libraries

025.218+75 (from 027.5)=025.218 75 (Area can also be added to 027.5)

Book Selection in the Library of Congress

025.218+75+ 73 (Table 2) = 025.218 757 3

Reference Service in Children's Libraries

025.527+7625 (from 027.625)=025.527 7625

Cataloguing and indexing of Microforms

025.34+94 (From 025.1794) = 025.349 4

Subdivisions beginning with zero should be avoided if there is a choice between 0 and 1-9 at the same point in the hierarchy of the notation. This is called the rule of zero.

Self Check Exercise

5.What do you understand by rule-of-zero?

6. Define the sections of personality?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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- **"Add to...." from the same Section**

Sometimes some special facets, applicable to all the subdivisions of a section are enumerated at the beginning of the same Section. These special facets are of general applicability within the same section. Instructions are provided against each subsection and their further divisions to add the desired facet. Take, for example, the title:

Heart Diseases Physicians Heart Specialists or Cardiologists

For heart diseases, we will have to go to the section dealing with all the diseases in medicine 610. The number for diseases is 616; and the specific number for heart diseases

6 16.12 (Diseases) * of heart

Here an asterisk leads us to the footnote which instructs us to add as instructed under 616.1-616.9. Going to this bulk of on (pp. 868-869). we find the number for Physician is 0232 and it is directly attachable to the base number:

616.12 0232-616.120 232

Similarly,

Prevention of Heart Diseases

616.12+05 616.120 5

Case studies in Heart Diseases

616.12+09-616.120 9

In such cases, since the subject divisions have usurped the original place of the standard subdivisions, therefore, the standard subdivisions are advanced to the place beginning with a double zero:

Research in Heart Diseases

616.12+0072-616.120 072

Similar Instructions are also found under the subdivisions of 618

618.1 Gynaecology

618.11 Diseases of Ovary

As per similar instructions, one can add to this number any required facet enumerated under the heading 618.1-618.8

Preventive measures for ovary diseases

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618.11+052-618.110 52

Surgical treatment of ovary diseases

618.11+07-618.1107

Take another example:

746 Textile arts and handicrafts.

To many of the subdivisions of 716 may be added a special subdivision given under 746: and whenever these special facets are admissible such places have been marked with an asterisk*

Crochet Patterns

Under 746 the specific class number for crochet is 746.434 and as per instruction, we add to it the number for "Pattern" given on page 1283.

Thus the complete class number is: 746.434+041 746.434 041 Pattern in Woven Carpets

746.72+041= 746.720 41

Similarly, under 787-789, "other" instruments and their music, many special facets have been enumerated which can be added, as explained before, to the subdivisions in 787-789

Guitar programmes

781.61 +0739-781.610 739

One can add area notation from Table 2 to 0739, 1

required:

Guitar Programmes in U. S. A

781.610739 + 73 (T2)

= 781.610 739 73

Guitar Scores

781.61+5-781.615

Take another example in 546 Inorganic chemistry. Here almost all the individual elements are extendable by some special facet enumerated once and for all at the beginning under the general heading 546 Inorganic chemistry. The instruction here is: Add to each subdivision identified by* as follows:

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1 The Element

2 Compounds

22 Acids and bases

24 Salts'

25 Complex compound

5 Physical chemistry

6 Analytical chemistry

For example, if the subject is: Potassium salt Class number for Potassium is

546.383

and "Salt" is a Special facet having the number "24"

The complete class number for Potassium salts therefore is:

546.383+24

= 546.383 24

Similarly, the Special facet for "Physical Chemistry of individual elements is "5". As per instruction. it is further divisible as the subdivisions of 541.3 as in 541.34-541.39.

We are to add to 5 the digits following 541.3 in 541.34-541.39.

For example,

Physical Chemistry of Potassium

546.383+5= 546.383 5

Chemical Kinetics of Potassium

(It is a topic of Physical Chemistry)

The base number is 546.383

Since it is a Physical Chemistry aspect, so we add 5

546.383 +5

= 546.383 5

The digit "5" is further extendable by the subdivisions

of 541.3

The class number for Chemical Kinetics is

541.394

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The digits that follow 541.3 are "94". Hence the complete class number for "Chemical Kinetics of Potassium" is

546.383+5+ 94 546.383 594

Similarly,

Isotopes of Potassium

546.383+5+88 546.383 588

Photochemistry of Potassium

546.383+5+5=546.383 55

Quantitative Analysis of Sodium

546.382 + 65 546.382 65

Some of the facets applicable to some of the subdivisions of 721-729 Specific aspects of the architecture have been enumerated there on page 1238

722 Ancient and Oriental Architecture

722.11 Chinese

It, as per instruction, admits a facet enumerated under 721-729.

Maintenance and repair of the Chinese Architecture

722.11 +0289=722.110289

Preservation Theatre Buildings

725+82 + 0288 725.820 288

The architecture of Buildings for physically handicapped

725.54

(Here there is no need of adding "42" from the facets given under 721-729)

Preservation of Knitted laces

746.22+0488 =746.220448

Repair of Woven rugs

746.72 +0489= 746.720 489

Scores of Children's Songs

784.624+06-784.62406

Collection of Duet Songs sung by Children

784.82 +1 (from 784.306 11) = 784.821.

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Self Check Exercise

7.Where we can add the special facets?

8. What is the use of an asterisk (*)?

9. What do you understand by Subject Analysis? Write down the steps of classification with an example.

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

_____

_____

_____

_____

_____

1.6 SUMMARY

Present Unit deals with the work of practical classification and consists of two distinct phases first phase deals with intellectual work in sorting out the specific subject of a document under classification and the second deals with the assignment of appropriate notations.

After reading this unit you will be able to :

i. analyse the subject;
ii. locating class number;
iii. practical number building.

1.7 GLOSSARY

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Add Note: An instruction appended to an entry to extend the class number by a part of the number taken either from the schedules(Volume 2) or from any of the Tables 2 to 7 (Volume 1).

Centred Entry/Centred Heading: A heading denoted by a span of numbers, as there is no specific number for that heading.Underevery centred entry, a number forcomprehensive works is always given.

`Class elsewhere' No: An instruction given under a heading directing to a distinct number for a related subject, or for a part part of that subject.

`Class here' Not : Instruction under a heading giving explicit instructions to class a topic under that class number where apparently it does not seem a part of that heading, Usually the subject to be classed there is broader than the heading under which this note appears.

Classifier: A person who assigns class numbers from aclassification system to books and other reading material in a library.

Subject Analysis:The specific subject of a document may be determined by examining the document under classification through its title, sub-title, preface table of contents and the text.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Class a work dealing with interrelated subjects/disciplines that is being acted upon. This is called the rule -of- application and takes precedence over any other rule.

2. If two subjects receive equal treatment and are not used to introduce or explain one another, class the work with the subject whose number comes first in the DDC Schedules. This is called the first-of-two rule"
3. Instead of admitting a whole class number from somewhere in schedules, a designated base may require addition from some specific part of the schedules, from a single Main class or Division or a Section or even smaller than that. It is only a specialized extension of instructions "Add to ...from 001-999.

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4. Classwork on three or more subjects that are all subdivisions of a broader subject in the first higher number that includes them all (unless one subject is treated more fully than the others). This is called the rule of three.
5. Subdivisions beginning with zero should be avoided if there is a choice between 0 and 1-9 at the same point in the hierarchy of the notation. This is called the rule of zero.
6. These personality facets from sections XX3-XX9 are further divisible by the facets of XX1 or XXX2; thereby giving the general citation order as personality followed by action.
7. Sometimes some special facets, applicable to all the subdivisions of a section are enumerated at the beginning of the same Section.
8. The meaning of asterisk (*) is explained in the footnote of every page where asterisked base numbers occur.
9. Check section 2.2.1.See all steps in this unit for classification of a document.

1.9 REFERENCES AND SUGGESTED READINGS

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LESSON:2.3

CLASSIFICATION OF DOCUMENTS USING TABLE 1 AND TABLE 2

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STRUCTURE

1.1Learning Outcomes

1.2Introduction

1.3 Methodology of Number Building with the Use of Tables

1.4 Table 1: Standard Subdivisions

- 1.4.1 Qualities of Standard Subdivisions
- 1.4.2Use of Standard Subdivisions
- 1.4.3 Rules for adding Standard Subdivisions
- 1.4.4Application of Standard Subdivisions at Irregular Places
- 1.4.5 Use of Zeroes in Standard Subdivisions
- 1.4.6 Other rules for adding Standard Subdivisions

1.5Table 2: Area

- 1.5.1 Adding Area Notation through the SS 09

1.6 Summary

1.7Glossary

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1.8Answers to In-text Questions

1.9 References and Suggested Readings

1.1 LEARNING OUTCOMES

You have already been done with the introductory part of DDC and Seven Tables. The present unit introduces you to how to give call numbers to the documents using Table 1 and Table 2. This unit further describes extending any number in the Schedules by adding any of the Two Tables.

1.2 INTRODUCTION

A classification scheme gives a systematical system to organize knowledge in similar or identical entities/groups. The table numbers are never used alone. "Table 1: Standard Subdivisions and these standard subdivisions should be added only when the work in hand covers the whole, or approximately the whole, subject to the number in the schedules. "Do not add one standard subdivision to another standard subdivision unless specifically instructed". Never use more than one zero in applying a standard subdivision unless instructed to do so. "If the 0 subdivisions of a number in a schedule are used for special purposes, use notation 001-009 for standard subdivisions"; "if the 00 subdivisions also are used for special purposes, use notation 000 for standard subdivisions". Table 2 deals with Geographic Areas, and Biography. These numbers are also never used alone.

Number	Name	Abbreviation	Pages in Vol.1
Table 1	Standard Subdivisions	s.s.-	1-13
Table 2	Areas	area-	14-386

1.3METHODOLOGY OF NUMBER BUILDING WITH THE USE OF TABLES

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It is very much clear and may be noted also that these numbers in Table 1 and Table 2 are never used alone in any case. “These are only attachable to a number in the Schedule and can be further extended on specific instructions only”. It may also be noted that “the addition of a number from "Table 1 Standard Subdivisions can be done without any instruction to do so. Table 2 areas can also be added on your own through the *ss-09”*(Satija,2013).

ACTIVITY

1.4 TABLE 1: STANDARD SUBDIVISIONS

A *standard subdivision represents* a recurring physical form, for example, a dictionary, encyclopedia, periodical, index and so on or moves toward history or research and “this applies to any subject or discipline that covers or approximates the whole of the meaning of the number”(Mortimer,1998).

a few examples:

150.1	Philosophy and theory of psychology
230.003	Dictionary of Christianity
340.02573	Directory of lawyers in the U.S.
405	Periodical on language
624.0285	Computer applications in civil engineering

1.4.1 Qualities of Standard Subdivisions

- The notation for such recurring concepts always starts with a zero and they have meaning only when attached to some class number.
- They cannot be used independently.

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- These were earlier termed as form divisions, as mostly they stood for the form of the document.
- In the seventeenth edition (1965) these form divisions were veritably renamed as “Standard Subdivisions”, as these recurring non-subject divisions gathered there had outgrown the form divisions.
- Now, they include some recurring viewpoints, and even facet indicators, as they are located 19th Edition of DDC.
- They are called "standard" because their meaning and notation remain the same wherever they are used (DDC, Volume 1, pp. 2-13).

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers through the answers given at the end of this Unit.

1.Classify the following titles using Table 1:

a. The Journal of Public Administration
b. The Journal of Aptitude Tests
c. Research in Central Government in India
d. Dictionary of Algebra in Spanish
e. Statistical Principles of Biology
f. Contribution of Indians to Library Classification

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1.4.2 Use of Table 1: Standard Subdivisions

Library classification in effect deals with knowledge as contained in documents. To account for such physical attributes of the documents, Melvil Dewey in the second edition (1885) separated such non-subject common forms of the documents and listed them at the beginning of each Division. "These tables could be attached to any class number and always remained the same in name and notation. This table could be attached to any class number and always remained the same in name and notation. The notation for such recurring concepts always starts with a zero and they have meaning only when attached to some class number". They are called "standard" because their meaning and notation remain the same wherever they are used. The standard subdivisions as they stand in DDC-19 (Volume 1, pp. 2-13) may broadly be categorized as under:

01, parts of 02, 07 and 09	Viewpoints
02 partially, 03, 05 and 06	Internal forms of treatment of subjects
04. 08 and to some extent 09	Facet indicators to introduce a new facet

1.4.2 Rules for adding Standard Subdivisions

"Rules" for adding standard subdivisions to a class number have been provided in Sections 5.24, 8.5.3 and 8.7 of the “Editor's Introduction” in Volume 1. Here rules have been explained to use Table 1, and some advice is given for the situations where the classifiers may feel plotted. Some brief instructions to apply them and the Order of Preference also precede the actual Table 1 (page 1. Volume 1).

“Standard Subdivisions are added to the ultimate class number of the document in question. Having reached the most specific class number, we do not necessarily need an invitation to add any standard subdivision”(Comaromi,1978, p.404).

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Encyclopedia of Islam

297+03-297.03

(Here Islam is the subject and Encyclopedia is the standard subdivision)

History of the Ahmadiya Movement

297.86+09 297.860 9

(Here we have added standard subdivisions 03 and 09 respectively, though there are no instructions to do so at these class numbers).

Note:"Two standard subdivisions are not applied in succession to a class number. If a subject poses two standard subdivisions, then only one is to be applied. on a preferential basis, and the other is to be ignored. The table of preference is prefixed to Table 1. If we examine, the preferential order, it becomes obvious that facet indicator general special is followed by viewpoints, and the real form divisions come in the end. It means internal forms are to be preferred over external forms"(Volume 1, pp. 2-13).

For example,

Encyclopaedia of Organisations on Applied Psychology

Here “Encyclopaedias and "Organizations" both are standard subdivisions with notations 03 and 06 respectively. Therefore, only one of them is to be added. As per the preferential table. "06" is to be given preference over "03". Therefore, the correct class number is 158.06 and not 158.03 or any number combining the two ss viz. 158.0306

Therefore, whenever there are two standard subdivisions, this table must be consulted to know which of them is to be applied, and which is to be ignored.

Note:“If any of the ss, when applied to a class, gets some local name in that context, then in that schedule all such proper standard subdivisions are to be used in all such cases, the notation is compatible with Table 1, but the nomenclature is somewhat modified” (Volume 1, pp. 2-13).

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For example,

610 Medicine

In Table 1, we have 073 students, learners, apprentices, and beginners, when it is added to 610 to make 610.73, it gets the meaning "Nursing and other activities auxiliary to the medical profession.

The Standard Subdivision 013 value in the context of 331 labour economics has been the meaning: "Freedom, dignity and value of labour".

Note: An extension of the standard subdivisions 01 does not exist elsewhere.

Similarly, the ss 08 Anthologies have been given the extended meaning of Rhetoric and collections of literature (irrespective of the language) which have further been subdivided as per need:

808	Rhetoric and collections
808.02	Authorship and editorial techniques
808.025	Writing for publication

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

2.Build class numbers for the following titles:

a. Social change in Indian Villages
b. Social change in Hindi Speaking areas of India
c. History of the Third World
d. Political Conditions in Non-aligned Countries of Africa
e. History of Third World during 1990-1999
f. History of English-speaking nations in the 19th Century

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1.4.4 Application of Standard Subdivisions at Irregular Places

Going beyond the extended meaning some standard subdivisions are shown as subject divisions and consequently moved to a division in the array. It happens if that compound subject has a subject value and considerable literary warrant. Such treatment allows further extension of such subjects. This happens usually for the geographical and historical treatment of a subject:

331.2	Wages (Labour economics)
331.29	Historical and geographical treatment of wages, Instead of 331.209

Note: "To avoid cross-classification cross-reference is provided from the probable class number likely to be looked at by the classifier to the actual number used in the schedules. For example, in the above case, the not used class number [331.209] is enclosed in square brackets, and a cross-reference here directs the classifier to 331.29".

Similarly. techniques, apparatus, and material for art metalwork are 739 instead of 739.028. Though techniques, apparatus etc., is a here they have been enumerated like a subject.

534.9 is Table reviews, exercises in sound physics Instead of 534.076.

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Again in 535 optics 535.9 is Reviews and exercises in optics instead of 535.076.

720.9 is a Historical and Geographical treatment of Architecture. But the architectures of specific ages. Instead of being provided in 720.901-.905 have been shifted to 722-724. Accordingly, at [720.901-.905] one reads the instructions "Do not use, class in 722-724."

Note: Another irregularity occurs in the case of Technology

666.3 Pottery Ceramic technology. Here, we are asked to add ss at 666.31-39, instead of at the usual place viz. 666.301-.309.

Not only this, there is one exception to this exception viz. The ss "Techniques, procedures, apparatus, equipment, the material is to be placed at 606.4. Instead of placing at the usual 666.328

Note: "Some other irregularities also occur in the case of the use of a Chronological Table. In usual cases, any chronological period division is to be taken from Table 1. where the "ss" "09" has been further subdivided as 0901 0905 enumerating all periods of history. These are attachable to any class number, but for some classes, for example, 800 Literature, and 900 History, some special "Period Tables" have been provided. Therefore, in such cases, these tables are to be used. Instead of the general one. e.g. at ss 09. In fact, in the case of the Main classes, the 800 and 900 periods is a subject facet. Instead of being merely an auxiliary".

For example:

20th Century English Poetry 821.91 instead of 821.0904

Elizabethan English Drama 822.3 instead of 822.09032

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Note: Extending the irregular use of the standard subdivisions a bit further, we find numerous cases, where a geographical facet is made inbuilt into the structure of the class number. In such cases, the geographical facet is not added through ss 09.

For example:

General Statistics of Europe
314 instead of 310.094
General Statistics of France
314.4 Instead of 310.0944
General Statistics of India
315.4 instead of 310.0954

Note: "Many a time, a classifier finds two places for the historical and geographical treatment of the subject. Both of them have their meaning.We must learn to perceive the subtle difference between the subject as an academic discipline, and the actual practical conditions in that field".

For example:

320 Political Science where

320.09	Historical and Geographical treatment of
320.9	Political science, and Political situations and conditions

The correct class number for Political conditions in India will be 320 954

592	Invertebrate Zoology
592.009	Historical And geographical treatment of the study of Invertebrates
592.09	Geographical treatment of Invertebrate Zoology
592.0954	Invertebrates (found in India)

1.4.5 Use of Zeroes in Standard Subdivisions

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In Table 1 every standard subdivision begins with a featured zero, whichis essentially a facet indicator marking the transition from subject divisions to the form division in the class number. Sometimes a featured zero may seem missing, while at others standard subdivisions may begin with one, two or even three zeroes. Wherever the position for standard subdivisions has been occupied by subject divisions, therefore, in such cases, the standard subdivisions are so designated as to precede subject divisions. This is done by denoting the standard subdivisions with two zeroes or three zeroes as the case may be.

For example:

Dictionary of Human Diseases 616.003

Journal of Constitutional Law 342.005

In the case of 350 Public Administration ss are to be added with three zeroes, as the subject division starts both with one zero or two zeroes.

Study and Teaching of the Subject of Central Government = 351.007

Journal on Central Governments =351.0005

1.4.6 Other rules for adding Standard Subdivisions

Subject to the above rules, a standard subdivision may be added to any class number.

- If the ultimate class number is the Main class or a Division 1.e. ends with two zeroes or one zero, the filler zeroes are to be removed before adding a standard subdivision.
- The digits are so reshuffled that the dot is placed after the first three digits.

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For example,

Encyclopedia of Science

Science is 500, and Encyclopedia is an ss with notation 03, Since in 500 there are two formal zeroes, therefore these are to be removed.

The synthesized class number is

= 500+03 503

1.5 USE OF TABLE 2: AREAS

Whenever and wherever a subject is studied within the perspective of a geographical area, the ultimate class number from the schedules may be qualified by the area number taken from Table 2. It is mandatory to add area notation in the subjects of social sciences and humanities because in these subjects the treatment and practice of a subject vary from place to place. Here the area is more or less an essential part of the subject. “Some other disciplines may also occasionally need the area facet. Where a schedule does not authorize us to add from the area table. The area table can still be added through the ss 09 from Table 1”(Satija, 2013).

This is the largest of all the auxiliary tables (pp. 14 to 386 out of the total of 452 pages). Its length consists not in any variety of subdivisions as it is in detail. A brief paragraph of Instructions (p.14) precedes the enumeration of area numbers. All areas of the world's natural geographical divisions, political or administrative units, or some scattered geophysical divisions of earth or some non-continuous conceptual based on various people who habitat them, have been accommodated in divisions 1 to 9. “Area 1 stands for the scattered regions bound by some geophysical or some social characteristics, for example, plane regions, forests, deserts, oceans, socio-economic regions, and so on”. “Number 2 has been allotted to persons regardless of area, region place. "The modem world as divided into various continents, countries, provinces, and cities have been denoted by the notation 4 to 9. The geographical subdivisions of area number for USA 73 are far more detailed than that of any other country” (Comaromi,1978, p. 407).

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The Area number is always added to the definitive number in the schedules while some classes are directly based on the geographical characteristics, so the number for areas is inbuilt there; for example,

In the class History

954 is the History of India,

973 is History for the USA,

as-54 and -73 are area numbers as taken from the Area Table

similarly,

314 is General Statistics of Europe and 315 is General Statistics of Asia

where 4 and 5 respectively are the area numbers of Europe and Asia

The use of "Table 2 for Areas" does not create any difficulty. "Whenever a class number needs extension by some geographical area, there are sufficient instructions there in the schedules to do so. Generally, a division usually at "9" in the array is left for the geographical and historical treatment of the subject" (Satija & Comaromi, 1998, p.143) :

Political conditions:

320.9

(As per instructions, this class number is to be further subdivided by the area numbers 1 to 9 from Table 2)

Political conditions of India

320.954 (T2)

= 320.954

Political conditions in Rajasthan

320.9+544 (T2)

= 320.954 4

Political conditions in Christian Countries

320.9+1761 (T2)

= 320.91761

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1.5.1 Adding Area Notation through the SS 09

Where there are no instructions but the subject of the document under classification requires the addition of an area number from Table 2, then the area number is added to the class number via the ss 09, which works as a facet indicator:

Child labour in India: an economic study 331.31+09 (T1)+ 54 (T2) = 331.310 954

Civil Rights in Communist Countries 323.4+09 (T1) + 1717 (T2) = 323.4091717

Note: Sometimes, an area number may be added through "0" instead of 09. For example, 920.03-09 Biographies by specific geographical areas.

Biographies of persons living in India 920.0+ 54 (T2) = 920.054 Here as per instructions, area number 54 for India has been added to the base number 920.0 Biographies of persons living in Rajasthan 920+0+544(T2) = 920.054 4

Note: Sometimes an area may be further extended by the special subject divisions as in the cases of 340 Law and 350 Public administration:

Miscellaneous Public Law 343

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Income Tax Law

343.052

The Indian law of Income Tax

343+54 (T2)+052 (from 343.052)

= 343.540 52

Here 343 has first been divided by country (India-54) then the resulting class number has been further extended by the subject division 052 Income Tax of 343.

Note: "A separate provision of the area table since the 17 edition has not only allowed more details in subdivisions for various countries but has also made possible the division of the earth and population clusters from various conceptual viewpoints These are various physio-geographic and socio-economic regions shown as subdivisions of 1"(Volume 1, pp. 2-13):

Atmospheric pressure in Forests

551.54+09 (T1)+ 152 (12)-551.540 915 2

Here "152" is forests from the Area Table added through the 56 09.

Note: As per instructions, each subdivision of 1 area is susceptible to be qualified by any region 3-9 from the same table. This has increased the versatility of the scheme:

Standard of Living in Indian Villages

339.47+ 09 (T1)+ 1734 (T2) +0+54 (T2)

=339.470 917 340 54

Atmospheric Pressure in Indian Forests

551.54+09 (T1) +152 (T2) 0+ 54 (T2)

=551.540 915 205 4

Note: In the schedules, many a time Instructions specify that "add areas notation 3-9 from Table 2". It only means that the areas denoted by subdivisions 1 and 2 fall outside the

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Jurisdiction of such instructions. In such cases, we cannot add directly areas from subdivisions 1 and 2 (Table 2). needed we can add such class numbers via the ss 09 (Volume 1, pp. 2-13):

For example:

> The foreign policy of non-aligned nations cannot have the following number:
>
> 327.1716
>
> The correct number is 327+09 (T1)+ 1716 (T2)=327.091

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

3. Classify the titles given below using Table 2:

a. Migration of people from India to the U.S.A.
b. Migration of Buddhists to Europe
c. Exchange Rate between the US dollar and Indian Rupee
d. The British Colonies in Asia
e. British financial investment in the Third World
f. Emigration from India to English-Speaking Countries
g. Foreign relations with British Commonwealth Countries
h. Labour workers from Nepal in India
i. Public Libraries in Developing Countries

_____

_____

_____

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_____

_____

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1.6 SUMMARY

The 19th edition of the DDC contains seven tables given in volume 1. Table 1 records viewpoints, modes of presentations, and internal forms of a document, for example, bibliography, encyclopedia, history, and philosophy, which are all standard subdivisions. These standard subdivisions are attachable to any class numbers in the schedules with the help of zero. In some cases, they are added with one, two or three zeros. Usually, filler zeros are removed while adding a standard subdivision to the main class to avoid contrary to the instructions.

Table 2 is a list of political, geographical, and geophysical areas and population clusters of the world. Numbers from Table 2 can be added directly on instructions or through *ss-09.*

1.7 GLOSSARY

Schedules : It is a long list ofclasses arranged systematically along with their notations

Standard Subdivisions: These are non-subject recurring aspects of a subject usually represents the viewpoints of presentation of subject or the medium and form of the document. For example, philosophy, history and research Auxillary Tables and Devices 107 Page 3 Classification-DDC-19th Edition.

Tables : It is a long list of auxillary non-essential aspects of a document.In DDC-19th Edition there are Seven Tables have been listed in Volume 1.

1.8 ANSWERS TO IN-TEXT QUESTIONS

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1.

a) 35.0005

b) 153.9400 05

c) 354+54(T2)+00072(T1) =354.540 007 2

d) 512 +003(T1) + 61(T6) =512.003 61

e) 574+015(T1)+195(from 519.5) = 574.015 195

f) 025.4+089(T1)+91411(T5) =025.408 991 4 11

2.

a) 303.4 +0954 (T1& 2) +009+734 (T2 deleting 1 = 303.409 540 097 34

b) 303.4 +0954 (T1& 2) +009+75(T2 deleting 1)+9143 (T6) = 303.409 540 097 591 43

c) 909.09+724(fromT2,following 1) = 909.097 24

d) 320.9+1716(T2)=320.917 160 6 or 320.9+6 (T2) +009+716 (from 1716,T2)
=320.960 097 16

e) 909.09+724 (from1724,T1)+0+29(from 909.829)
=909. 09724+0+829 = 909.097 240 829

f) 909.09+75 (from175,T2)+2 1 (T6) +81 (from 909.81)
=909. 09+75+21+ 81 = 909.097 521 81

3.

a) 304.8 +73 +0 +54 + 304.73 054

(Note that country towards which migration occurs is to be taken first and the place of origin comes later)

b) 304.8 + 4 + 0 + 176 +43 (from 292-299) = 304.840 176 43

c) 332.45609 + 73 + 0 + 54 = 332.456 097 305 4

d) 325.3 + 41 + 09 +5 = 325.341 095

e) 332.673 + 41 + 0 +1724 = 332.673 410 172 4

f) 325 .254 071 521

g) 327.091 712 41

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h) 338.1 + 54 + 0 +5496 = 338.915 405 496

i) 027.4 + 09 + 172 4 = 027.40 172 4

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LESSON 2.4

USE OF RELATIVE INDEX

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STRUCTURE

1.1Learning Outcomes

1.2 Introduction

1.3 Importance and Use of Relative Index

1.4 Structure of Relative Index

1.4.1 Terms not included in the Relative Index

1.4.2 Structure of the Index Page

1.5 Summary

1.6 Answers to Self-Check Exercises

1.7Glossary

1.8 References and Suggested Readings

1.1 LEARNING OUTCOMES

Assigning a class number to a particular document is not an easy task in the libraries because it is an intellectual activity and takes lots of effort to understand the main subject first. In this process Relative Index plays an important role in likewise Tables (Volume 1) and Schedules

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(Volume 2) of DDC-19th Edition. The present unit introduces to you the definition, nature and characteristics, need and importance, organisation and structure of the Relative Index.

1.2 INTRODUCTION

The present unit explains how to analyse any subject of a particular document and then how to assign a class number to the specific subject with the help of the Schedules (Volume 2) and Tables (Volume 1) of DDC 19th Edition. The Relative Index (Volume 3) is an important source of information for assigning numbers because it plays an important role in guiding and getting the appropriate Class Number from Schedules and Tables.

1.3 IMPORTANCE AND USE OF RELATIVE INDEX

The Relative Index has always been a significant part of the Dewey Decimal Classification system."It is an alphabetical Index to every key term occurring in the schedules and all the tables. It is just not an aid to the use of schedules, but an entity itself and has a value like schedules. In addition to the explicit terms, some terms/concepts implied or obtainable through the number building process, and popular synonymous terms have also been included" (Dewey,1971 & Dewey 2012, p.1221). Similarly, in the 19th edition Index, the total number of more than 80.000 entries is far more than the total of 29,528 enumerated entries in the Schedules and Tables combined.

"The Index is called relative as it reverses the pattern of collocation of subjects. In the schedules the first division of the knowledge is by broader disciplines" (Miska,1980, p485). A classifier can see a glimpse of the different features and implications of a subject. It is called relative as it also depicts the relation of one aspect of a subject to another. It is useful and a quick key to the classes and topics for those classifiers who are not very much familiar with the whole structure and pattern of DDC.

1.4 STRUCTURE OF RELATIVE INDEX

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The Relative Index is structured in a way that the proper names have been indexed under their AACR-2 form. It s essential to determine the subject of the document then only you can consult the Relative Index. The subjects are arranged in alphabetical order/position. When the term is treated in three or more fields of study the number opposite the heading is to be used in the interdisciplinary number. The arrangement is word-by-word; and entered in first-word capital as under :

Abra, Philippines
Abrading tools
Asia Minor
Asian
New York
Newark

Phrases have been entered in "Adjective+ Noun" form without any inversion as a matter of rule:

Agricultural banks
Colour television
F-region Iconosphere
Fabian socialism
Facial bones
Festive music Indian Desert
Indian hemp
Indian Ocean
Inorganic chemistry

Compound (hyphenated) words have been treated as if they were a single word, for example, a hyphen is ignored.

Franco-German war history

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Franconia Ger.
Franconian
Highboys
High-calorie Cookery High-carbohydrate
High compression-Ignition
High-energy
Higher

Self Check Exercise

1.What is the structure of the Relative Index in DDC 19th Edition?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

_____

_____

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1.4.1 Terms not Included in the Relative Index

The terms not listed in the Schedules or Tables are as follows:

i. Names of all places, minerals, plants, diseases, and so on.

ii. Persons, except for heads of state who are used to identify historical periods, for example, Louis XIV: founders of religions

iii. Names of art or literary forms for particular languages and countries, for example,

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American short stories. English poetry, Russian drama, Italian architecture, French cooking and so on

iv. General concepts that occur in most fields and are represented by standard subdivisions, for example, educational administration, language laboratories, mathematical

tables, agricultural research, and business education.

Self Check Exercise

2.Which terms are not included in the Relative Index?

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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1.4.2 Structure of the Index Page

As a structural format of an Index in DDC, the pages of each entry have been divided into two columns by a vertical line in the centre.

For example,

Architecture

Assam India

720

Or area-541 62

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- The Index is highly structured both semantically and typographically.
- Maximum use of indentions and typographical devices has been made to depict rank relations and to show different aspects of the concept Indexed.
- A cross-reference has been defined as "An instruction note leading from the point at which comprehensive works on a subject are classed (whether stated or implied) to subdivisions of the topic located in numbers other than those subordinate to the number used for comprehensive works."

It means that apart from the Bible aspect of the Exodus the readers are instructed to see under Historical books (O.T.) for other aspects of Exodus. In the 19th edition, the most important of the FOR references is see also type, transcribed in abbreviations in the schedules as s.a. This mostly refers to the aspects not covered under the main heading

Habits	
Child rearing home econ	649.6
Customs see social customs	
Psychology	152.33
animals	156.233
schildren	155.412
s. a. psych of other specs. groups	
s.a. Behavior	

It means that some related material on habits may be found under the term Behaviour. So we must explore the term Behaviour. Also an "s. a." Instruction appears under psychology, which in turn appears under Habits, It means that two aspects of habit psychology namely children and animals have been given.

"Under each entry, the coordinate and subordinate relations have been shown by Indentions. This is rather a very fine and efficacious device. Understanding these Indentions is very essential to the technical reading of the Index, for example,

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Ecology

elementary ed 372.357

life sci 574.5

animals 591.5

man 573

microorganism plants 576.15

plants 581.5

s. a. other spec organisms

Soc. theology

Christianity 261.836 2

Comp.rel 291.178 362

s.a .other spec. rel

sociology 304.2

Analyses,

Ecology has four main aspects namely:

a) elementary education,

b) life sciences,

c) social theology and

d) sociology with equal ranks among themselves and formed an array and been shown typographically under the term ecology" (page 331 of the Index, 19th edition).

Abbreviations for the various Tables as used in the Index are as follows:

Table Number	Full Name of the Table	Abbreviations used

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Table 1	Standard Subdivisions	S.S.
Table 2	Areas	*Area*
Table 3	Subdivisions of Individual Literatures	*Lit.sub.*
Table 4	Subdivisions of Individual Languages	*Lang. sub.*
Table 5	Racial, Ethnic, National Groups	*r.e.n.*
Table 6	Languages	*lang.*
Table 7	Persons	*Pers.*

Self Check Exercise

3.Why is the Index of DDC called the Relative Index?

4. What do you understand by an entry in the Relative Index?

5. Spell out the following abbreviations.

a. ed._____

b. gen.wrks_____

c. govt_____

d. spec._____

e. O.T._____

f. s.a._____

g. vet.sci_____

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

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1.5 SUMMARY

In this Unit we have discussed the need value, scope, entry' format and use of theRelativeIndex: The Relative Index:

- contains a word-by-word sequence of allthe key terms in the schedules, the Seven Auxiliary Tables and some of thesynonymousterms;
- provides anindependentapproachto the Universe of Knowledge;
- help to understand knowledgeclassification.
- provides a quick look at the various subjects/disciplines;
- provides synonymous terms, see cross-reference, which directs to unused terms and key to the abbreviations;

1.6 GLOSSARY

Entry :A term or phrase followed by information inthe form either of a number or a referencetoan other termorphrase,or both.

Indentation : Typographical setting in which

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subheadingsare printed leaving a space to the left of thelineofthefirst letterofthemain heading.

Index : Ordinarily an alphabetically arranged list oftopics/concepts in the book givinginformation for each item is to be traced using a number. In some indexes, thearrangementmay beotherthanalphabetical.

RelativeIndex : An alphabetical index to a classificationscheme in which all relationships andaspects of a subject are brought togetherundereach index entry.

ScatterReference : A cross-reference in the index not referringto a specific term but suggesting a variety ofpossibilities. This is done by *see also*references.

See : A direction note from a not used term to theused term. A direction note referring theuserto related topics.

s*.a.*: : This refers to related topics scattered in theIndexunder different terms.

Word-by-WordAlphabetization: Init,terms/conceptswhich havethesame first words are arranged in the alphabeticalorder of the subsequent word. Here the word(not the letter) is the unit. It is also called thenothing before-something method. Thismethod is also recommended by the BritishStandardsInstitution.

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1.7 ANSWERS TO IN-TEXT QUESTIONS

1. It is an alphabetical index to every key term occurring in the schedules and all the tables.

2. Names of the places, minerals, plants, diseases, and so on.

3. It is called relative, as its approach to knowledge organisation is 'inverse to that of the schedules'. It also depicts all the relations of the subject.

4. A term or phrase followed by information in either of a number or a reference to another term or phrase is called an entry in the Relative Index.

5.

a. Education
b. General Works
c. Government (s), governmental
d. Old Testament
e. See also
f. Veterinary Science

1.8 REFERENCES AND SUGGESTED READINGS

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Lesson 3.1

USE OF COMMON ISOLATES, PHASE RELATIONS AND DEVICES:

CLASSIFICATION OF DOCUMENTS WITH COMPOUND AND COMPLEX SUBJECTS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Background and Structure of the Colon Classification(CC)
1.4 Common Isolates
1.4.1 Anteriorising Common Isolates (ACI)
1.4.2 Posteriorising Common Isolates (PCI)
1.5 Phase Relations
1.6 Devices in Colon Classification
1.6.1 Chronological Device (CD)
1.6.2 Geographical Device (GD)
1.6.3 Subject Device (SD)
1.6.4 Mnemonic Device (MD)
1.6.5 Alphabetical Device (AD)
1.6.6 Superimposition Device (SID)
1.6.7 Classic Device
1.7 Summary
1.8 Glossary
1.9 Answers to In-text Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

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The lesson's objectives will be to use and understand the concept of Common Isolates (Both ACI and PCI), Phase Relations, and Devices in the Colon Classification (CC) Scheme by the learner. It will also help the learner understand how to classify the documents of Compound and Complex Subject documents in CC.

After reading this Unit, the learner will be able to understand:

1.1.1 Get an overview of Colon Classification and its background
1.1.2 Get an overview of Common Isolates and how to use them in CC
1.1.3 To understand Phase Relations and Devices Used in CC
1.1.4 Get an Overview of Simple, Compound, and Complex Classes
1.1.5 Construct the Class Number by using Common Isolates, Phase Relations, and different Devices.

1.2 INTRODUCTION

In the first unit of Paper- B-103 - LIBRARY CLASSIFICATION (Practical),youmust understand the concept of all three parts (Part-I: Rules, Part-II: Schedules of the Classification and Index to Schedules, and Part-III: Schedules of Classics and Sacred Books with Special Names of the Colon Classification as well as youmust aware about the various steps in Classification of Documents. This unit helps you to understand the classification of documents using Common Isolates, Phase Relations, Devices, and Compound and Complex Subjects.

The Colon Classification (CC) System is based on the five essential categories of Personality (P), Matter (M), Energy (E), Space (S), and Time (T). When we go from the simple to compound subjects in CC, we can see the use of rounds and levels of manifestation. When we classify the documents of a complex subject, we can see the use of phase relations. Further, different kinds of devices used in CC help sharpen the focus of any facet.

Overall, the fundamental categories, common isolates, phase relations, and devices help the classifier classify the complex documents with sharping and different degrees ofcomplexity.

1.3 BACKGROUND AND STRUCTURE OF THE COLON CLASSIFICATION (CC)

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The late S.R. Ranganathan (Father of Library Science in India) devised Colon Classification (CC). Ranganathan brought the first edition of the scheme in 1933, and so far, seventh editions have been published. Primarily 6th edition of the Colon Classification is used in most libraries. We will also use the 6th edition of CC to classify the documents in this unit. The 35threpinrt of the 6th edition of CC came out in 2017. Its bibliographic details are given below:

Colon Classification by S. R. Ranganathan. 6th ed. (35 re-print), Bangalore: Sarada Ranganathan Endowment for Library Science, 1960.

The Colon Classification is divided into three parts, i.e., Part – 1: Rules, Part – II, Schedule, and Part – III: Classics of Sacred Books.

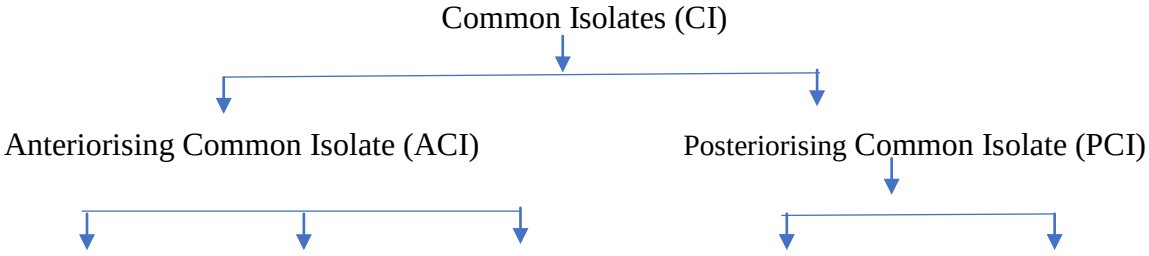
Part I : Rules of the CC is further divided into seven chapters i.e., Chapter – 1: Main Class, Chapter – 2: Common Isolates, Chapter – 3 to 5 deal with Time, Space, and Language Isolates, Chapter – 6: Introduces the concepts of Phase, Intra-Facet, and Intra-Array Relation and Chapter – 7 deals with Classic Devices.

Part II: Schedule of the CC provides the schedules of classification. It is also further divided into chapters. Chapters 1 to 5 give the preliminary schedules of the Main Class, Common Isolates, Time, Space, and Langauge Isolates, respectively. Chapter 6 provides the schedules for the Phase, the Intra-Facet, and the Intra-Array Phase Relations. The schedules for the several Facets of the several Main Classes are given in the remaining Chapters.

Part III – Classics of Sacred Books provides the classes and classics in Indology worked out in far greater detail than in other schemes.

1.4 COMMON ISOLATES

An isolate is the smallest unit of knowledge in the Colon Classification (CC), whereas Common Isolate is an isolate that is common to all the main classes in CC. Ranganathan defines common isolates as "an isolate idea denoted by the same isolate term and represented by the same isolate number, quite irrespective of the compound subject in which it occurs, or the basic subject with which the compound subject goes."Further, it can understand with the help of the following table:



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Applicable before Space facet	Applicable only after the Space facet	Applicable only after the Time facet	Personality Common Isolate	Energy Common Isolate

Let us discuss these two types of Common Isolates.

1.4.1 Anteriorising Common Isolate (ACI)

ACI are those attached to a subject that gives it an anterior position over other subjects of the same class. Further, it does not require any connecting symbol during their attachment with the main class.The isolates in this group include encyclopedias, dictionaries, periodicals/journals, conference proceedings, historical material, etc. ACI is further divided into three categories as follows:

1.4.1.1 ACI Applicable before the Space Facet

ACI, which are applicable before the Space Facet, is enumerated on page 2.5 of CC (6^{th} ed.), and the Faced Formula are explained in the Rules Section on page no. 1.43 to 1.47 of the CC (6^{th} ed.). In the faced formula, generally, [P1] is the area/country to be found from Geographical Device (GD), and [P2] is the time of origin to be seen fromthe Chronological Device (CD). In the Rule section [T] is applicable for the latest effective decade.

Let us understand it with the help of an example:

Example:

Title: Indian Journal of Mathematics, 1975

Class Number: Bm44,N75

Facet Formula for Journal (m): m[P], [P2]		
B	=	Mathematics (Main Class)
Bm	=	Mathematics (Main Class), Journal (ACI)
Bm44	=	Mathematics (Main Class), Journal (ACI), India [P]
Bm44, N75 [P2]	=	Mathematics (Main Class), Journal (ACI), India [P], Year i.e., 1975

Example:

Title: Proceeding of the Indian National Conference on Physics held in 1995

Class Number:**Cp44, N95**

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Facet Formula for Proceeding (p): p[P], [P2]		
C	=	Physics (Main Class)
Cp	=	Physics (Main Class), Conference Proceedings (ACI)
Cp44	=	Physics (Main Class), Conference Proceedings (ACI), India [P]
Bm44, N75	=	Physics (Main Class), Conference Proceedings (ACI), India [P], Year [P2]

More examples are given below: x

i. Periodical of Mathematics
Class Number: **Bm**

B	=	Mathematics (Main Class)
Bm	=	Mathematics (Main Class), m - Periodical (ACI)

ii. Collection of English Poem
Class Number: **O111,1x**

O	=	Literature (Main Class)
O111	=	Literature (Main Class), English Fiction (P)
O111,1=		Literature (Main Class), English Fiction (P), Poetry (P)
O111,1x	=	Literature (Main Class), English Fiction (P), Poetry (P), Collection/works (x)

iii. Biography of Ranganathan 1892
Class Number: **2wM92**

2	=	Library Science (Main Class)
2w	=	Library Science (Main Class), Biography 'w' (ACI)
2wM92	=	Library Science (Main Class), Biography 'w' (ACI), Year of Birth

1.4.1.2 ACI Applicable only after the Space Facet

ACI is applicable only after the Space Facet is divided into two parts as per the following: (page 2.6 of CC (6th ed.).

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r - Administrative Report

t - Statistics (If periodical)

The Facet formula for this category of Isolate is s[T].

Example:

Title: Indian Economic Tables started in 1989

Class No: X.44sN89

Facet Formula for Statistics (Periodical Only) s[T]		
X	=	Economics (Main Class)
X.44	=	Economics (Main Class), India (GD)
X.44s	=	Economics (Main Class), India (GD), s (ACI applicable after Space)
X.44sN89	=	Economics (Main Class), India (GD), s (ACI), N89 (Time)

1.4.1.3 ACI Applicable only after the Time Facet

ACI is applicable only after the Time Facet is divided into the following divisions (Page 2.6 of CC (6th ed.).

s	Statistics (if any)	v	Source Material
t	Commission Report	v5	Literature
t4	Survey	v6	Tradition
t4	Plan	v7	Archaeology, etc. (As in 'V' History)
t6	Ideal	v8	Achieve (As in 'V' History)

Example:

Title: Survey of Research Libraries in India

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Class No: 236.44‘N79t4

2	=	Library Science (Main Class)
236	=	Library Science (Main Class), Research Libraries
236.44	=	Library Science (Main Class), Research Libraries, India (GD)
236.44‘N79	=	Library Science (Main Class), Research Libraries, India (GD), Year (CD)
236.44‘N79t4 (ACI)	=	Library Science (Main Class), Research Libraries, India (GD), Year (CD), t4

1.4.2 Posteriorising Common Isolate (PCI)

PCI are those attached to a subject that gives it a posterior position.Adding the PCI to any class decreases the extension and comes after the original class.Further, it requires any connecting symbol during their attachment with the main class.First, the host class will be formulated based on the Facet formula, and then the PCI number will be added.

PCI is further divided into two categories as follows (Page 2.6 of CC ed.):

1.4.2.1 Energy Posteriorising Common Isolate (PCI)

1.4.2.2 Personality Posteriorising Common Isolate (PCI)

1.4.2.1 Energy Posteriorising Common Isolate (PCI)

Energy PCI are attached with a Colon (:). Facet Formula is : (C1), [P], [P2]: [E]

Examples:

i. A Critical evaluation of Shakespeare's Hamlet
Class No. **O111,2J64,4:g**

O	=	Literature (Main Class)

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O111 =	Literature (Main Class), Written in English Language [P]
O111,2=	Literature (Main Class), Written in English Language [P], Shakespeare Hamlet is a Drama (Form) [P2]
O111,2J64=	Literature (Main Class), Written in English Language [P], Shakespeare Hamlet is a Drama (Form) [P2], Authors date of birth is 1564 [P3]
O111,2J64,4 =	Literature (Main Class), Written in English Language [P], Shakespeare Hamlet is a Drama (Form) [P2], Authors date of birth is 1564 [P3], it was Authors 4th Work [P4]
O111,2J64,4:g=	Literature (Main Class), Written in English Language [P], Shakespeare Hamlet is a Drama (Form) [P2], Authors date of birth is 1564 [P3], it was Authors 4th Work [P4], Criticism (PCI)

ii. Research Education in India
Class No. **T:f.44**

T	=	Education (Main Class)
T:f	=	Education (Main Class), Energy PCI
T:f.44	=	Education (Main Class), Energy PCI, India

1.4.2.2 Personality Posteriorising Common Isolate (PCI)

The formula for Personality PCI is: Main Class. space, PCI, AD-9CD,P2:t

Examples:

i. Punjab Agricultural University, Ludhiana
Class No. J.4436,e4,P

J	=	Agriculture (Main Class)
J.4436	=	Agriculture (Main Class), Punjab (Space)
J.4436,e4	=	Agriculture (Main Class), Punjab (Space), Higher Education
J.4436,e4,P	=	Agriculture (Main Class), Punjab (Space), Higher Education, Alphabetical Device

ii. Central Potato Research Institute (Shimla, founded in 1935)

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Class No. J341.443674,f,9N

J	=	Agriculture (Main Class)
J341	=	Agriculture (Main Class), Potato[P]
J341.443674	=	Agriculture (Main Class), Potato [P], Shimla [S]
J341.443674,f	=	Agriculture (Main Class), Potato [P], Shimla [S], Research (PCI)
J341.443674,f,9N35=Agriculture (Main Class), Potato [P], Shimla [S], Research (PCI), Year of Establishment		

A- IN-TEXT QUESTIONS

1. Common Isolates are two types _____and_____.
2. Herald of Library Science, India, 1962 is a Posteriorising Common Isolate (PCI): True / False
3. Construct the Class Number of the Following:
   i. Dictionary of Library Classification
   i. IASLIC Periodical, 1957
   ii. Report of the Advisory Committee on Libraries (India, 1957

1.5 PHASE RELATIONS

The books expounding on the relation between two isolates in one and the same facet of a class is called Intra-Facet Relation. It can also define as aclass that comprehends two or more classes brought into mutual relation is called a complex class, and their relationship is known as Phase relation. It may occur between two or more main classes, within the same facet of a primary class, or within the same array in isolates. Hence, the three levels of relations are given below:

1.5.1 Inter-Subject Phase Relation

1.5.2 Intra-facet Phase Relation

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1.5.3 Intra Array Phase Relation

At each level, there can be five kinds of the relationship, as given below:

S. No.	Nature of Relation	Description	Inter-Subject	Intra-Facet	Intra-Array
i	General	Relationship between two class is general	a	j	t
ii	Bias	Phase I is biased towards phase 2	b	k	u
iii	Comparison	Where Phase I is compared with Phase 2	c	m	v
iv	Difference	When differences between the two phases	d	n	w
v	Influence	When the first phase influences the second phase	g	r	y

Table: 1 Phase Relations

The connective symbol for a phase relation is a zero (0), and an appropriate relation indicator is given in above table number 1.

1.5.1 Inter-Subject Phase Relation

It shows the relationship between two or more main subjects or classes. There can be five kinds of relationships under it.

1.5.1.1 Inter-Subject Phase Relation (General)

Title: Relation between Political Science and Economics

Class No: W0aX

W	=	Political Science (Main Class)
0a and	=	Connecting symbol indicates General Relations between two Main Classes subjects
X	=	Economics (Main Class)

1.5.1.2 Inter-Subject Phase Relation (Bias)

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Title: Mathematics for Engineers

Class No: B0bD

B	=	Mathematics (Main Class)
0b	=	Connecting symbol indicates Bias Relation between two Main Classes and subjects
D	=	Engineering (Main Class)

1.5.1.3 Inter-Subject Phase Relation (Comparison)

Title: Physics compared to Chemistry

Class No: C0cE

C	=	Physics (Main Class)
0c	=	Connecting symbol indicates Comparison Relation between two Main Classes and subjects
E	=	Chemistry (Main Class)

1.5.1.4 Inter-Subject Phase Relation (Difference)

Title: Difference between Literature and Linguistics

Class No: O0dP

O	=	Literature (Main Class)
0d	=	Connecting symbol indicates Difference Relation between two Main Classes and subjects
P	=	Linguistics (Main Class)

1.5.1.5 Inter-Subject Phase Relation (Influence)

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Title: Geopolitics

Class No:W0gU

W	=	Politics (Main Class)
0g	=	Connecting symbol indicates Influencing Relation between two Main Classes and subjects
U	=	Geography (Main Class)

1.5.2 Intra-facet Phase Relation

It shows the relationship between two isolates in one and the same facet of a class. There can be five kinds of relationships under it. These are:

1.5.2.1 Intra-facet Phase Relation (General)

Title: Trade relations between India and USA

Class No:X:5.440j73

X	=	Economics (Main Class)
5	=	Trade [E] Foci in [E] of Economics
44	=	India [S]
0j	=	Connecting symbol indicatingIntra-facet **General** Relation
73	=	USA [S]

1.5.2.2 Intra-facet Phase Relation (Bias)

Title: Air Vehicle for Electrical Engineers

Class No:D530k66

D	=	Engineering (Main Class)

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53	=	Air Vehicle [P] of Engineering
0k	=	Connecting symbol indicating Intra-facet **Bias** Relation
66	=	Electrical [P] of Engineering

1.5.2.3 Intra-facet Phase Relation (Comparison)

Title: Rigveda compared to Yajur Veda

Class No: Q110m12

Q	=	Religion (Main Class)
11	=	Rigveda [P] of Religion
0m	=	Connecting symbol indicating Intra-facet **Comparison** Relation
12	=	Yajur Veda [P] of Religion

1.5.2.4 Intra-facet Phase Relation (Difference)

Title: Difference between Academic and Special Libraries

Class No: 230n4

2	=	Library Science (Main Class)
3	=	AcademicLibraries [P] of Library Science
0n	=	Connecting symbol indicating Intra-facet **Difference** Relation
4	=	Special/Business Libraries [P] of Library Science

1.5.2.5 Intra-facet Phase Relation (Influence)

Title: Influence of Christianity on Jainism

Class No:Q60r3

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Q	=	Religion (Main Class)
6	=	Christianity [P] of Religion
0r	=	Connecting symbol indicating Intra-facet **Influence**Relation
3	=	Jainism [P] of Religion

1.5.3 Intra Array Phase Relation

It shows the relationship between two Array-isolates in one and the same array. There can be five kinds of relationships under it.

1.5.3.1 Intra Array Phase Relation (General)

Title: General Study of Genius Criminal

Class No:S610t5

S	=	Psychology (Main Class)
61	=	Genius [P] of Psychology
0t	=	Connecting symbol indicating Intra-facet **Influence** Relation
5 (65)	=	Criminal [P] of Psychology

1.5.3.2 Intra Array Phase Relation (Bias)

Title: Chemical Method used for Examination of Cell

Class No:L:4030u1

L	=	Medicine (Main Class)
403	=	Chemical Method [2E] of Medicine
0u	=	Connecting symbol indicating Intra-facet **Bias**Relation
1 (411)	=	Examination of Cell [2E] of Medicine

1.5.3.3 Intra Array Phase Relation (Comparison)

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Title: Comparative Study of DDC and CC

Class No:2:51M760vN3

2	=	Library Science (Main Class)
51	=	Classification System [E] of Library Science
M76	=	DDC first published in 1876 [S]
0v	=	Connecting symbol indicating Intra-facet **Comparison** Relation
N3	=	CC first published in 1933 [S]

1.5.3.4 Intra Array Phase Relation (Difference)

Title: Difference between accountancy and audits

Class No:X:8H0wJ

X	=	Economics (Main Class)
8H	=	Accountancy [E] of Economics
0w	=	Connecting symbol indicating Intra-facet **Difference** Relation
8J	=	Audit [E] of Economics

1.5.3.5 Intra Array Phase Relation (Influence)

Title: Influence of Cloud on Temperature

Class No:U2840y53

U	=	Geography (Main Class)
284	=	Temperature [P] of Geography
0y	=	Connecting symbol indicating Intra-facet **Influence** Relation
53 (2853)	=	Cloud [P] of Geography

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B- TEXT QUESTIONS

Construct the Number of the following titles and identify the appropriate relationship.

i. Relations between Physics and Chemistry

ii. Influence of Religion on Working Class

iii. Electronics for Nuclear Engineers

iv. Different between Adult Education and University Education

v. Chemical method used for Examination of Urine

vi. Influence of Kashmir Saivism on Virasaivism

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1.6 DEVICES IN COLON CLASSIFICATION

Devices are used in Colon Classification (CC) to sharpen the focus of any fact. Using devices in CC has helped shorten the schedule's length and repeatedly avoid unnecessary enumeration of the isolates. The followings are some essential devices that are being used in CC.

1.6.1 Chronological Device (CD)

A chronological device is the most widely, easily used device that involves the use of the time Isolate to create new isolates. “The Chronological Device (CD) consists in using the appropriate ChronologicalCharacteristics for the formation or the subdivision of an isolate, capable of chronological formation or subdivision, or when the individualisation of the isolates or sub-isolates may be made to depend conveniently on the period of origin or birth or on the year of first investigation or on the year of discovery or on the year of initiation or commencement or on the year of occurrence or on the year of that may definitely associated with the respective isolates in any other manner.”[1].

In the basic class ‘B’ Mathematics, ‘C’ Physics, ‘L’ Medicine, ‘Q’ Religion, ‘S’ Psychology, ‘T’ Education, ‘V’ History and ‘X’ Economics have all been taken from Chronological Device (CD).

Examples:

i. Ayurveda

Class No: LB

L	=	Medicine (Main Class)
LB	=	Medicine (Main Class), B (9999 to 1000 BC) from Chronological Division

ii. Line Complex Geometry
Class No: B6N

B6	=	Geometry (Main Class)
B6N	=	Geometry (Main Class), N (1900 to 1950AD) from Chronological Division

iii. Montessori School (Started in 1939)
Class No: T1N39

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T	=	Education (Main Class)
TI	=	Education (Main Class), Pre-secondary School (Personality)
T1NI	=	Education (Main Class), Pre-secondary School (Personality), N39 from CD

iv. Godan
Class No: O152, 3M75

O	=	Literature (Main Class)
112	=	Fiction written in the Hindi Language [P1]
3	=	Fiction [P2]
M75	=	Date of the Birth [P3] (Novel written by MunsiPrechandra was born on 1875)

Religious groups are also got by (CD)

v. Title: Baptist
Class No: Q68J3

vi. Title: New Church
Class No: Q68L4

vii. Title: Ahamadiya Muslims
Class No: Q78M9

In the Main Class (MC) 'V'- History, the isolate under 4A[P2]- specific parties can also be derived by the Chronological Device (CD).

Title: Bharatiya Janata Party (BJP)

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Class No: V44, 4N80

V	=	History (Main Class)
44	=	India (P)
4	=	Specific Parties [P2]
N80	=	BJP is a Political Party founded in 1980 and derived from the CD

The classification number of Classification schemes can be seen in the Rules Section (Page No. 1.645 of CC of the Main Class '2 – Library Science).

Examples:

i. Dewey Decimal Classification (1876) - 2:51M
ii. Cutter's Expansive Classification (1891) - 2:51M9
iii. Universal Decimal Classification (1896) - 2:51M96
iv. Library of Congress Classification (1904) - 2:51N
v. Colon Classification (1933) - 2:51N3
vi. Bliss Bibliographic Classification (1935) - 2:51N35

1.6.2 Geographical Device (GD)

The Geographical Device (GD) uses geographical characteristics, i.e., continent, country, state, district, etc., for the formation or subdivision of an isolate capable of such formation or division. The use of the Geographical Device is found in the personality facet of History [V], Law [Z], and Generalia [z]. [1]

Examples:

History [V] as Main Class:

Indian History = V44 (V=History and 44=India, taken from GD)
American History = V7 (V=History and 7=America, taken from GD)

Law [Z] as Main Class:

Indian Law = Z44 (Z=Law and 44=India, taken from GD)
American Law = Z7 (Z=Law and 7=America, taken from GD)

Generalia [z] as Main Class:

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Sinology = z41 (z=Generalia and 41=China, Taken from GD)

Architecture [NA] and Fine Arts [NR] as Main Class:

Similarly, in the Canonical Classes of Architecture [NA] and Fine Arts [NR] the personality faced could be derived by using the Geographical Device (GD).

Indian Architecture = NA44 (NA=Architecture and 44=India, Taken from GD)
Russian Music = NR58 (NR=Music and 58=Russian, Taken from GD)

1.6.3 Subject Device (SD)

The Subject Device (SD) uses the appropriate Class Characteristics for the formation or subdivision of an isolate capable of such formation or subdivisions of an isolate [1]. The use of SD as a personality facet is indicated in the schedules of the main classes of Library Science, Engineering, Ethics, Psychology, Education, Industry, History, and Law.

Examples:

Law Libraries = 24(Z)

2	=	Library Science (Main Class)
4	=	Business Libraries [P]
(Z)	=	Law (Main Class) (Used as Subject Device)

Computers = D6,8(B)

D	=	Engineering (Main Class)
6	=	Machinery [P]
8(B)	=	Computers (Other Machinery)

Teaching of Mathematics = T:3(B)

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T	=	Education (Main Class)
3	=	Teaching [E]
B	=	Mathematics (Used as a Subject Device)

Textile Industry = X8(M7)

X	=	Economics (Main Class)
8	=	Industry [P1]
M7	=	Textile (derived by using Subject Device taking isolate from the Main Class 'M' – 'Useful Arts')

1.6.4 Mnemonic Device (MD)

Mnemonic Device refers to the use of specific digit or digit groups to represent a particular concept in all the classes. It means the art of assisting the Memory. Ranganathan defines Mnemonic Device as, "It consists in choosing the digit for the further division on a class, i.e., the formation of the sharpening of a focus, in accordance with a convention in regard to the different possible significances of the digits available for use".

For example, digit 1 is used for represent Unity, God, World, the First in Evolution or time and other similar corelates. MD represent digit 1 to 8, which are explained in the rule section of CC (Page 1.32). The example is given below:

Title: Structure of Classification

Class No: 2:51:2

2	=	Library Science (Main Class)
51	=	Classification [Energy]
2	=	Structure [Seminal Mnemonic, see page 1.32, Digit 2 of CC

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1.6.5 Alphabetical Device (AD)

The Alphabetical Device (AD) consists in using the first or the first two, or the first three, etc., initial letters (all in the CAPITAL letters) of the name of an entity, existential or conceptual, for the formation or the subdivision of an isolate [1]. This device will be used only when no other subdivision method gives a more helpful sequence.

Examples:

Title: Atlas Cycle

Class No: D5125A

D	=	Engineering (Main Class)
5125	=	Cycle
A	=	Atlas

Example of Rule 05882 –

i. Hero Cycle
Class No: D5125**HER**

ii. Harcules Cycle:
Class No: D5125**HAR**

Rule 0582 is applicable in the above examples because combinations of letters frequently occur at the beginning of the names. Hence first letters in CAPITAL are used to secure individualization.

Title: Basmati Rice

Class No: J381B

J	=	Agriculture (Main Class)
381	=	Rice [P]
B	=	Basmati

Similarly, the class number of Permal Rice is: **J381P,**and Sella Rice is**: J381S**

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1.6.6 Superimposition Device (SID)

Ranganathan defines (SID) as "Connecting together two or more isolate ideas belonging to the same universe of Isolate Ideas." SID is used where the isolates are not provided in the schedules but can be developed by using two isolates in the same facet. It consists of putting a hyphen "-" between the two or more isolates (Rule 05862, page 1.33, CC). The isolate occurring in the schedule must be placed first, followed by the next number putting a hyphen (-).

Examples:

Title: Elementary and Secondary School Library

Class No: 231-2

2	=	Library Science (Main Class)
31	=	Elementary School [P]
32	=	Secondary School [P]

Female University Students: T4-55

T	=	Education (Main Class)
4	=	University [P]
55	=	Female [P2]

1.6.7 Classic Device

It is referred to be a "Classic Device" when we keep books and reviews, comments, and other information about the books together.

It consists in putting the digit x after the final class to which a classic belongs. The digit x is further augmented by [P1] and [P2] may be obtainedfrom (CD) as in O Literature. [P1] is the work facet as in [P4] of O Literature. It may be obtained by Group Notation or by (AD).

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Examples:

Title: Second Criticism of Godan

Class No.: O152,3M34,5:2

O	=	Literature (Main Class)
152	=	Hindi Language [P]
3	=	Fiction [P2]
M34	=	Date of Birth of MunsiPremchandra, who has written 'Godan.'
5	=	Fifth Publication of MunishPremchandra
2	=	Second Criticism of Godan

C- TEXT QUESTIONS

Construct the Number of the following titles:

i. As you like it (Novel)
ii. Japanese Philosophy
iii. Insurance Libraries
iv. Mathematical Physics
v. Ranikhet (Place)
vi. Gypsy Woman

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1.7 SUMMARY

In this unit, we have discussed about the background of Colon Classification (CC), classification of titles related to the Basic, Compound and Complex Subjects. The main points discussed in this unit are given below:

i. Construction of Class Number using two types of Common Isolates i.e., Anteriorising Common Isolate (ACI) and Posteriorising Common Isolate (PCI).

ii. Complex Subjects are classified with the help of three levels of Phase Relations i.e., Inter-Class or Subject Phase Relations, Intra-Facet Phase Relation and Intra-Array Phase Relation.

iii. Devices used in Colon Classification give the classifier autonomy while also reducing the size of the schedule. The important devices of the CC are: Chronological Device (CD), Geographical Device (GD), Subject Device (SD), Mnemonic Device (MD), Alphabetical Device (AD), Superimposition Device (SID) and Classic Device.

1.8 GLOSSARY

Array : Set of mutually exclusive coordinate subclasses.

Basic Subject : A Basic Subject is one that does not have any isolated idea attached to it as a component.

Examples: Mathematics, Physics, Chemistry, Economics, etc.

Compound Subject : A compound subject is made up of a basic subject and one or more isolate ideas.

Examples: Fungus Diseases in which Medicine is Basic Subject and Fungus Diseases is Isolate Idea.

Complex Subject or : A complex subject is created by combining two or more basic compound subjects.

Example: Effect of **Temperature** on **Personal Health**

Common Isolate : It is an isolate common to all the Main Class.

Facet : A group of isolates identified on the basis of a single fundamental category.

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Focus	:	Term used to denote an isolate idea or a basic class.
Isolate	**:**	A general term denoting an isolate concept or isolate number.
Isolate Idea	:	A through unit which is a manifestation of one of the five fundamental categories.
Phase Relation	:	Relation between the phase of a complex array isolate.

1.9 ANSWERS TO IN-TEXT QUESTIONS

A-TEXT QUESTIONS - ANSWERS

1. Common Isolates are two types **Anteriorising Common Isolates (ACI)** and **Posteriorising Common Isolates (PCI)**.

2. Herald of Library Science, India, 1962 is a Posteriorising Common Isolate (PCI): **False**

   The class number of Herald of Library Science, India, 1962 is: **2m44, N62**

   The ACI 'm' - Periodicals is applicable before the space facet (44-India) further it does not require any connecting symbols during its attachment with the main class i.e., Library Science '2'.

3. Construct the Class Number of the Following:

   i. Dictionary of Library Classification - **2:51k**

Facet Formula: 2 [P]; [M] : [E] [2P]		
2	=	Library Science (Main Class)
51	=	Classification (Energy), Foci in [E] cum [2P]
K	=	ACI applicable before the Space Facet

   ii. IASLIC Periodical, 1957 - **2m44, N57**

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2	=	Library Science (Main Class)
2m	=	Library Science (Main Class), Periodical (ACI)
2m44	=	Library Science (Main Class), Periodical (ACI), 44 (India)
2m44, N57	=	Library Science (Main Class), Periodical (ACI), 44 (India), N57 - Year

iii. Report of the Advisory Committee on Libraries (India, 1957) - **2.44 'N57t**

2	=	Library Science (Main Class)
2.44	=	Library Science (Main Class), India (Space)
2.44 'N57	=	Library Science (Main Class), India (Space), Year (1957)
2.44 'N57t	=	Library Science (Main Class), India (Space), Year (1957), t (ACI) applicable only after time facet

B-TEXT QUESTIONS - ANSWERS

i. Relations between Physics and Chemistry – **C0aE**

C	=	Physics (Main Class)
0a	=	Connecting symbol indicating **Inter-ClassGeneral Relation** between two Main Class
E	=	Chemistry (Main Class)

ii. Influence of Religion on Working Class – **Y490gQ**

Y	=	Sociology (Main Class)
Y49	=	Working Class [P] of Sociology
0g	=	Connecting symbol indicating**Inter-ClassInfluence Relation** between two Main Class
Q	=	Religion

iii. Electronics for Nuclear Engineers – **D650k7**

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D	=	Engineering (Main Class)
65	=	Electronics [P] of Engineering
0k	=	Connecting symbol indicating **Intra-Facet Bias Relation**
7	=	Nuclear Engineering

iv. Different between Adult Education and University Education – **T30n4**

T	=	Education (Main Class)
3	=	Adult [P] of Education
0n	=	Connecting symbol indicating **Intra-Facet Difference Relation**
4	=	University Education

v. Chemical method used for Examination of Urine – **L:4030u5**

L	=	Medicine (Main Class)
4	=	Pathology [2E] of Medicine
03	=	Chemical Method [2E] of Medicine
0u	=	Connecting symbol indicating **Intra-Array Bias Relation**
5	=	Examination of Urine [2E]

vi. Influence of Kashmir Saivism on Virasaivism – Q2340y3

Q	=	Religion (Main Class)
234	=	Virasaivism [P] of Religion
0y	=	Connecting symbol indicating **Intra-Array Influence Phase Relation**
3	=	Kashmir Saivism [P]

C-TEXT QUESTIONS - ANSWERS

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i. As you like it (Novel)- O111, 2J34

O	=	Literature (Main Class)
111	=	Novel written in the English Language [P1]
2	=	Drama [P2]
J34	=	Date of the Birth [P3] (Novel written by William Shakespeare born on 1534)

ii. Japanese Philosophy- R842

R	=	Philosophy (Main Class)
8	=	Other System [Chronological Division]
42	=	Japan (Taken from the Space Isolate Schedule)
J34	=	Date of the Birth [P3] (Novel written by William Shakespeare born on 1534)

iii. Insurance Libraries - 24(X81)

2	=	Library Science (Main Class)
4	=	Business Libraries [P]
X81	=	Insurance (Used as a Subject Device)

iv. Mathematical Physics – C:(B)

C	=	Physics (Main Class)
(B)	=	Mathematics

v. Ranikhet – V445265R

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V	=	History (Main Class)
4452	=	Uttara Pradesh (UP) (Uttarakhand separated from UP in 2000)
445265	=	Almora
R	=	Ranikhet (falls under Almora District)

vi. Gypsy Woman - Y15-738

Y	=	Sociology (Main Class)
15	=	Woman [P]
738	=	Gypsy [P]

1.11 REFERENCES

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1.12 SUGGESTED READINGS

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LESSON 4.1

CLASSIFICATION OF DOCUMENTS USING TABLES 1-7

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Methodology of number building with the Use of Tables in DDC
1.4 Table 1: Standard Subdivision
1.4.1Qualities of Standard Subdivisions
1.4.2Use of Table 1: Standard Subdivisions
1.4.3Rules for adding Standard Subdivisions
1.4.4 Application of Standard Subdivisions at Irregular Places
1.4.5 Use of Zeroes in Standard Subdivisions
1.4.6 Other rules for adding Standard Subdivisions
1.5 Use of Table 2: Areas
1.5.1 Adding Area Notation through the *ss* 09
1.6 Use of Table 3: Subdivisions of Individual Literature
1.6.1 When Language Facet is Absent
1.6.2 When Language is Present 1.6.3 In Case The Form is Absent

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1.6.4 Literary Works Without Language and Form

1.7 Use of Table 4: Subdivisions of Individual Language of Main Class 400 Languages

1.7.1 Bilingual Dictionaries

1.7.2 Table 4 may also be supplemented by Table 6

1.8 Use of Table 5: Racial, Ethnic,National

1.9 Use of Table 6: Languages

1.10 Use of Table 7: Persons

1.11 Summary

1.12 Answers to In-text-Questions

1.13 Self Assessment Questions

1.14 Glossary

1.15 Refrences

1.16 Suggested Readings

1.1 LEARNING OUTCOMES

You have already been done with the introductory part of DDC and Seven Tables in previous lessons of this unit. The present unit introduces you to how to give call numbersdocuments using or classify documentsusing Table 1 to Table 7. This unit further describes extending any number in the Schedules by adding any of the Seven Tables.

1.2 INTRODUCTION

Classification provides a system for organizing knowledge in the same entities/groups. Table numbers are never used alone. " Table 1: Standard Subdivisions and these standard subdivisions should be added only when the work in hand covers the whole, or approximately the whole, subject to the number in the schedules. "Do not add one standard subdivision to another standard subdivision unless specifically instructed". Never use more than one zero in applying a standard subdivision unless instructed to do so. "If the 0 subdivisions of a number in a schedule are used for special purposes, use notation 001-009 for standard subdivisions"; "if the 00 subdivisions also are used for special purposes, use

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notation 000 for standard subdivisions". Table 2 deals with Geographic Areas, and Biography. Table 3: deals with, Table 4,Table 5,Table 6,Table 7. These numbers are also never used alone.

Table 1.Seven Tables in Dewey Decimal Classification (DDC)

Number	Name	Abbreviation
Table 1	Standard Subdivisions	s.s.-
Table 2	Geographic Areas, Historical Periods,Biography	area-
Table 3	A-C Subdivisionsof Individual Literature	literature-
Table 4	Subdivisions of Individual Languages of Main Class 400 Languages	Languages-
Table 5	Racial, Ethnic and National Groups	ethnic groups-
Table 6	Languages	languages-
Table 7	Persons	Persons-

ACTIVITY

Visit different college library in your nearby campus and collect how many libraries are using DDC with their edition? If you find any library not using DDC explain the reason.

IN-TEXT QUESTIONS 3

1. Table 1 in DDC deals with Areas. True / False
2. Table 2 in DDC deals with Languages. True / False
3. Table 3 in DDC deals with Subdivis. Tions of Individual Literature.True / False

1.3 METHODOLOGY OF NUMBER BUILDING WITH THE USE OF TABLES IN DDC

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It is very much clear and may be noted also that these numbers in Table 1 and Table 2 are never used alone in any case. These are only attachable to a number in the Schedule. Schedules can be further extended on specific instructions. It may also be noted that the addition of a number from "Table 1 Standard Subdivisions can be done without any instruction to do so. Table 2 areas can also be added on your own through the *ss-09.*

1.4 . TABLE 1: STANDARD SUBDIVISIONS

A *standard subdivision represents* a recurring physical form, for example, a dictionary, encyclopedia, periodical, index and so on or approach like (history or research) and this applies to any subject or discipline that covers or approximates the whole of the meaning of the number.

Some examples:

150.1	Philosophy and theory of psychology
230.003	Dictionary of Christianity
340.02573	Directory of lawyers in the U.S.
405	Periodical on language
624.0285	Computer applications in civil engineering

1.4.1 Qualities of Standard Subdivisions

- The notation for such recurring concepts always starts with a zero and they have meaning only when attached to some class number.
- They cannot be used independently.
- These were earlier termed as form divisions, as mostly they stood for the form of the document.
- In the seventeenth edition (1965) these form divisions were veritably renamed as "standard subdivisions", as these recurring non-subject divisions gathered there had outgrown the form divisions.

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- Now, they include some recurring viewpoints, and even facet indicators, as they stand in the nineteenth edition.
- They are called "standard" because their meaning and notation remain the same wherever they are used (DDC, Volume 1, pp. 2-13).

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

1.Classify the following titles using Table 1:

a. Journal of Public Administration
b. Journal of Aptitude Tests
c. Research in Central Government in India
d. Dictionary of Algebra in Spanish
e. Statistical Principles of Biology
f. Contribution of Indians to Library Classification

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1.4.2 Use of Table 1: Standard Subdivisions

Library classification in effect deals with knowledge as contained in documents. To account for such physical attributes of the documents, Melvil Dewey in the second edition (1885) separated such non-subject common forms of the documents and listed them at the beginning of each Division. "These tables could be attached to any class number and always remained

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the same in name and notation. This table could be attached to any class number and always remained the same in name and notation. The notation for such recurring concepts always starts with a zero and they have meaning only when attached to some class number". They are called "standard" because their meaning and notation remain the same wherever they are used. The standard subdivisions as they stand in DDC-19 (Volume 1, pp. 2-13) may broadly be categorized as under:

01, parts of 02, 07 and 09	Viewpoints
02 partially, 03, 05 and 06	Internal forms of treatment of subjects
04. 08 and to some extent 09	Facet indicators to introduce a new facet

1.4.3 Rules for adding Standard Subdivisions

"Rules" for adding standard subdivisions to a class number have been provided in Sections 5.24, 8.5.3 and 8.7 of the "Editor's Introduction" in Volume 1. Here rules have been explained to use Table 1, and some advice is given for the situations where the classifiers may feel plotted. Some brief instructions to apply them and the Order of Preference also precede the actual Table 1 (page 1. Volume 1).

"Standard Subdivisions are added to the ultimate class number of the document in question. Having reached the most specific class number, we do not necessarily need an invitation to add any standard subdivision"(Comaromi,1978, p.404).

Encyclopedia of Islam

297+03-297.03

(Here Islam is the subject and Encyclopedia is the standard subdivision)

History of the Ahmadiya Movement

297.86+09 297.860 9

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(Here we have added standard subdivisions 03 and 09 respectively, though there are no instructions to do so at these class numbers).

Note:"Two standard subdivisions are not applied in succession to a class number. If a subject poses two standard subdivisions, then only one is to be applied. on a preferential basis, and the other is to be ignored. The table of preference is prefixed to Table 1. If we examine, the preferential order, it becomes obvious that facet indicator general special is followed by viewpoints, and the real form divisions come in the end. It means internal forms are to be preferred over external forms"(Volume 1, pp. 2-13).

For example,

Encyclopaedia of Organisations on Applied Psychology

Here "Encyclopaedias and "Organizations" both are standard subdivisions with notations 03 and 06 respectively. Therefore, only one of them is to be added. As per the preferential table. "06" is to be given preference over "03". Therefore, the correct class number is 158.06 and not 158.03 or any number combining the two ss viz. 158.0306

Therefore, whenever there are two standard subdivisions, this table must be consulted to know which of them is to be applied, and which is to be ignored.

Note: "If any of the ss, when applied to a class, gets some local name in that context, then in that schedule all such proper standard subdivisions are to be used in all such cases, the notation is compatible with Table 1, but the nomenclature is somewhat modified" (Volume 1, pp. 2-13).

For example,

610 Medicine

In Table 1, we have 073 students, learners, apprentices, and beginners, when it is added to 610 to make 610.73, it gets the meaning "Nursing and other activities auxiliary to the medical

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profession.

The Standard Subdivision 013 value in the context of 331 labour economics has been the meaning: "Freedom, dignity and value of labour".

Note: An extension of the standard subdivisions 01 does not exist elsewhere.

Similarly, the ss 08 Anthologies have been given the extended meaning of Rhetoric and collections of literature (irrespective of the language) which have further been subdivided as per need:

808	Rhetoric and collections
808.02	Authorship and editorial techniques
808.025	Writing for publication

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

2.Build class numbers for the following titles:

a. Social change in Indian Villages
b. Social change in Hindi Speaking areas of India
c. History of the Third World
d. Political Conditions in Non-aligned Countries of Africa
e. History of Third World during 1990-1999
f. History of English-speaking nations in the 19th Century

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1.4.4 Application of Standard Subdivisions at Irregular Places

Going beyond the extended meaning some standard subdivisions are shown as subject divisions and consequently moved to a division in the array. It happens if that compound subject has a subject value and considerable literary warrant. Such treatment allows further extension of such subjects. This happens usually for the geographical and historical treatment of a subject:

331.2	Wages (Labour economics)
331.29	Historical and geographical treatment of wages, Instead of 331.209

Note: "To avoid cross-classification cross-reference is provided from the probable class number likely to be looked at by the classifier to the actual number used in the schedules. For example, in the above case, the not used class number [331.209] is enclosed in square brackets, and a cross-reference here directs the classifier to 331.29".

Similarly, techniques, apparatus, and material for art metal work are 739 instead of 739.028. Though techniques, apparatus etc., is a here they have been enumerated like a subject.

534.9 is Table reviews, exercises in sound physics

Instead of 534.076.

Again in 535 optics 535.9 is Reviews and exercises in optics instead of 535.076.

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720.9 is a Historical and Geographical treatment of Architecture. But the architectures of specific ages. Instead of being provided in 720.901-.905 have been shifted to 722-724. Accordingly, at [720.901-.905] one reads the instructions "Do not use, class in 722-724."

Note: Another irregularity occurs in the case of Technology

666.3 Pottery Ceramic technology. Here, we are asked to add ss at 666.31-39, instead of at the usual place viz. 666.301-.309.

Not only this, there is one exception to this exception viz. The ss "Techniques, procedures, apparatus, equipment, the material is to be placed at 606.4. Instead of placing at the usual 666.328

Note: "Some other irregularities also occur in the case of the use of a Chronological Table. In usual cases, any chronological period division is to be taken from Table 1. where the "ss" "09" has been further subdivided as 0901 0905 enumerating all periods of history. These are attachable to any class number, but for some classes, for example, 800 Literature, and 900 History, some special "Period Tables" have been provided. Therefore, in such cases, these tables are to be used. Instead of the general one. e.g. at ss 09. In fact, in the case of Main classes, the 800 and 900 periods is a subject facet. Instead of being merely an auxiliary".

For example:

20th Century English Poetry 821.91 instead of 821.0904

Elizabethan English Drama 822.3 instead of 822.09032

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Note: Extending the irregular use of the standard subdivisions a bit further, we find numerous cases, where a geographical facet is made inbuilt in the structure of the class number. In such cases, the geographical facet is not added through the ss 09.

For example,

General Statistics of Europe 314 instead of 310.094 General Statistics of France 314.4 Instead of 310.0944 General Statistics of India 315.4 instead of 310.0954

Note: "Many a time, a classifier finds two places for the historical and geographical treatment of the subject. Both of them have their meaning.We must learn to perceive the subtle difference between the subject as an academic discipline, and the actual practical conditions in that field".

For example,

320 Political Science where

320.09	Historical and Geographical treatment of
320.9	Political science, and Political situations and conditions

The correct class number for Political conditions in India will be 320 954

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592	Invertebrate Zoology
592.009	Historical And geographical treatment of the study of Invertebrates
592.09	Geographical treatment of Invertebrate Zoology
592.0954	Invertebrates (found in India)

1.4.5 Use of Zeroes in Standard Subdivisions

In Table 1 every standard subdivision begins with a featured zero, whichis essentially a facet indicator marking the transition from subject divisions to the form division in the class number. Sometimes a featured zero may seem missing, while at others standard subdivisions may begin with one, two or even three zeroes. Wherever the position for standard subdivisions has been occupied by subject divisions, therefore, in such cases, the standard subdivisions are so designated as to precede subject divisions. This is done by denoting the standard subdivisions with two zeroes or three zeroes as the case may be.

For example:

Dictionary of Human Diseases 616.003

Journal of Constitutional Law 342.005

In the case of 350 Public Administration ss are to be added with three zeroes, as the subject division starts both with one zero or two zeroes.

Study and Teaching of the Subject of Central Government = 351.007

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Journal on Central Governments

=351.0005

1.4.6 Other rules for adding Standard Subdivisions

Subject to the above rules, a standard subdivision may be added to any class number.

- If the ultimate class number is the Main class or a Division 1.e. ends with two zeroes or one zero, the filler zeroes are to be removed before adding a standard subdivision.
- The digits are so reshuffled that the dot is placed after the first three digits.

For example,

Encyclopedia of Science

Science is 500, and Encyclopedia is an ss with notation 03, Since in 500 there are two formal zeroes, therefore these are to be removed.

The synthesized class number is

= 500+03 503

1.5 USE OF TABLE 2: AREAS

Whenever a subject is studied within the context of a geographical area, the ultimate class number from the schedules may be qualified by the area number taken from Table 2. It is mandatory to add area notation in the subjects of social sciences and humanities because in these subjects the treatment and practice of a subject vary from place to place. Here the area is more or less an essential part of the subject. "Some other disciplines may also occasionally need the area facet. Where a schedule does not authorize us to add from the area table. The area table can still be added through the ss 09 from Table 1"(Satija, 2013).

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This is the largest of all the auxiliary tables (pp. 14 to 386 out of the total of 452 pages). Its length consists not in any variety of subdivisions as it is in detail. A brief paragraph of Instructions (p.14) precedes the enumeration of area numbers. All areas of the world's natural geographical divisions, political or administrative units, or some scattered geophysical divisions of earth or some non-continuous conceptual based on various people who habitat them, have been accommodated in divisions 1 to 9. "Area 1 stands for the scattered regions bound by some geophysical or some social characteristics, for example, plane regions, forests, deserts, oceans, socio-economic regions, and so on". "Number 2 has been allotted to persons regardless of area, region place. "The modem world as divided into various continents, countries, provinces, and cities have been denoted by the notation 4 to 9. The geographical subdivisions of area number for USA 73 are far more detailed than that of any other country" (Comaromi,1978, p. 407).

The Area number is always added to the definitive number in the schedules while some classes are directly based on the geographical characteristics, so the number for areas is inbuilt there; for example,

In the class History

954 is the History of India,

973 is History for the USA,

as-54 and -73 are area numbers as taken from the Area Table

similarly,

314 is General Statistics of Europe and 315 is General Statistics of Asia

where 4 and 5 respectively are the area numbers of Europe and Asia

The use of "Table 2 for Areas" does not create any difficulty. "Whenever a class number needs extension by some geographical area, there are sufficient instructions there in the schedules to do so. Generally, a division usually at "9" in the array is left for the geographical and historical treatment of the subject" (Satija&Comaromi, 1998, p.143) :

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Political conditions:

320.9

(As per instructions, this class number is to be further subdivided by the area numbers 1 to 9 from Table 2)

Political conditions of India

320.954 (T2)

= 320.954

Political conditions in Rajasthan

320.9+544 (T2)

= 320.954 4

Political conditions in Christian Countries

320.9+1761 (T2)

= 320.91761

1.5.1 Adding Area Notation through the SS 09

Where there are no instructions but the subject of the document under classification requires the addition of an area number from Table 2, then the area number is added to the class number via the ss 09, which works as a facet indicator:

Child labour in India: an economic study

331.31+09 (T1)+ 54 (T2)

= 331.310 954

Civil Rights in Communist Countries

323.4+09 (T1) + 1717 (T2) = 323.4091717

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Note: Sometimes, an area number may be added through "0" instead of 09. For example, 920.03-09 Biographies by specific geographical areas.

Biographies of persons living in India

920.0+ 54 (T2)

= 920.054

Here as per instructions, the area number 54 for India has been added to the base number 920.0

Biographies of persons living in Rajasthan

920+0+544(T2)

= 920.054 4

Note: Sometimes an area may be further extended by the special subject divisions as in the cases of 340 Law and 350 Public administration:

Miscellaneous Public Law

343

Income Tax Law

343.052

The Indian law of Income Tax

343+54 (T2)+052 (from 343.052)

= 343.540 52

Here 343 has first been divided by country (India-54) then the resulting class number has been further extended by the subject division 052 Income Tax of 343.

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Note: "A separate provision of the area table since the 17 edition has not only allowed more details in subdivisions for various countries but has also made possible the division of the earth and population clusters from various conceptual viewpoints These are various physio geographic and socio-economic regions shown as subdivisions of 1"(Volume 1, pp. 2-13):

Atmospheric pressure in Forests

551.54+09 (T1)+ 152 (12)-551.540 915 2

Here "152" is forests from the Area Table added through the 56 09.

Note: As per instructions, each subdivision of 1 area is susceptible to be qualified by any region 3-9 from the same table. This has increased the versatility of the scheme:

Standard of Living in Indian Villages

339.47+ 09 (T1)+ 1734 (T2) +0+54 (T2)

=339.470 917 340 54

Atmospheric Pressure in Indian Forests

551.54+09 (T1) +152 (T2) 0+ 54 (T2)

=551.540 915 205 4

Note: In the schedules, many a time Instructions specify that "add areas notation 3-9 from Table 2". It only means that the areas denoted by subdivisions 1 and 2 fall outside the Jurisdiction of such instructions. In such cases, we cannot add directly areas from subdivisions 1 and 2 (Table 2). needed we can add such class numbers via the ss 09 (Volume 1, pp. 2-13):

For example:

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The foreign policy of non-aligned nations cannot have the following number:

327.1716

The correct number is 327+09 (T1)+ 1716 (T2)=327.091

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

3. Classify the titles given below using Table 2:

a. Migration of people from India to the U.S.A.
b. Migration of Buddhists to Europe
c. Exchange Rate between US dollar and Indian Rupee
d. British Colonies in Asia
e. British financial investment in the Third World
f. Emigration from India to English-Speaking Countries
g. Foreign relations with British Commonwealth Countries
h. Labour workers from Nepal in India
i. Public Libraries in Developing Countries

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1.6 USE OF TABLE 3 : SUBDIVISIONS OF INDIVIDUAL LITERATURE

As the name of this auxiliary table involves, this table is completely meant for the main class 800 literature. It was introduced, alongwith other tables, for the first time in the 18th edition (1971). Since then it has considerably simplified the number-building process in this class which has always been considered a problematic area.

Table 3 in the 19th edition has been split into two tables like 3 and 3A, the latter is only to be used on instructions from Table 3, which in turn depends upon the instructions in the main class 800 for its use. However, in sections 808 and 809 Table 3A can be directly used with the main class number on instructions from schedules.

The subdivisions detailed in Table 3 and 3A are not any new or unfamiliar but have only been precipitated from the main class, especially sections 808 and 809. These two tables have changed and made easy the mode of addition of facets. It was a step towards making DDC more faceted and easy to operate.

Table 3 consists of the standard subdivisions 01- 07 in conformity with Table 1. In the case of the *ss* 08, its perfect meaning (that it carried upto the 18th edition) has been preserved, for example, still it denotes collections and anthologies whereas for other main classes the ss 08 no more stands for anthologies, and so on. Hence it is now a more or less special standard subdivision for 800 literature. The ss -08 here can be further extended by Table 3A. The ss-09 'History, description, critical appraisal' applies to the body of literature regardless of the form or language in which the literature is written. The *ss -09* is extendable either by the period table, or by some literary viewpoints taken from Table 3A, but not by both if no form of literature is given. It may be noted that the period is to be taken not from Table 1. but each language literature has its special period (Time) tables given in the schedule of 800 (volume 2). Therefore, both the standard subdivisions -08 and -09 are somewhat modified forms of the standard subdivisions here. This table consists of the various forms of literature, which are the same for every literature irrespective of the language in which it is written:

-1 Poetry

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-2 Drama

-3 Fiction

-4 Essays

-5 Speeches

-6 Letters

-7 Satire and humour

-8 Miscellaneous

Each form subdivision has further been subdivided into its various kinds and further into varieties if any. These scopes kinds/varieties of forms have been further subdivided through a single zero, and the *ss* are also applicable to the form divisions through double zeroes. For example, take the form divisions.

Fiction:

-3001-3009	Standard subdivisions of Fiction
-301-308	Fiction of specific scope and kinds
-301 Short stories	
-306 Cartoon fiction	
-308 Specific type of fiction	
-3081	Historical and period
-3083	Sociological, psychological, realistic
-3084	Occupational
-3085	Love and romance
-3087	Adventure

Here 3. and for this reason, any bare form division 1-8 is separable by the period divisions specific to each language literature. Kinds of form do not admit period facet.

For example,

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English Fiction:	
-31	Fiction of Early English Period
- 32	Fiction of Pre-Elizabethan Period
-33	Fiction of Elizabethan Period
-34	Fiction of Post-Elizabethan Period
-35	Fiction of Queen Anne Period
-36	Fiction of Later 18th Century
- 37	Fiction of Early 19th Century
-38	Fiction of Victorian Period
-39	Fiction of 20th Century

Similarly,

Hindi fiction the period is as follows:

- 31	Hindi Fiction upto 1345
-32	Hindi Fiction from 1345-1645
-33	Hindi Fiction from 1645-1845
-34	Hindi Fiction from 1845-1895
-35	Hindi Fiction from 1845-1920
-36	Hindi Fiction from 1920-1940
-37	Hindi Fiction after 1940

After the period division, we can further add the ss special to the main class 800 as given in Table 3.

The main class 800 has thus many facets, viz. Language. Form, Period, Standard Subdivision, the latter being further extendable by a variety of viewpoints. Because of the multiplicity of facets, their citation order presents some complications especially when not all

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the facets are present. Language, Form and Period are the Central facets in their decreasing order of concreteness.

1.6.1 When Language Facet is Absent

The study of literature irrespective of the language falls in sections 801 to 809. On minutely viewing, it is clear that these are the standard subdivisions (of course modified) as applied to the bare main class:

801 Philosophy and Theory

802 Miscellany about literature

803 Miscellany about literature

805 Dictionaries, encyclopaedias, etc. Serial publications

806 Organisations

807 Study and teaching

808 Rhetoric and collections

809 History, description, critical appraisal of more than one piece of literature.

Subdivisions of 801 and part of 808 have been enumerated in the schedule: some synthesis is also possible here. However, the citation order in 808.8 "Collection from more than one literature" needs some illustrations. The citation formula is:

Base number 808.8+ Form + Period (From Table 1)

Collections from 20th Century Literature (Regardless of Form)

808.8001-8005 Collections from a specified period.

As per instructions here, we are to add to the base number 808.800 the number following 090 in 0901-0905 from Table 1 (of Standard subdivisions). Their number for the 20th Century is 0904, thus the digit following 090 is "4" only. Hence the class number is

808.800+4=808.800 4

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Similarly,

Collection of 16th Century Literature

808.800 +31 (from 09031 Table 1) = 808.800 31

Selections from the literature of the 1990s

808.800+49 (from 09049 Table 1) = 808.800 49

A Collection of Poetry

808.81

Collections from Poetry of the 1990s

808.81+0+49= 808.810 49

808.81 is a collection of poetry. This number is asterisked(*). As per instructions given under 808.81 -808.88 we have added to the 808.81 the notation for a period as explained there. Again the period has been taken from the general period table, viz. Table I of standard subdivisions. As a rule, when no language is given, the period is to be taken from Table 1 of standard subdivisions.

It may be noted that period division cannot be added to the collections of some specific forms of literature displaying a specific kind or some specific feature.

Collection of Epic Poetry of 20th Century

808.81+3= 808.813

(No period has been added)

Similarly,

Collection of 20th Century Drama on Social Themes

808.829 +355 (T3A) = 808.829 355

The notation 355 has been added from Table 3A as per instructions under 808.829. No period division for the 20th Century can be added as there are no instructions to do so.

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1.6.2 When Language is Present

Literature of specific languages is classed in 810-890. and the language makes the first facet in the citation order. The procedure for building a co-extensive class number for any language literature has been explained in the schedules on pages 1398-1400. It may be stated as follows in a simplified manner.

- The combination of main class digit 8 and the language constitutes the compound facet, which is termed the Base.
- it is the base to which all other facets are added in an ordained order.
- Base numbers for almost all the languages have been enumerated and specifically indicated.
- For some minor or obscure languages,the base number can be built with the help of the language number taken from Table 6 Languages.

For example:

891.99 Literature in other Indo-European languages.

891.991 Albanian

891.892 Armenian

891.993-1998 Others

Here the instruction reads:

Add to 891.99 the number following 9199 in Language notation 91993-91998 from Table 6, for example,

Hindi 891.998.

To the available base number in the schedule we add the facets in the following order:

Base number + Form + Period + ss 08 or 09 (Subject/viewpoint from Table 3A) (See flow charts)

It is obvious that in a given literary work all the above facets may not be present all the time. Form facet is to be taken from Table 3. General instructions have been provided in the main

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class 800 to use Table 3 and this table is regularly needed to build class numbers for titles having both the specified Language and Form. Whenever Table 3 is to be used such base numbers are marked with an asterisk(*). Even for major kinds of literature readymade class numbers adding the form facet have been enumerated. For example:

821	English Poetry
822	English Drama
827	English Satire and Humour
861	Spanish Poetry
862	Spanish Drama
863	Spanish Fiction
864	Spanish Essays
865	Spanish Speeches.
866	Spanish Letters
867	Spanish Satire and Humour
868	Spanish miscellaneous writings

Instructions to use Table 3 and to construct a class number have been explained in a programmatic manner preceding the divisions in Table 3, viz. pp. 387-388 (Volume 1). These instructions have made the facet structure quite transparent, though the instructions do not make a very easy reading mostly due to the multiplicity of facets.

In the case of individual authors, the use of standard subdivisions and their further extension by standard subdivisions and Table 3A is not admissible. Hence the books by and on an individual literary author get the same number. For example:

A critical study of John Keats' Poetry

(He was an English Poet of the early 19th Century)

82 (Base) + 1 (Form Poetry) + 7 (Period from pp. 1403) 4

=82+1+7-821.7

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(Here we cannot add the ss for criticism)

Similarly, a study of plot construction in the novels of Thomas Hardy will get the class number as follows:

82 (Base) + 3 (Form. Fiction from Table 3) +8 -82 +3 +8=823.8

Here, the criticism facet of "Plot Construction" will have to be ignored. Any work of fiction by Hardy, or any work on Hardy as a fiction writer will get the class number 823.8, and the various Victorian novelists such as Hardy, George Eliot. Thackery, Dickens, and Mrs Gaskell could only be differentiated through Book Numbers. However, the works on and by an individual writer can further be divided on the analogy of the classification of the works on and by William Shakespeare 822.33. This, however, is beyond the scope of the present work.

1.6.3 In Case The Form is Absent

In Case the Form is absent. The order of the citation formula as:

Base Number +080+ Table 3A (No period)

Base Number + 0900+ Period for that Specific literature + Table 3A for viewpoint or theme

Collection of Hindi literature on love theme.

891.43+080+354 (T3A) = 891.430 803 54

Collection of Hindi Literature on Tragedy

891.43+080+ 16 (T3A) = 891.430 801 6

Critical Study of Characters in English Literature

82+09 27 (T3A) = 820.927

History of 20th Century English Literature

82+0900+91 820.900 91

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In the facet formula, the third facet is the period in which the author flourished as a writer. It may be noted that in the case of specific language literature the period is not to be taken from the ss 09 of Table 1.

For every language, literature special period divisions enumerating the periods of that particular literature have been given in the schedules at the beginning of each language literature.

For example,

American literature, the Period Table as given under 810 is:

1 Colonial period 1607-1776
2 Post-Revolutionary period 1776-1830
3Middle 19th century 1830-1861
4 Later 19th century 1861-1900
5 Twentieth century
52 Early, 1900-1945
54 Later, 1945

In case the literature in that language is written in more than one country, then different period tables are given for each major country.

For example,

In French literature different period tables exist for Asian and African countries, Belgium, Canada and of course France. It is obvious, as each country has different periods in its literary history of that language. For instance, for French language literature Period Table for French is:

For Asian and African Countries:

1 To 1960
2 Later 20th Century, 1960
For Belgium

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1 Early Period to 1830

2 19th Century.. 1830-1900

3 20th Century.

32 Early, 1900-1945

34 Later, 1945-

For Canada

3 Colonial period to 1867

4 Later 19th Century, 1.867-1900

5 20th Century

52 Early, 1900-1945

54 Later, 1945-

For France

1 Early period to 1400.

2 15th century, 1400-1500

3 16th century, 1500-1600

4 Classical period. 1600-1715

5 18th century. 1715-1789

6 Revolution and Empire, 1789-1815

7 Constitutional monarchy, 1815-1848

8 Later 19th century, 1848-1900

9 1900

91 20th century

912 Early, 1900-1945

914 Later, 1945

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After adding the period division, the ss may be added with only one zero. Detailed instructions have been provided to give step-by-step guidance. The period division is further extendable by the standard subdivisions as taken from 1001 1009.

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Here the *ss* begins only with a single zero, as per rule. If needed, these *ss* especially 08 and 09 may further be extended by the viewpoint Table 3A.

For example,

Collection of Victorian Poetry. (It means it is English Poetry of the late nineteenth century).

Base (English Language Literature)	82
Poetry (Form. Table 3)	1
Victorian Period (pp. 1403-4 of Vol. 2)	8
Collection (as Instructed under 11-19	08Table 3)

From Table 3. We have added to the period division the number following 10 in 1001-1009, and the Collection is 1008

Hence the complete class number is

82+1+8+08 = 821.808

Similarly,

Critical appraisal of Victorian fiction

82+3+8+09= 823.809

Social themes in Victorian Fiction For a critical appraisal of Victorian fiction we have 823.809. Since 08 and 09 are further extendable by Table 3A. So, we can add to the result the appropriate notation for social themes in Table 3A which is 355.

Hence the complete class number is:

823.809+355 823.809 355

Again,

Critical study of plots in Post-War American novels:

81 (Base) + 3 (Form) + 54 (Period)

+09 (Critical appreciation, Table 3)

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+24 (Plot, Table 3A)

= 81+3+54 + 09+ 24 = 813.540 924

Some other examples:

American Literature

810

Dictionary of American Literature 81+03 810.3

(Note, the Base for American Literature is 81)

International Conference on American Literature

81+0601 (T1) = 810.601

All India Conference on American Literature

81+060 (T1)+ 54 (T2)= 810.605 4

(We have added -54 from Table 2 to the base number 060 from Table 1. This has been done as per instructions under the ss-0603-9).

History of the American Literature of the Colonial Period

81+0900 + 1 = 810.900 1

Here 1 has been added from the period Table for the American literature given on page 1401

History of 20th Century American Literature

81+0900+ 5 (p. 1401, vol..2)

= 810.900 5

History of American Literature for Children

81+09+ Notation for Children in Table 3A

= 81+09+9282 810.992 82

History of Realism in American Literature

81+ 09+ 12 (T3A. Realism) = 81+09 + 12

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= 810.912

American Poetry

81+1=811

Dictionary of American Poetry

81+ 1003 (T3) = 811.003

All India Conference on American Poetry

81+ 10060 (T3 & TI) + 54 (T2)

=811.006054

History of American Poetry 81+1009 (T3)

= 811.009

American Epic Poetry

81+ 103 (T3) = 811.03

Dictionary of American Epic Poetry

81+103 (T3) + 03 (T1)= 811.030 3)

All India Conference on American Epic Poetry

81+ 103 (T3) + 06054 (T1&T2) = 811.030 605 4

History of American Epic Poetry

81+103+09 = 811.030 9

History of Realism in American Epic Poetry

Though in the subject here period, viz. 20th Century exists, but as per provisions for the kind of poetry, we cannot add it: so we will have to ignore the period, and treat it as if it is the history of American Epic poetry irrespective of time = 81+103+09 = 811.030 9

1.6.4Literary Works Without Language and Form

Collection of 20th Century Literature

808.8

Collection from more than one literature

808.8001-.8005 Collection from Specific periods

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As per instructions, we are to add to the base number 808.800 the number following 090 in ss notation 0901-0905. from Table 1 = 808.800+4=808.800 4

It is again reminded here that the period has been taken from the general period table viz Table 1.

Collection of literature on Social Themes: 808.801-803 Collections displaying specific features.

Here, we are to add to the base number 808.80 notation 1-3 from Table 3A. In Table 3A the notation for social themes is355.

Hence the required class number is 808.80 +355 808.803 55

Anthology of Epic Poetry

(No language and period) 808.81 Collection of Poetry

808.812-818 Collection of Specific kind of Poetry

As per instructions here we are to add to the base number 808.81 the number following 10 in 102-108 of Table 3 Subdivisions of Individual literature. The notation for Epic Poetry is 103. So, as per instructions, we are to add "3" to the base 808.81808.81+3=808.813

Critical Appraisal of Romanticism in the 19th Century English Poetry

821+7+09 +145821.709 145

Portrayals of Children in Victorian English Fiction (Period is later 19th Century: the Victorian Period)

823.7+09 +352 + 054 (Table 7) =823.709 352 054

Period

822 +5 (period) + 09+ 32 (Place) from Table 3A

Account of London in English Drama of Queen Anne

=822.50932 +421 (London. Table 2)= 822.509 324 21

Depiction of India in Victorian Fiction 82+3+8+09+ 32+ 54 (Table 2)

= 823.809 325 4

Collection of English Literature written by Negroes 82+08+08 (From Table 3A) + 036 (Table 5)

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= 820.808 036

20th century French Literature - A critical appraisal

84+0900+91 (For 20th Century) = 840.900 91

Romanticism in English Poetry

82+1009 (Table 3) + 145 (Table 3A) = 821.009 145

The poet in 17th Century Spanish Novel

86+3+3 (Period) + 09+ 24 (Table 3A)= 863.309 24

Description of Women in 20th Century English Novel

82+3+91 +09+ 352 (Table 3A) + 042 (Table 7)= 823.910 935 204 2

Collection of German Language Literature written by Englishmen

83+08+0+8 (Table 3A) + 21 (Table 5)= 830.808 21

Collection of German Language Literature by Jews

83+08+0+8+ 924 (Table 5) = 830.808 924

Collection of German Language literature by Afro-Asianwriters

83+08+0+9 (Table 3 A) + 17165 (From Table 2) = 830.809 17165

Depiction of Indian religions in English Literature

82+09+ 4 (Table 3A) +294 (From the schedules001-999) 820.942 94

A critical study of the poet in Hindi Novels of the Early 20thCentury

891.433+09+24 (T3A) = 891.4330924

Contributions to Hindi Literature by Bengalis-A Critical Study (no form, no period)

891.43+09 (ss from Table 3) + 8 (Literature for and by various specificracial-ethnic, and national groups from table 3A) As per instructions, 8 is to be further subdivided by Table 5. where the notation for Bengali people is 9144

Hence the complete number is

891.43098 +9144 (Table 5) 891.430 989 144

Contribution to Hindi literature by Bengalis after 1949

891.430 900 7

Contributions of Bengalis to Hindi Poetry (No period)

891.43+ 1009+ Table 3A 891.431009 +8+9144 (Table 5)

= 891.431 009 891 44

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Contributions of Bengalis to Hindi Poetry of Post 1940

891.43+1 (Form) + 7 (Period) + 09 (ss) + Table3A+ Table 5=891.43+1 (From) +7 (period) + 09 (ss) +8 (by various national, ethnic groups, Table 3A) +9144 (For Bengalis from Table 5) = 891.431 709 891 44

Hindu Religion in British Fiction

823.009+ 4 (Table 3A) + 294.5 (from 001-999)

=823.009 429 45

Hindu Religion in 20th Century British Fiction

823+9 (Period) + 09+4+294.5 = 823.909 429 45

Collection of Hindi Literature for Children

891.43+080 (Table 3)+ 9282 (Table 3A)

= 891.430 809 282

Collection of Hindi Poetry for Children

891.43+ 10080 (T3) + 9282 (T3A) = 891.431 008 092 82

Collection of Modern Hindi Poetry for Children

891.43+1+7 (Period) + 08+ (Table 3) + 9282 (T3A)= 891.431 708 928 2

Critical study of Women Novelists of the Victorian Period

823+8 (Period) + 09+ 9287= 823.809 928 7

It may be reminded that the elements from Table 3, or 3A can only be added on instructions. A number which admits notation from Table 3 is marked with an asterisk. The number cannot be extended further where there is no asterisk. For example,

Old Low Germanic Literature

839.1

If we have old Law Germanic Poetry even then the class

Anthology of Pali Literature

891.3

Anthology of Pali Poetry 891.3 the number is 839.1

Stream of consciousness in 20th Century English Novel 82+3+91 +09+25=823.910925

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(Here no other facet is admissible)

More examples,

Anthology of French poems composed by Indians (Here there are no period divisions) Base number for French Literature84

Collection of Poetry

1008

For Indians, as per instruction, the number is to be taken from 93-99 in Table 3A.

Here 9 is the base which is to be further synthesized from Table 2, thus, the number for Indians is

9+54-954

Making 10080 as the base, we add to it the number for Indians:

84+ 1008 +0 +954 = 841.008 095 4

Collection of Hindi Lyrical Love Poetry

891.43 + 103 + 08+ 354 891.431 030 835 4

Critical appraisal of Punjabi Satirical Poetry written by the writers living in Canada

891.42+ 107 (T3) + 09 (as under-1-8(T3) +9 (from 93-99 T3A) + 71 (T2)

= 891.421 070 997 1

Here we have the instructions to go to Table 3A where the number of children writers is 9282: 82+08 +9282= 820.892 82

1.6.5 Use of Table 3 in Other Main Classes

Table 3, specifically 3A also finds use in the class 792 Theatrefor the obvious relation between theatre andliterature 792.0909 Special aspects (of Theatre)

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The instruction reads "add notations 1-3 from Table 3A to base number 792.0909...."

Theatrical dialogues

792.0909 +26 (T3A) = 792.090 926

Treatment of social Themes in Theatre

792.0909+355 (T3A)= 792.090 935 5

Since 792.1-792.8 can be further divided by 792.04-.09 so table 3A is also applicable here.

Dialogues in a comedy play 792.230 909 26

Social themes in comedies

792.230 909 355

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

4. Classify the titles given below using Table 3:

a. Bangla Fiction
b. English Fiction
c. Collections from the 20th Century
d. Collection of Epic Poetry of 20th Century

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1.7 USE OF TABLE : 4 SUBDIVISIONS OF INDIVIDUALLANGUAGES OFMAIN CLASS 400 LANGUAGE

Table 4 enlists linguistic aspects and is one of the simplest tables to use because it is exclusively used for the Main Class 400 Linguistics. If required it may also be extended to Table 6 Languages.

The facet formula that emerges is:

Base number + Table 4+ Table 6 Whenever Table 4 or Table 6 is to be used, sufficient instructions guide us by marking the base number with an asterisk*

Grammar of English Language
Base number for English = 42
Grammar (Table 4) =5
= 425
A study of words inthe Sanskrit Language
Base number for Sanskrit= 491.2
Words (T4) = 81
= 491.281
Hindi Primer (reader) for English-speaking people
491.43+864 (T4) + 21 (T6)
= 491.438 642 1

1.7.1 Bilingual Dictionaries

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The DDC can provide very precise class numbers for bilingual dictionaries. Here the language in which the words are given forms the base number: to this base number 3 Dictionaries (from Table 4) are added and to the resulting class number, the language number for the language in which meanings are given is added as taken from Table 6. Thus the formula is:

Base number + 3 (Table 4) + Table 6

For example, take "Sanskrit-German Dictionary".

Here Sanskrit forms the base number, as the words are given in Sanskrit.

491.2 + 3 (T4) + Number for German from Table 6

=491.2+3+31 491.2331

Similarly, the class number for German-Sanskrit Dictionary will be

43 +3 +912 (T6) = 433.912

(Here 43 is the base number for the German language and 912 the number for the Sanskrit language as taken from Table 6).

Similarly,

Russian-Punjabi Dictionary

491.7+3+9142-491.739 142

English-French Dictionary

42+3+41-423.41

1.7.2 Table 4 may also be supplemented by Table 6

For example,

Use of English words in the Hindi Language

It is the study of the Hindi Language so it will form the base number. For foreign elements we have 24 in Table 4 which is further extendable by Table 6:

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491.43 +24+ Number for English from Table 6

= 491.43 +24+ 21 = 491.432 421

Similarly,

French Phrases in the English language

42+24 (T4) + 41 (T6) = 422.441

English primer for Hindi Speaking Learners

42+864 +9143 428.649 143

It may further be noted that in the schedule of Main Class 400 Languages class numbers for all the known languages do not exist, but the base number for such unenumerated languages can be crystallised through the use of Table 6. Instructions to add from Table 6 exist in such cases.

For example,

Tocharian Language

(It is a member of the Baltic family of Languages and the class number for it has not been given specifically).

At 491.9 we have Baltic and other languages. Some Languages have been enumerated, 491.993-.998 are other languages. Instructions say that to obtain the class number for any of the other languages, we are to add to 491.99 the number following 9199 in 91993-91998 from Table 6.

In Table 6 Tocharian Languages is 91994. Thus the number for Tocharian Languages is:

491.99+4=491.994

Similarly Egyptian languages (Belongs to the family of Hamitic and Chad languages whose class number is 493). As per instructions at 493 the class number for Egyptian languages is:

493 + 1 = 493.1

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Similarly, for Mongolic Languages (which belong to the Attic Languages family) Base number is 494.

Thus, the class number is :

494 + 2 = 494.2

Some other Class numbers illustrate the use of Main Class 400

English Dialects

427.9

Indian English

427.9+ 54 (T2) = 427.954

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

5. Classify the titles given below using Table 4:

a. Bangla Grammar491.445
b. English Grammar425
c. Indian English
d. A study of words inthe Sanskrit Language

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1.8 USE OF TABLE : 5 RACIAL, ETHNIC AND NATIONAL

This table specifies people based upon their Racial, Ethnic or National origins. A subject can be treated among groups of people characterised by their national, racial or ethnic origin, even if there are no instructions in the schedules. Its use is very simple where there are instructions in the schedules we are simply to add the notation from Table 5 to the designated base number in the schedule.

For example,

Psychology of Negroes

For the Psychology of Specific racial and ethnic groups,

class number: 155.84

Under this class number, we have the instructions that to the base number 155.84 add the number from the Table5, where the number for Negroids is- 036. The full class number, therefore, is 155.84+036 155.840 36

Similarly,

Psychology of Swedes

155.84 + 397 155.843 97

Class Numbers for some of the lesser known religions are obtainable with the application of Table 5

Other Religions 299

299.1-.4 of Indo-European, Semitic, North African.

North and West Asians, of Dravidian origin.

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"Add Racial, Ethnic, National Groups Notation 91-94 from Table 5 to base Number 29..." For example:

Mithraism (It is a religion of Iranians)

29+915 299.15

Druidism (It is a religion of Celts)

29+916-299.16

Similarly, 299.68 is also further divisible by Table 5 to get the number for religions of specific tribes.

Another officially invited use occurs at 305.8 Social Structure of Racial Ethnic and National Groups

A Social Study of Bengalis (Bengalis are a Linguistic Ethine Group)

305.8 is the base number to which the notation for

Bengalis are to be added from Table 5, as per instructions:

305.8+9144 (T5) = 305.891 44

Encyclopedia of Jewish Society

305.8+924+03 (T1) = 305.892 403

Another inevitable use of Table 5 occurs at 641.592

Here instructions exist to add to the above base the notation from Table 5 for the Cookery of various racial, ethnic or national groups.Scientific Principles of Punjabi method of preparingfood

641.592+9142+015 (T1) = 641.592 914 201 5

Another official use of Table 5 is made at 784.76 Songs of ethnic and cultural groups, which, is a part of 784.4 Folk Songs. Under 784.76 there is an instruction to "add Racial Ethnic, National Groups notation 01-99 from Table 5 to base number 784.76". It may be noted that

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the Class number for songs of ethnicand cultural groups in the United States and Canada are already enumerated at 784.75, therefore US and Canadianculture groups do not fall at 784.76

Punjabi Folk Songs

784.76 +9142 = 784.769 142

Folk Songs of Indian Gypsies

784.76 +91497 = 784.769 149 7

Folk Songs of Dutch

784.76+3931 = 784.763 931

Folk Songs of North Americans

784.75, Not 784.76 + 1 = 784.761

Some of the numbers in Table 5 are further divisible by Table 2. For example, in Table 5 Spanish Americans 68 is further divisible by national groups of Spanish Americans by the addition of notation 7-8 from Table 2 to the base number -68.

Therefore, the class number for Libyan Society is 305.8+927612 = 305.892 761 2 Sometimes the area from Table 2 is added through zero as a facet indicator e.g. -96073 United States Blacks. For "US

blacks in Canada" the notation may be obtained by adding the area number for Canada to the above base but through the addition of a zero e.g.-96073071

Though the instructions are not explicit. the above method can be generalised, for example,

Indians in the U.S.

-91411073

Bengalis in England

-9144 (T5)+0+42 (12) =-91-44042

Brazilians in the U.S.A

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-698+0+73=-698073

Nepalis in India

-91495+0+54=-91495054

The above generalization stands approved by the note given under 305.8 where instructions are provided to study a racial-ethnic or national group of people in some countries of the world. Here the area is added to the notation from Table 5 through a 0 (zero).

Social Study of Indians in the United States.

Indians here are a national group. The base classnumber is 305.8

As per instruction, to this base, the number for Indians isadded from Table 5.

Social Study of Indians

305.8+91411=305.891 41

For Indians in the U.S.A. to the resultant class number add 0 and then the area number for the U.S.A as taken from Table 2.

305.891411+0+73 (T2)=305.891 411 073

Similarly,

Social Study of Nepalis in India

305.8+91495 (T5) +0-54 (12)

=305.8911 495 054

Folk Songs of Libyans

784.76 +927612-784.769 276 12

Use of T5 through the *ss* - 089 Apart from these, other situations demanding the use of Table 5 can be dealt with through the use of ss-089.

Child Labour among Indians

331.31+089 (Table 1) + 91411 (Table 5)

= 331.310 899 141 1

Indian Handicraftsmen in England

745.5+089 +91411 +0 +42

= 745.508 991 411 042

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Reading Habits of Indians

028.9+089 +91411 028.908 991 411

Reading Habits of Indians in England

028.908991411+0+42

=028.908 991 411 042

World History of Jews 909.04 +924 (From Table 5)

= 909.049 24

Memorials of Indian Soldiers in Europe who Fought in the World War II

940.5465+4(T2)+089(T1)+91411(T5)

=940.546 540 899 141 1

Similarly,

World History of Celts in the 20th Century

909.04 +916 (T5) + 82

= 909.049 168 2

Period subdivisions of World History as given under 909.1-909.8 (p. 1437, v. 2) can also be added with a zero as a facet indicator.

World History of Punjabis in the 19th Century

909.04 +9142 (T5)+0+8 (from 909.8)

= 909.049 142 08

Collected biographies of Jews

920.0092+924 (T5) = 920.009 292 4

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

6. Classify the titles given below using Table 5:

a. Bangla Grammar
b. English Grammar
c. Hindi Primer (reader) for English-speaking people

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d. German-Sanskrit Dictionary
e. French Phrases in English language

1.9 USE OF TABLE 6 : LANGUAGES

Whenever any subject is further dividable by a language facet the notation from Table 6 is added to the specified base number. The provision of a separate table enlisting almost all the languages has eased the process of synthesis and made possible the detailed enumeration of many lesser known languages not up till now easy.

Table 6 is to be used to supplement a number from the schedules or even from the Tables.

For example,

The division of 030 General Encyclopaedias is intoa broad languages group, which can be sorted further into individual languages by the use of Table 6.

For example:

036 Encyclopaedias in Spanish and Portuguese

For any specific language encyclopaedia in this language group add to 03 the number for the particular language in 61 69 in Table 6, as per instructions:

Spanish Encyclopaedia 03+61

=036.1

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Papiamento Language Encyclopaedia

03+68036.8

Similarly, 039 is Encyclopaedias in other languages not provided for in 031-038). Class numbers for other encyclopaedias are to be obtained by adding language notation 2-9 from Table 6 to base number 039.

VishvKosh (Encyclopaedia in the Hindi Language)

039+9143 039.914 3

General Encyclopaedia in Japanese

039+956 039.956

Similarly, class numbers for various translations of the Bible

are also got by the device of Table 6:

For different languages, we are asked to add the number for the corresponding language from Table 6 to the specified base of 220.5

Bible in Hindi

220.5+9143 220.591 43

Bible in German

220.5+31 220.531 =

Though Table 6 has been used at a fairly large number of places in the schedules the main classes 400 Linguistics and 800 Literature appear to be intrinsic fields of its applications. In these double fields, the use of this Table has already been discussed and illustrated while dealing with the use of Table 3 and Table 4 respectively.

In the Main class 400 Linguistics, all the major languages have been enumerated except for some lesser known languages. But Table 6 contains almost an exhaustive list of all the known languages.

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Therefore, the class numbers for these unenumerated languages can be obtained by the use of Table 6 on instructions.

Faliscan language is one of the Italic languages which has not been enumerated under 470-478. Therefore, it will go to 479. In Table 6 under -79 and its parts, we see that the notation for the Faliscan language is 794.

Following the above instructions, the class number for the Faliscan language is:

479+ 4 (from 794 of T6) = 479.4 (We have added to 479 the digits following 79 which isSimilar instructions appear at 491.993 -.998, 493,"4").

494, 495.92.95, 496, 497 and 498.

Again take the Tupi language (It is a South American nativelanguage). Its class number is:

498 +3 = 498.3

The use of Table 6 in conjunction with Table 4 for bilingual dictionaries in 400 has already been sufficient.

Similarly, in the 800 Literature schedule, some of the languages not enumerated can be obtained by the use of Table 6. The use here is just analogous to its use in 400 Linguistics.

For example,

(Here particular language literature in this family of languages is to be obtained by adding to the base number 893 the number following 93 in 931-937 in Table 6).

Egyptian Literature 893+1 = 893.1

(Since 931 is the Egyptian language in Table 6, and the digit coming after 93 is"1"). Similarly, Somali Literature

893+5893.5

(Since notation for the Somali language is 935 in Table 6) Another inevitable use of Table 6 is at 372.65 Foreign language skills in Elementary Schools.

The teaching of specific foreign languages in elementary schools is got by adding to the base 372.65 the relevant notation from Table 6.

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Hindi as a second language in elementary schools

372.65+9143 (T6)

= 372.659 143

German as a foreign language in Elementary Schools

372.65+31 372.653 1

Class numbers derived from 372.65 can further be synthesised by adding facets enumerated under 372.3-372

Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

7. Classify the titles given below using Table 6:

a. Egyptian Literature
b. Hindi as a second language in elementary schools
c. English Proverbs
d. Bible in Bangla

1.10 USE OF TABLE 7 : PERSONS

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This table lists persons by their social, psychological or some other individual characteristics such as health, age, marital status, and lastly and largely by their profession. The notations 01-08 denote the previous group of persons. Notations in this table cover various categories of people who may be either Male (-041), Female (-042), School Children (-044) and so on.

For example,

The social stratification of Baptists. It is a subject of sociology, where social stratification isplaced at 305, and the social stratification of various religious groups is placed at 305.6. Here as per instructions, we are to add to the base 305.6 the number following 2 in 21-29 from Table 7.

This derived class number may further be subdivided by Area table (T2) through the facet indicator 0 (zero):

The social stratification of Baptists in India

305.661+0+ 54

= 305.661 054

The social stratification of Baptists in Europe

305.661+0+4

= 305.661 04

Table 7 is extended at 390.4 Customs of people of various specific occupations. It is to be further subdivided by the Table 7 notation from 09 to 99.

For example,

Customs of Librarians

390.4092390.4 092

Customs of Historians

390.4+97390.497

where 092 and 97 are the numbers for librarians and historians respectively in Table 7.

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Similarly,

704 Special topics of general applicability infine and decorative arts can be extended by the Table 7 notation from 04 to 87.

Buddhists as Artists

704+2447704.244 7

where 2447 is the notation for Buddhism in Table 7.

Artworks by Scientists

704+5=704.5

174 is for Economical, Professional, and Occupational Ethics. Ethics of some of the professions have beenenumerated,

for example, 174.2

Ethics of Medical profession 174.3

Ethics for all other professions have been placed at 174.9. and we have been asked to get the individual class number for ethics of the rest of the professions by adding notations 09-99 from Table 7.

For example,

Ethics of Librarianship

174.9+092174.909 2

Here 092 has been taken from Table 7, where it means"persons occupied with library and information Sciences."

Ethics of Historians

174.9+97174.997

In addition to its invited use at various places in themain schedules, the use of Table 7 has also been suggested in various auxiliary tables. For instance in Table 1

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(Standardsubdivisions) "024 works for specific types of users" is furtherextendable by Table 7 for works specifying the type of user:

Library Classification for Philosophers 025.42 is classification (and for a subject of a specific type of users, we have the ss 024, which as per instructions is further divisible by Table 7. For Philosophers, we have thenotation 11 in Table 7).

Thus the complete class number is: 025.42+024 +11= 025.420 241 1

Philosophy for Librarians

100+ 024 (T1) + 092 (T7) = 102.4092

Similarly, Mathematics for Engineers = Mathematics for a specific type of users

510+024-510.24

For Engineer, we have the notation 62 in Table 7.

So the complete class number is

510.24+62-510.2462

In such cases, it is essential to differentiate between a subject by a specific group of persons and for a specific group of users. In Area, Table-176 denotes regions where specific religions predominate. Here 176 have been further divided based on some enumerated religions, while all the otherunenumerated religions have been placed at 1762-1769, and

we are asked to divide 176 by the number following 29 in 292

299 from Table 7.

For example, take "Islamic regions of the World". As per the above instructions, we will add to the base 176 the number following 29 in 292-299 in Table 7 where the number for Islam is 2971.

Thus the desired notation for the above area is :

176+27 + 71=-17671

Similarly, countries, where Buddhism prevails, is

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176+43=-17643

If say our title is "Libraries in Islamic countries of the world",

we will proceed as follows:

General Libraries 027

For geographical treatment, we are to add 027.0 (as thebase) to the area notation for the specified region from Table 2. The number for Islamic regions as already worked out is 17671. So, the appropriate class number is:

027.0+17671= 027.017 671

Wages in Islamic Countries

331.29+17671 = 331.291 767 1

The political situation in Buddhist Countries

320.9+17643 = 320.917 643

Since all the subdivisions of notation 1 in the Area

Table 2 can be added to all the subdivisions 3-9 in the Area Table through the facet indicator 009, so Table 7 is thus admissible in virtually the whole of the Area table.

For example

"Islamic Countries of Europe" will be-4+009+767 1=

-40097671(Here note that 1 in 17671 has been removed)

Similarly:

Buddhist Countries of Asia

-5+009+ 7643-50097643

Political Conditions in Buddhist Countries of Asia

320.9+50097643-320.950 097 643

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The use of Table 7 also occurs through Table 3A, which itself depends on the use of Table 3. In Table 3A, 352 is a specific kind of person, as the subject/theme of literature. As per instructions under -352 (in Table 3A) it is to be further sub-divided by the notation 03-99 from Table 7.

For example,

Treatment of lawyers in literature -352 (T3A) + 344 (T7)-352344

Similarly:

Treatment of Police officials in literature

-352 +3632-3523632

Portrayals of Grandparents in literature

-352 +0432-3520432

Another use of Table 7 in Table 3A also occurs at 92 Literature "for and by persons of specific classes." As per instructions at 392 in 3A, we are to "Add 'persons' notation 04-79 from Table 7 to 92". The reader may be again reminded here that the use of Table 3A is dependent upon Table 3 itself. Let our title be

"Collection of recent Urdu Poetry by Mathematicians".

891.439

(7 being taken from the chronological Table of Indian LiteraturesCollections (ss Table 3)

Critical appraisal of late 20th Century Hindi Drama written by Muslims

891.43+2+7+09+92+2971

= 891.432 709 922 971

(Here2 Drama from Table 3is period for another special period Table (page 1422)

09 Critical appraisal from Table 3

92 Literature special kind of person from Table 3A

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2971 Muslims from Table 7.)

Similarly, in Table 3A, 929 persons occupied withgeography, history and related disciplines are also divisible by notation 9 from Table 7. It is, in fact, a corollary of the division in 92 by Table 7.

Collection of recent Urdu Poetry Composed by Archaeologists

891.439+1+7+08 +92 +93 = 891.439 170 892 93

Collection of English Poetry composed by ProfessionalHistorians (No specific period). 821.0080+92 (T3A) + 97 (17)

= 821.008 092 97

Collection of recent Urdu Poetry by Historians

891.4391+7+08 +92 +97= 891.439 170 892 97

Even, if there are no instructions to use Table 7 in a given situation, Table 7 can be used through the ss 088:

Historical Painting drawn by School Children

756+088 (Table 1) + 0544 (Table 7)=756.088 054 4

Paintings of flowers by crippled persons

758.42+088+08166-758.420 880 816 6

Circulation Services to Blinds in Libraries

025.6+088+ 08161 025.608 808 161

The persons occupied with Generalia disciplines such as bibliographers, library scientists, and Journalists have been placed at 09.A brief introduction to applying this table precedes the table of persons (pp. 432-452 Vol. 1). This table can be used on instructions given in the main schedules or various tables, or it can be applied on its own through the ss-088. This table is used when the development, practice or state of the subject is studied concerning a specified group of persons.

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Self Check Exercise

Note: i) Write your answers in the space given below:

ii) Check your answers with the answers given at the end of this Unit.

8. Classify the titles given below using Table 7:

a. Ceramic Arts by Academician
b. Painting by Academician
c. Hindi Primer (reader) for English-speaking people
d. German-Sanskrit Dictionary
e. French Phrases in the English language

1.11 SUMMARY

The 19th edition of the DDC contains seven tables given in volume 1. Table 1 records viewpoints, mode of presentations, and internal forms of a document, for example, bibliography, encyclopedia, history, and philosophy, which are all standard subdivisions. These standard subdivisions are attachable to any class numbers in the schedules with the help of zero. In some cases, they are added with one, two or three zeros. Usually, filler zeros are removed while adding a standard subdivision to the main class to avoid contrary to the instructions.

Table 2 is a list of political, geographical, geophysical areas and population clusters of the world. Numbers from Table 2 can be added directly on instructions or through *ss-09.*Table

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3is for subdivisions of individual literature. Table 4 is for subdivisions of individual languages of main class 400, for example, Hindi, English, Bengali and so on. Where Table 5 is for racial, ethnic and national groups. Table 6 deals with languages and Table 7 is for persons. The notations from these tables (1-7) may add to the base number. Classifiers should use these with their intellect.

1.12 ANSWERS TO IN-TEXT-QUESTIONS

1.

a) 35.0005
b) 153.9400 05
c) 354+54(T2)+00072(T1) =354.540 007 2
d) 512 +003(T1) + 61(T6) =512.003 61
e) 574+015(T1)+195(from 519.5) = 574.015 195
f) 025.4+089(T1)+91411(T5) =025.408 991 4 11

2.

a) 303.4 +0954 (T1& 2) +009+734 (T2 deleting 1 = 303.409 540 097 34
b) 303.4 +0954 (T1& 2) +009+75(T2 deleting 1)+9143 (T6) = 303.409 540 097 591 43
c) 909.09+724(fromT2,following 1) = 909.097 24
d) 320.9+1716(T2)=320.917 160 6 or 320.9+6 (T2) +009+716 (from 1716,T2) =320.960 097 16
e) 909.09+724 (from1724,T1)+0+29(from 909.829) =909. 09724+0+829 = 909.097 240 829
f) 909.09+75 (from175,T2)+2 1 (T6) +81 (from 909.81) =909. 09+75+21+ 81 = 909.097 521 81

3.

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a) 304.8 +73 +0 +54 + 304.73 054

(Note that country towards which migration occurs is to be taken first and the place of origin comes later)

b) 304.8 + 4 + 0 + 176 +43 (from 292-299) = 304.840 176 43

c) 332.45609 + 73 + 0 + 54 = 332.456 097 305 4

d) 325.3 + 41 + 09 +5 = 325.341 095

e) 332.673 + 41 + 0 +1724 = 332.673 410 172 4

f) 325 .254 071 521

g) 327.091 712 41

h) 338.1 + 54 + 0 +5496 = 338.915 405 496

i) 027.4 + 09 + 172 4 = 027.40 172 4

4.

a) 891.443

b) 823

c) 80888.00 4

d)808.813

5.

a) 491.445

b) 425

c) 427.9+ 54 (T2) = 427.954

d) 491.281

6.

a) 491. 445
b) 425

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c) 491.438 642
d) 43 +3 +912 (T6) = 433.912
e) 42+24 (T4) + 41 (T6) = 422.441

7.

a) 893+1 = 893.1
b) 372.65+9143 (T6) = 372.659 143
c) 398.9+21=398.921
d) 220.59144

8.

a) 738.090
b) 750.0901
c) 491.438 642
d) 43 +3 +912 (T6) = 433.912
e) 42+24 (T4) + 41 (T6) = 422.441

1.13SELF ASSESSMENT QUESTIONS

1. Explain the use of Table 1 with suitable examples. How Standard Subdivisions are important for the classification of documents?

2.Explain the use of Table 2 with suitable examples.

3. Explain the use of Table 3 with suitable examples. Brief about the mnemonic 3 in Table 3.

4.Explain the use of Table 4 with suitable examples.Brief the use of mnemonics 9144 in Table 4 and Table 5.

5.How do classifiers useTable 5 with suitable examples? How it is different from the other 6 tables in DDC?

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6. Explain the use of Table 6 and Table 7 with suitable examples. How and where mnemonic 001 is used in Table 7?

1.14GLOSSARY

Schedules : It is a long list ofclasses arranged systematically along with their notations

Standard Subdivisions : These are non-subject recurring aspects of a subject usually represents the viewpoints of presentation of subject or the medium and form of the document. For example, philosophy, history and research Auxillary Tables and Devices 107 Page 3 Classification-DDC-19th Edition.

Tables : It is a long list of auxillary non-essential aspects of a document. In DDC-19th Edition there are Seven Tables have been listed in Volume 1.

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1.16 SUGGESTED READINGS

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LESSON 1.1

COMPUTERS: GENERATIONS, TYPES, INPUT AND OUTPUT DEVICES, COMPUTER ARCHITECTURE

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STRUCTURE

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1.1 LEARNING OBJECTIVES

After reading this chapter, you will be able to:

- Gain knowledge about the basics of computer
- Identify the different generations of computer
- Understand different types of computers and their characteristics
- Explain different types of input and output devices
- Understand the architecture of computer

1.2 INTRODUCTION

Computers have made a significant impact on our everyday life. A computer is a machine that is being used to perform a wide variety of activities. Government departments, agencies, institutions, and other similar organizations are making use of computers in a variety of their activities such as data storage, processing, and retrieval. The use of computers is also being done in libraries and information centers to improve their operational efficiencies.

Computers play a key role in our everyday lives. In addition to communication media like television, radio, and newspapers, we have another communication medium called computers. We use computers for e-mailing, chatting, internet browsing, teleconferencing, video conferencing etc. We also use computers for e-learning, e-commerce, e-banking, e-governance and many other activities. Unlike other communication devices, the most useful part of computer is that the interaction in computers is in two ways- we can be a creator as well as the user. We may use computer as a medium to get more information or as a tool to perform certain activities.

In today's information age, knowledge of computers is a must. Irrespective of the field that one specializes in, basic knowledge of computers and modern technology is an absolute necessity- may it be composing a letter or writing an article on word processor, preparing budget using a spreadsheet, sending an email, surfing the internet, making a presentation and so on. Our work has become so dependent on computers that we cannot survive without them. Also, computers are great tools in improving human productivity, provided one knows how to use them.

1.3 INTRODUCTION TO COMPUTERS

The word computer is derived from the Latin word *compute*. The term *compute* refers to calculate. A computer is an electronic device that performs arithmetic and logical calculations. It receives user input, processes the data according to a set of instructions, and

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provides the result as output. Computers perform simple and complex operations quickly and accurately(Anita Goel, 2010).

According to Merriam-Webster, “A computer, is a device that computes; specifically, a programmable electronic device that can store, retrieve, and process data”.

Fig 1.1: A Modern-day computer

Source: (*UNIVAC 1 VS Modern-Day Computer*)

Two main characteristics of computers are:

- It responds to a specific set of instructions in a well-defined manner.
- It can execute a prerecorded list of instructions.

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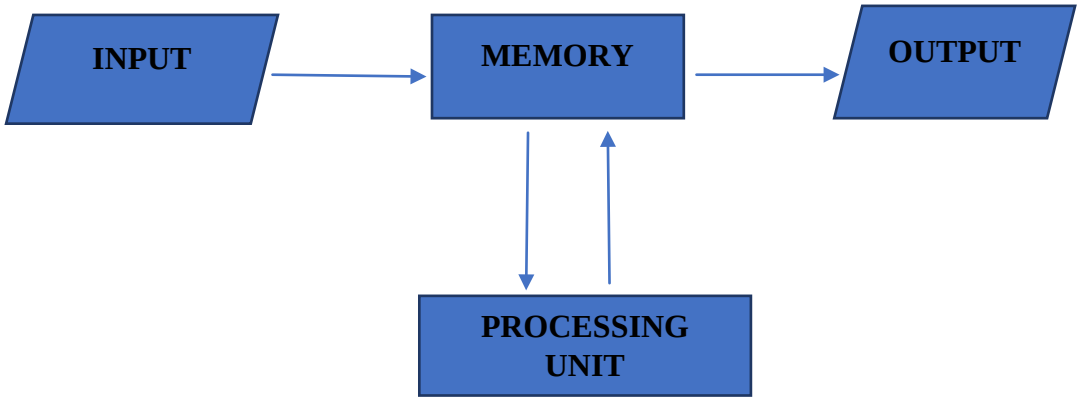

Fig 1.2: Organization of a computer

Regardless of their type or size, all computers share certain characteristics. Computers are more than just calculators; they can perform complex tasks and operations. A computer's key characteristics include: speed, accuracy, diligence, storage capacity, and versatility.

Speed: The computer can process data very fast, at the rate of millions of instructions per second. Some characteristics that would have taken hours and days to complete otherwise, can be completed in a few seconds using the computer. Example: calculation and generation of salary slips of thousands of employees of an organization, calculation of pressure and humidity of various places etc.

Accuracy: A computer can provide a high level of accuracy. Hardware errors are possible, but error detection and correction techniques will prevent false results. For example, a computer can accurately give the result of division of any two numbers up to 10 decimal places.

Diligence: Diligence means being constant and earnest in effort and application. The computer doesn't grow tired after being used for a while. It can perform long and complex calculations with the same speed and accuracy.

Storage capability: Both primary and secondary memory systems are present in computers.With more auxiliary storage devices, which can store huge amounts of data, the storage capacity of a computer is virtually unlimited. The computer can store and retrieve huge amounts of data and information as needed. One of a computer's key features is its capacity to store and retrieve massive amounts of data quickly and effectively.

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Versatility: Computers are adaptable by nature. It can carry out various duties with equal ease. They can do practically any task as long as it can be broken down into a sequence of logical steps.

1.4 GENERATIONS OF COMPUTER

Computers have developed from mechanical devices to sophisticated and complicated machines. We have observed how computers have improved in usability and accessibility. Computers are divided into generations, ranging from first generation to fifth generation, depending on the period of development and characteristics included. Every new technical advancement impacts the design of a new generation of computers, which results in better, more affordable, and more compact computers than their predecessors. (Leon & Leon, 1999). In the following table, approximate dates for each generation of computer have been mentioned:

Table 1.1: Generations of computer

Different generations of computer		
First Generation	1946-1956	Vacuum tube based
Second Generation	1956-1963	Transistor based
Third Generation	1964-1971	Integrated Circuit based
Fourth Generation	1971- Present	VLSI microprocessor based
Fifth Generation	Present and beyond	Using artificial intelligence
First Generation	1946-1956	Vacuum tube based

1.4.1 First generation

At the University of Pennsylvania in the USA, a group under the direction of Professors Eckert and Mauchly created the first digital computer in 1946 utilizing components known as vacuum tubes. This machine, known as the Electronic Numerical Integrator and Calculator (ENIAC), has 5 million soldered joints and 18,000 vacuum tubes. This computer required 160 kilowatts of power because it was such a large piece of equipment.

When Professor John Von Neumann put forth the idea of stored programmes in 1946, it marked a turning point in the logical design of computers. In order to store both stored programmes and data, he built the Electronic Discrete Variable Automatic Computer (EDVAC) with a memory. The central processing unit, which allowed tubes which led to large power dissipation, was the essential component of Von Neumann architecture.

In 1951, UNIVAC I (Universal Automatic Computer) was built by Remington Rand, and it became the first commercially available computer. This computer also used vacuum tubes.

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As vacuum tubes used filaments as a source of electrons, they had a limited life. Each tube consumed about half a watt of power. Computers typically used about ten thousand tubes which led to high power dissipation.

Due to the extensive usage of vacuum tubes, the initial generation of computers produced a lot of heat. They were expensive to run and absorbed a lot of electricity. The equipment was prone to frequent breakdowns and required ongoing repair. Because the earliest computers employed machine language, they were difficult to program.

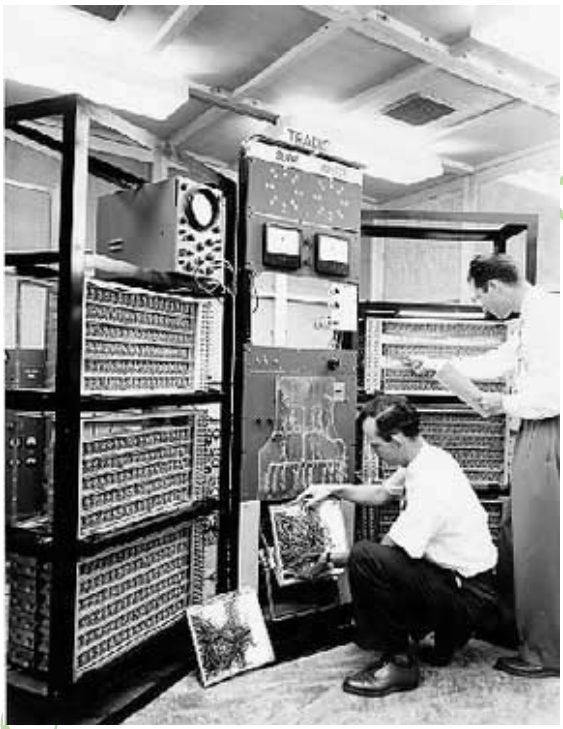

Fig 1.3: First generation computer

Source: ("*Computer - First Generation*")

1.4.2 Second generation

By 1948, the invention of the transistor by Bardeen, Brattain, and Shockley had significantly influenced the development of the computer. The transistors that replaced the large vacuum tubes were smaller, faster, more reliable, and used less energy. Transistors made of germanium semiconductor material were far more reliable than tubes because there was no filament to burn.

Second-generation computers used assembly language instead of machine language, allowing abbreviated programming codes to replace long, difficult binary codes. During this time, more sophisticated and high-level languages such as COBOL (Common Business-Oriented Language) and FORTAN (Formula Translator) became widely used. These languages

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simplified computer programming by replacing cryptic binary machine code with words, sentences, and mathematical formulae. Second generation computers include the IBM 1620, IBM 7090, Control Data Corporation's CDC 1604, and the PDP-8.

Fig 1.4: Second generation computer

Source: ("*Computer - Second Generation*")

1.4.3 Third generation

Though transistors were clearly superior to vacuum tubes, they still generated a lot of heat, which damaged the computer's sensitive internal components. The third generation began in 1965, with silicon transistors replacing germanium transistors. Jack Kilby, a Texas Instruments engineer, created the Integrated Circuit (IC), which combined three electronic components onto a small silicon disc made of quartz. Later, scientists were able to fit even more components on a single chip known as a semiconductor. As more components were squeezed onto the chip, computers became even smaller.

Magnetic core memory design has seen significant advancements. The main memory was 4 Megabytes in size. Magnetic disc technology advanced quickly. The interaction of high-capacity memory, powerful CPUs, and large disc memory resulted in the development of time-shared operating systems. It increased the productivity of programmers.

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Fig 5: Third generation computer

Source: ("*Computer - Third Generation*")

1.4.4 Fourth generation

For both the CPU and memory, the fourth generation computers used Very Large-Scale Integrated Circuits (VLSI) chips. The ability to fit so much into such a small space aided in reducing the size and cost of computers. It also increased their strength, efficiency, and dependability. The Intel 4004 chip, developed in 1971, advanced the integrated circuit by locating all computer components (CPU, memory, and input/output control) on a tiny chip. Semiconductor memories have taken the place of magnetic core memories. The emergence of microprocessors led to two directions in computer development:

- One direction was the emergence of extremely powerful personal computers. Computers' cost came down so that professionals can have their computers at home or offices. Hard disk provided a low cost, high-capacity secondary memory.
- The second direction of development was the decentralization of computer organization. Individual microprocessor controls for terminals and peripheral devices allowed the CPU to concentrate on processing the main program. Networks of computers and distributed computer systems were developed.

As computers became more common in the workplace, new ways to maximise their potential emerged. As smaller computers became more powerful, they could be linked or networked together to share memory space, software, and information, as well as communicate with one another.

Then came the age of computer networks. With the introduction of fibre optic Local Area Networks, which could transmit 100 MB/sec to 1 GB/sec, networks became extremely powerful. Many mainframes were replaced by powerful workstations connected by the fiber optic network. Another significant event that occurred during this period was the rapid

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increase in the number of computers connected to the internet. This resulted in the World Wide Web (WWW), which facilitated information retrieval.

Fig 6: Fourth generation computer

Source:("*Computer - Fourth Generation*")

1.4.5 Fifth generation

Fifth-generation computers are currently in development. Many advances in computer design and technology are combining to enable the development of fifth generation computers. Parallel processing, which replaces Von Neumann's single central processing unit design with a system that harnesses the power of many CPUs to work as one, is one of the engineering advances. Another breakthrough is superconductor technology, which allows electricity to flow with little or no resistance, increasing the speed of information flow.

Fifth-generation computers aim to solve highly complex problems that, when solved by humans, require reasoning, intelligence, and expertise. They are designed to handle large subsets of natural languages and draw on massive knowledge bases. Artificial intelligence is at the heart of the fifth generation of computers. They attempt to stimulate human thinking and reasoning. Expert systems, natural language processing, speech recognition, voice recognition, robotics, and other areas of artificial intelligence are included in the fifth generation.

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Fig 7: Fifth generation computer

Source: ("*Computer - Fifth Generation*")

IN-TEXT QUESTIONS

1. The second generation of computers used?

(a) Vacuum tubes (b) Capacitors

(c) Transistors (d) Integrated circuits

2. The third generation of computers used?

(a) Vacuum tubes (b) Capacitors

(c) Transistors (d) Integrated circuits

3. The generation based on VLSI microprocessor?

(a) 1st (b) 2nd (c) 3rd (d) 4th

1.5 TYPES OF COMPUTERS

The size, speed, processing power, and price of a computer determine which category it belongs to. However, due to rapidly changing technology, the distinction between categories is not always clear. This trend of computers and devices with overlapping technologies, known as convergence, leads to computer manufacturers constantly releasing newer models with similar functionality and features. (V.Rajaraman, 1999.)The sizes and types of

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computers available today vary. The components are broadly classified into following categories:

Supercomputers

Supercomputers are the most powerful and expensive machines. They have a faster processing speed than other computers. Weather forecasting, molecular research, nuclear research, and aircraft research all use supercomputers for highly calculation-intensive tasks. They are used in major universities, military organisations, and scientific research labs. The fastest supercomputers can process more than one quadrillion instructions per second. These computers, weighing more than 100 tonnes, can store more than 20,000 times the data and information. Supercomputers are constructed by connecting thousands of parallel-processing processors.

Mainframe

Mainframe computers are high-performance, multi-user, multi-programming computers. They can operate at high speeds, have large storage capacities, and can handle the workload of multiple users. These are large and powerful systems that are typically used in centralised databases. The user connects to the mainframe computer through a terminal, which could be a dumb terminal, an intelligent terminal, or a PC. They are capable of processing millions of programme instructions per second. Large organisations rely on these room-size systems to handle large data-intensive programmes. Mainframe computers are used in organisations such as banks or businesses where multiple people need frequent access to the same data. Most major corporations conduct business on mainframe computers. Enterprises can use mainframes to bill millions of customers, prepare payroll for thousands of employees, and manage thousands of inventory items. According to one study, mainframes process more than 83% of all transactions worldwide. In a network environment, mainframes can also serve as servers. People can also use terminals or personal computers to access programmes on the mainframe. The CDC 6600 and IBM ES000 series are two examples of mainframes.

Minicomputers

Minicomputers are digital computers that can support hundreds of users at the same time and are commonly used in multi-user systems. They outperform microcomputers in terms of processing speed and storage capacity. Minicomputers perform well in Distributed Data Processing (DDP). It denotes that a company's processing power is distributed or decentralised across multiple computers. Minicomputers, according to some experts, fall somewhere between a microcomputer and a mainframe because they are smaller than a mainframe but larger than a microcomputer. Minicomputers are smaller and lighter. These portable devices can easily fit anywhere. In comparison to their size, these devices are less expensive and extremely fast. The client/server model, in which end users process on their own microcomputers, is an example of such a computer architecture. End users can also access and share the server's resources, which are typically minicomputers.

Microcomputers

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Microcomputers are single-user digital computers that are small and inexpensive. They are made up of the CPU, input unit, output unit, storage unit, and software. Although microcomputers are self-contained machines, they can be linked together to form a network of computers that can serve more than one user. Microcomputers include the IBM PC, which is based on the Pentium microprocessor, and the Apple Macintosh. Desktop computers, notebook computers or laptops, tablet computers, handheld computers, smart phones, and netbooks are all examples of microcomputers.

Desktop computer or personal computer is the most common type of microprocessor. It is a standalone machine that can be placed on the desk. It consists of three units: keyboard, monitor and a system unit containing CPU, memory, Hard disk etc. It is suited to the needs of a single user at home, office, education sector etc.

Notebook computers or Laptop are portable and have all the features of a desktop computer. The main advantage of laptop is that it is small in size, portable, has a battery backup.

Tablet computer has the features of a notebook ut it can accept input from a pen instead of a keyboard or mouse. It is also a portable computer.

Handheld computers or Personal Digital Assistant (PDA) is a small computer that can e held on the top of a palm. They combine pen input, writing recognition and can be connected to the internet via a wireless connection. Over the last few years PDA's have merged into mobile phones to create smart phones. An example of PDA is Apple's Newton.

E-Book Readers: An e-book reader is a handheld device that is used primarily for reading e-books. An e-book, or digital book, is an electronic version of a printed book, readable on computers and other digital devices. In addition to books, users typically can purchase and read other forms of digital media such as newspapers and magazines. Most e-book readers have a touch screen and are Internet-enabled. These devices usually are smaller than tablet computers but larger than smart phones.

According to functionality, computer can be divided in to three types:

1. Analog
2. Digital
3. Hybrid

Analog Computers:

An analogue computer is a type of computer that models a problem by using continuously changing aspects of physical reality such as electrical, mechanical, or hydraulic quantities. Temperature gauge, analogue clock, and speedometer are some examples of analogue computers.

Digital Computers:

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A computer that performs calculations and logical operations using digits, typically in the binary number system of 0 and 1. IBM, Apple Macintosh, calculators, digital watches, and so on are examples of such computers.

Hybrid Computers:

A computer that can handle both analogue and digital data A hybrid computer is a type of digital computer that accepts analogue signals, converts them to digital, and then processes them digitally. A hybrid computer can use or generate analogue or digital data. It takes in a continuously varying input and converts it into a set of discrete values for digital processing. Example: A hybrid computer is one that is used in hospitals to measure a patient's heartbeat. Hybrid Machines, are generally used in scientific applications or in the control of industrial processes.

1.6 INPUT AND OUTPUT

Peripherals are input/output devices that are attached to the computer machine from the outside. The input-output devices attached to a computer allow it to interact with the outside world. The input device is used to supply data and instructions to the computer. Following the processing of the input data, the computer provides output to the user via the output device.

Any data that is to be processed by a computer must first be converted into a format that can be read by a computer's input unit. This is referred to as machine readable form. An input unit reads machine-readable data, converts it to appropriate internal code, and stores it in the computer's memory. When the programme commands it, the processed data is sent to an output unit. The output unit then converts the internal representation of data into a human-readable format.

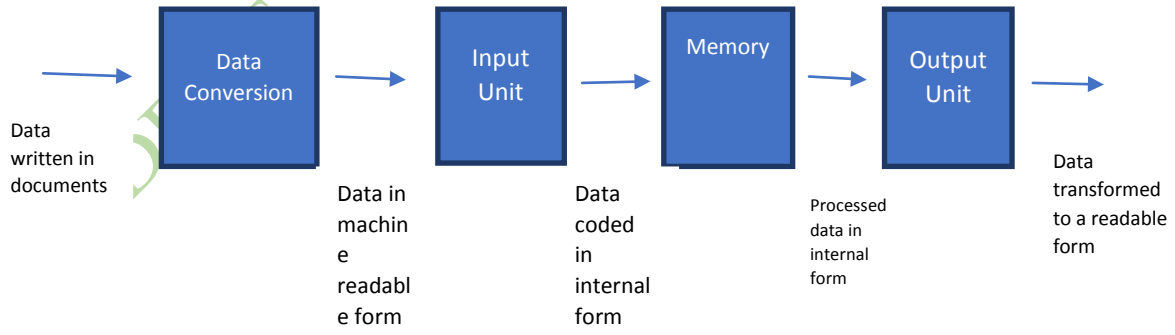

Fig 8: Illustrating steps in data input and output

In this section, we shall discuss various kinds of input and output devices.

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1.6.1 Input Devices

Users and other applications can use input devices to enter data into computers for processing. An input device converts input data and instructions into a binary format that the computer can understand. Text, audio, video, and other types of data can be entered into a computer. Some of the input devices are:

i) ***Keyboard:*** Programs and data are entered into a computer through a keyboard which is attached to the large computer. A keyboard contains typewriter-like keys which enables us to enter data into the computer. The keys are classified as Alphanumeric keys, Punctuation keys, special keys, caps lock key and so on. The standard layout of letters, numbers and punctuation is known as QWERTY.

ii) ***Mouse:*** A mouse is a pointing device. The data is entered by pointing the mouse to a location on the computer screen. The mouse may also be used to position the cursor on screen, move an object by dragging, or select an object by clicking.

iii) ***Joystick***: A joystick is also a pointing device. It is commonly used for playing video games. Its function is similar to that of a mouse. A joystick is a stick which has spherical ball at its lower end as well as its upper end. The lower spherical ball moves in the socket. The joystick can be moved right or left, forward or backward.

iv) ***Scanner***: A scanner is an input device that can read text or illustrations printed on paper and translate the information into a form that computer can use. A scanner works by digitizing an image- dividing it into a grid of boxes and representing each box with either a zero or one, depending on whether the box is filled in.

v) ***Barcode Reader:***Barcode readers are commonly used in bookstores, supermarkets, and other establishments. Photoelectric scanners called barcode readers are used to read the vertical white and black lines or barcodes that are printed on items. The product is identified by the barcode to the computer that has product information.

vi) ***Stylus:***A stylus is a tool with a pen-like shape that is used with graphics tablets or other touch-screen devices to input data. On a screen, one can write or draw similar to that on a piece of paper. In contrast to a pen, the tip of a stylus might be made of plastic or felt, depending on the device's functionality.

vii) ***Touch Screen:***A touch screen is an interactive display that enables users to interact with a computer using a pen or their finger. They're a practical substitute for a mouse or keyboard while using a GUI (graphical user interface). Many gadgets, including computer and laptop displays, mobile phones, tablets, cash registers, and information kiosks, use touch screens. Instead of using touch-sensitive input, some touch screens detect the presence of a finger using a grid of infrared rays.

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Fig 9: Input Devices*Source: ("Input Devices of Computer,")*

1.6.1 Output Devices

The output devices receive information from the computer and provide them to users. The computer sends information to the output devices in binary coded forms. Some of the output devices are:

i) ***Printer:*** A printer prints the output information from computer onto a paper. Printers are used to print textual information but nowadays printers also print graphical information. The print quality is determined by the resolution of the printer. Resolution is measured in dots per inch. Printers are classified into two categories: Impact printers and non-impact printers. Impact printers include Dot Matrix printer, daisy wheel printer and non-impact printers include Ink-jet printers and laser printers.

ii) ***Monitor:*** A monitor is a common output device. The monitor is provided along with the computer to view the displayed output. A monitor is of two kinds: monochrome display monitor and colour display monitor. Two basic types of monitors are used with microcomputers, which are as follows: **Cathode Ray Tube (CRT)**: CRT or Cathode Ray Tube Monitor is the typical monitor that you see on a desktop computer. It looks a lot like a television screen and works the same way. **Liquid Crystal Displays (LCD):** This type of monitors is also known as flat panel monitor. Most of these employ liquid crystal displays (LCDs) to render images.

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iii) ***Plotter***: A plotter is used to draw graphs, maps, blueprints of ships, buildings etc. Plotters use different colours (cyan, magenta, yellow and black) for drawing. They differ from printers because they draw lines using a pen. As a result, they can produce continuous lines, whereas printers simulate lines by printing a closely spaced series of dots. They are expensive than printers and used mostly in engineering application where precision is required. Plotters are of two kinds: drum plotter and flatbed plotter.

Fig 10: Output device*Source: ("Output Devices of Computer,")*

IN-TEXT QUESTIONS

4. The process of producing results from the data for getting useful information is called:

(a) output (b) input (c) processing (d) storage

5. Which of the following is NOT an input device?

(a) Barcode Reader (b) Scanner (c)Microphone (d) Speaker

6. What all keys can be found on a keyboard?

(a) Alphabet keys (b) Numerical keys (c) Command keys (d) All of the above

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1.7 COMPUTER ARCHITECTURE

The computer as we know it today did not appear all at once in a single machine built by a single person. A set of rules and methods that describe the functionality, organisation, and implementation of computer systems is known as computer architecture. It is concerned with balancing a computer system's performance, efficiency, cost, and reliability.

Computer architecture is concerned with designing and coordinating the operation of various units in a computer, such as the input output unit, memory, and processor, in order to use the system to execute the program as efficiently as possible. The system bus connects all the above components, which includes the address bus, data bus, and control bus. (Ram, 1994).

Von Neumann Architecture:

Von Neumann Model is the most common architecture representation of a computer system.

- It was published by John von Neumann in 1945.
- This architecture includes Arithmetic & Logic Unit (ALU), Control Unit (CU), Memory Unit, Inputs/Outputs (I/O) and Registers.
- Neumann's idea included holding data and programs in read-write Random Access Memory (RAM) and then transferring it to the Memory Unit and processor
- Neumann's idea to treat programmed instructions as data has made many programming tools possible including assembler and compiler.

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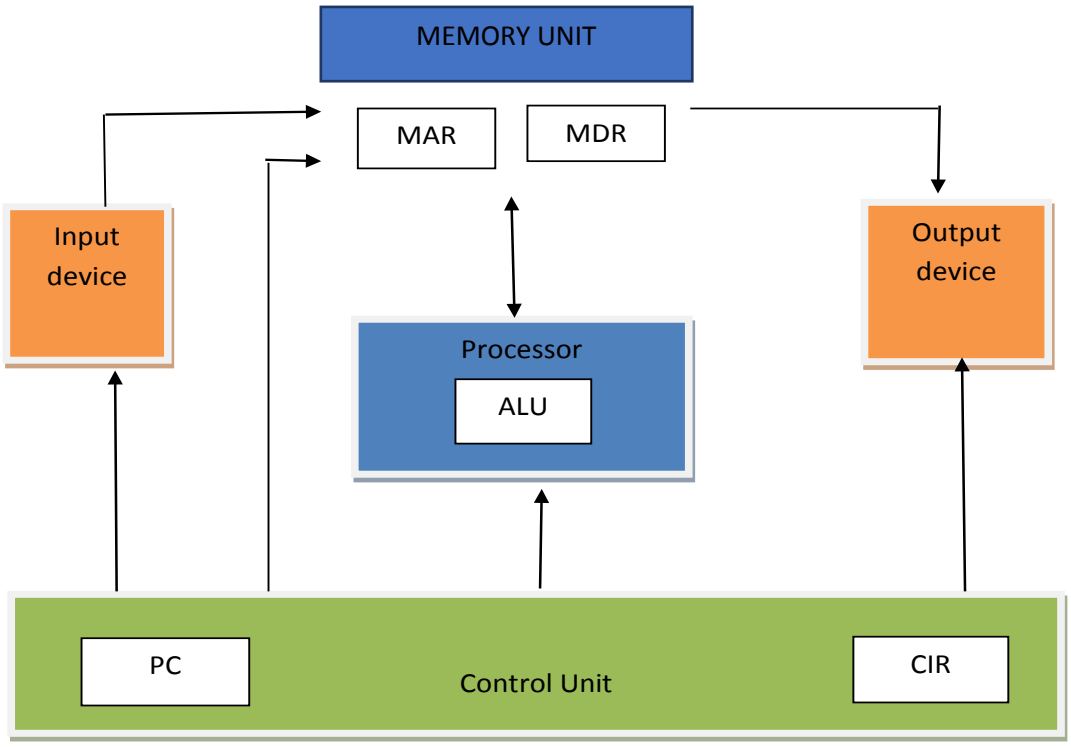

Fig: Detailed Von Neumann's Architecture

1.7.1 Inside Memory

Computer's memory comes intwo basic types:

- Random Access Memory (RAM), which the processor can read from and write to
- Read Only Memory (ROM), which the processor can never change.

Since the information in a Read Only Memory (ROM) is built into the part at the factory, ROM's retain their information even when their power is turned off. The computer's Random Access Memory (RAM) is used for changing information or for loading in programs from disk before running them. This memory does not preserve its contents when the power is turned off. The contents of RAM and ROM are organized in the same way. Each memory has number of cells, and each cell has a unique address. The lowest address is typically 0, and the highest legal address is determined by the processor- this range of address is known as the machine's address space.

The memory chips in most systems are organized so that a cell is 8 bits wide, which gives each byte a unique address. When the computer wants to read or write a location in memory,

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it needs to specify an address or read and write the specified location. The computer does this by first placing the address on the address bus, where it is carried to memory.

Computers also have another memory called a **cache**, a small, extremely fast that can be used to store information that is urgently or frequently needed. Current research includes cache design and algorithms that can predict what data is likely to be needed next and preload it into the cache for improved performance.

1.7.2 Inside Processor

The processor contains the control unit and the arithmetic/logic unit (ALU). The control unit coordinates and controls all the operations carried out by the computer. The control unit operates by repeating three operations which are:

- Fetch – cause the next instruction to be fetched from memory;
- Decode – translate the program instruction into commands that the computer can process
- Execute – cause the instruction to be executed

The arithmetic/logic unit (ALU) plays two roles:

- Arithmetic operations – these operations are addition, subtraction, multiplication and division.
- Logical operations – it compares two data items to determine whether the first one is smaller than, equal to or greater than the second item.

The Control Unit accepts one instruction from the data bus and directs the rest of the units to perform the instruction.

- The computer contains a set of memory cells internal to the processor. Each cell is typically as wide as processor's data bus. The processor can read or write data values into these locations much more quickly than it can access external memory.
- The control unit fetches data and instructions from memory and uses operations of the ALU to carry out those instructions using that data. (The control unit and ALU together are referred to as the CPU) When an input or output instruction is encountered, the control unit transfers the data between the memory and the designated Input Output controller. The operational speed of the CPU primarily determines the speed of the computer. All these components—the control unit, the ALU, the memory, and the Input Output controllers—are realized with transistor circuits.

1.7.3 Inside the Peripheral Devices

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Other devices besides memory can be found in the processor's address space. These peripherals, sometimes referred to as input/output devices, are employed by the processor to interact with the outside world. Examples include disk-drive controllers, video and audio controllers, network interfaces, and serial controllers that communicate with keyboards, mouse, and modems, among other devices.

There are three main ways in which data may be exchanged with the external world:

- **Programmed I/O**

The processor accepts or delivers data at times convenient to the processor.

- **Interrupt-driven I/O**

External events command the processor to halt the running programme so that the external event can be handled. The CPU will be interrupted by an external device (which asserts an interrupt control line into the processor), at which point it will pause the running job (programme) and launch an interrupt service routine. Data can be sent from the input to memory or from the memory to the output as part of the interrupt service.

- **Direct Memory Access (DMA)**

DMA enables data to be transmitted directly from Input Output devices to memory without the processor's constant participation. In high-speed systems, when the speed of data transport is crucial, DMA is used.

1.7.4 Buses

A bus is a group of parallel cables used to connect two or more computer components. Three distinct buses—the Control bus, the Data bus, and the Address bus—connect the CPU to the main memory. The CPU transmits an address to memory across the address bus whenever it needs to access a certain location in memory. Following that, the CPU receives the data in that memory location via the data bus. Along the control bus, control signals are transmitted.

Control Bus

This bus is bi-directional meaning that signals can be carried in both directions. All the components in the computer share the data and address buses. Control lines are used to ensure that access to and use of the data and address buses by the different components of the system does not lead to conflict. The purpose of the control bus is to transmit command, timing and specific status information between system components such as the memory, processor, keyboard input controller VDU output controller and the Disk I/O controller.

Data bus

A data bus provides a bi-directional path for moving data and instructions between system components. A typical data bus consists of 8, 16, or separate lines. The width of the data bus is a key factor in determining overall system performance. For example, if the data bus is 8

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bits wide, and each instruction is 16 bits long, then the processor must access the main memory twice during each instruction cycle.

Address bus

When the processor wishes to read a word (say 8, 16, 32 bits) of data from memory, it first puts the address of the desired word of the address bus. The address bus is used for communicating the physical addresses of computer memory elements/locations that the requesting unit wants to access.

1.8 SUMMARY

This chapter introduces us to the basic concept of computer and its characteristics. We learnt that the evolution of computer to their present state is divided into five generations of computers based on the hardware and software they use, their physical appearance and their computing characteristics. Input/output devices, the concept of stored programmes, and memory aspects have been briefly discussed. Computers are used in various areas of our life. Education, entertainment, sports, advertising, medicine, government, office, home are some of the application areas of computers. The details of information contained in the chapter will allow us to gain sufficient knowledge to work with the machine to solve problems relating to library automation and information processing.

1.9 GLOSSARY

Vacuum tube :	An electronic device that regulates electron flow in a vacuum. Many older radios, televisions, computers, and other electronic devices used it as a switch, amplifier, or display screen.
Transistor:	An electronic component that can function as both an amplifier and a switch. It is used to control the flow of electricity in radios, televisions, computers, and other electronic devices.
Integrated circuit (IC):	A small electronic circuit printed on a chip (typically silicon) that contains many of its own circuit elements (e.g., transistors, diodes, resistors, and so on).
Microprocessor:	An electronic component held on an integrated circuit that contains the central processing unit (CPU) of a computer and other associated circuits.
CPU (central processing unit):	It is frequently referred to as a computer's brain or engine because it is where the majority of the processing and operations take place (CPU is part of a microprocessor).
Cache memory:	A small area of memory in a computer that can be accessed very quickly.
Input/Output (I/O):	The communication between an information processing

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system (such as a computer), and the outside world.

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. Transistors
2. Integrated circuits
3. 4th
4. Output
5. Speaker
6. All of the above

1.11 SELF-ASSESSMENT QUESTIONS

1. What is a computer? Explain main features of a computer.
2. Define input and output devices
3. Explain in detail the generations of computer.

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LESSON 1.2

DATA REPRESENTATION AND STORAGE

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction to Data Representation

1.3Number System

- 1.3.1 Decimal Number System
- 1.3.2 Binary Number System
- 1.3.3 Octal Number System
- 1.3.4 Hexadecimal Number System

1.4 Binary Coding Schemes

1.5Binary Data Representation

1.6 Data Storage

- 1.6.1 Memory Hierarchy
- 1.6.2 Data storage units
- 1.6.3 Memory Units

1.7 Summary
1.8 Glossary
1.9 Answers to In-text Questions
1.10 Self-Assessment Questions
1.11 References
1.12 Suggested Readings

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1.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- Understand the concept of Data representation
- Learn about the different number system and their conversion
- Understand character representation including ASCII and Unicode
- Explain the fixed and floating point number formats
- Define the different data storage devices used

1.2 INTRODUCTION TO DATA REPRESENTATION

We use computers to process the data and get the desired result. The data input can be in the form of alphabets, digits, symbols, audio, video, magnetic cards. All kinds of data are represented in terms of 0 and 1 in the computer. In order to discuss how data is processed by the computer, we should first understand the form in which data is stored in its memory. In this chapter, how data is transformed or coded to facilitate its storage and processing is being discussed. Since the binary system is the foundation of the computer system, we will devote the entire lesson to the ideas of binary data representation in the computer system. You will be reintroduced to the number system ideas in this unit. The Binary, Octal, and Hexadecimal notations are among the number systems that are defined in this unit.

The data stored in computer is of different types:

- Numeric data
- Alphabetic data
- Alphanumeric data

In order to store any data in a computer the user must be able to reduce it down to the strings of the building blocks of 1 and 0. This applies to all types of data such as numbers, characters, audio and images.

1.3 NUMBER SYSTEM

A number system in base r or radix× r uses unique symbols for r digits. One or more digits are combined to get a number. The base of the number decides the valid digits that are used to make a number. In a number, the position of digit starts from the right hand side of the number. The rightmost digit has position 0, the next digit on its left has position 1 and so on. The digits of the numbers have two kinds of value: Face value and Position value.

In computer, we are concerned with four kinds of number systems:

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- Decimal Number System
- Binary number system
- Octal number system
- Hexadecimal number system

The numbers given as input to computer and the numbers given as output from the computer are generally in decimal number system which is most easily understood by humans. However, computer understands the binary number system in terms of 0 and 1. to understand the working of computer, the knowledge of binary, octal and hexadecimal number system is essential.

1.3.1 Decimal Number System:

The base or radix× of a number system is defined as the number of digits it uses to represent the numbers in the system. Since decimal numb er system uses 10 digits- 0 through 9- its base or radix× is 10. The decimal number system is also called base-10 number system. The weight of each digit of a decimal number depends on its relative position within the number. For example: consider the number 6498

$6498 = 6000 + 400 + 90 + 8$

In other words,

$6498 = 6 \times 10^3 + 4 \times 10^2 + 9 \times 10^1 + 8 \times 10^0$

From the above example, we can see that weight of the nth digit of the number from the right hand side is equal to n^{th} digit $\times$ 10^{n-1} which is again equal to nth digit $\times$ $(base)^{n-1}$. The number system, in which the weight of each digit depends on its relative position within the numbers, is called the positional number system.

1.3.2 Binary Number System:

The base or radix of the binary number system is two. It uses only 2 digits- 0 and 1which is commonly called a **bit**. Data is represented in a computer system by either the presence or absence or electronic or magnetic signals. In the binary system all numbers are expressed as groups of binary digits, called bit that is as groups of 0 and 1. Just as in any other number system, the value of binary number depends on the position or place of each digit in a grouping of binary digits. The values are based on the right to left position of digits in a binary number, using the power of 2 as position values.

For example: let us consider the binary number 10100

$10100 = 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0 = 16 + 0 + 4 + 0 + 0 = 20$

Decimal Number	Binary Equivalent	Decimal Number	Binary Equivalent

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0	0	11	1011
1	1	12	1100
2	10	13	1101
3	11	14	1110
4	100	15	1111
5	101	16	10000
6	110	17	10001
7	111	18	10010
8	1000	19	10011
9	1001	20	10100
10	1010		

Table 1.1.3 Binary equivalents of decimal number from 0 to 20

1.3.3 Octal Number System:

The base of octal number system is 8. The system is also used in computer industry. It uses eight digits 0, 1, 2, 3, 4, 5, 6 and 7. The decimal number 8 is represented by 10, 9 by 11, 10 by 12 and so on. For example, 4 is represented by 100, 6 by 110 and 7 by 111. If an octal number contains two or more than two digits each digit is individually represented by a group of three binary digits. For example, 46 is represented by 100 110 and 354 by 011 101 100.

1.3.4 Hexadecimal Number System

The base or radix× of hexadecimal number system is 16. Its digits from 0 to 9 are same as those used by decimal number system. In this number system 10 is represented by A, 11 by B, 12 by C, 13 by D, 14 by E, 15 by F. the decimal number 16 is represented by 10, 17 by 11 and so on. A hexadecimal digit is represented by four binary digits. For example, 5 is represented by 0101, A by 1010 and D by 1101. If a hexadecimal number consists of two or more than two digits, each digit is represented individually by four binary bits. Example, 86 is represented by 1000 0110.

System	Base	Digits
Binary	2	0 1
Octal	8	0 1 2 3 4 5 6 7
Decimal	10	0 1 2 3 4 5 6 7 8 9
Hexadecimal	16	0 1 2 3 4 5 6 7 8 9 A B C D E F

Conversion of Binary to Decimal number

To convert a binary number to decimal equivalent, we use the following expression:

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The weight of the n^{th} bit of a number from the right-hand side = n^{th} bit × $2^{n-1.}$

After calculating the weight of each bit, they are added to get the decimal value as shown in the following example:

$101 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 4 + 0 + 1 = 5$

$1010 = 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 8 + 0 + 2 + 0 = 10$

$1111 = 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 8 + 4 + 2 + 1 = 15$

$1.01 = 1 \times 2^0 + 0 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} = 1 + 0 + 0 + .125 = 1.125$

Conversion of Decimal to Binary number

In a decimal number, the 1^{st} position from the right hand side is for 1s, 2^{nd} for 10s, 3^{rd} for 100s, 4^{th} for 1000s and so on. Similarly, in a binary number the 1^{st} position from right hand size is for 1, 2^{nd} for 2, 3^{rd} for 4, 4^{th} for 8, 5^{th} for 16 and so on. This fact is utilized for the conversion of a decimal number to its binary equivalent.

Example: Convert the decimal number 153 to binary.

Quotient	*Remainder*
153 ÷ 2 = 76	1 (Least Significant Bit)
76 ÷ 2 = 38	0
38 ÷ 2 = 19	0
19 ÷ 2 = 9	1
9 ÷ 2 = 4	1
4 ÷ 2 = 2	0
2 ÷ 2 = 1	0
1 ÷ 2 = 0	1 (Most Significant Bit)

153 (Decimal Number) = 10011001 (Binary Number)

Checking the answer:

10011001

(Binary Number) $= 1 \times 2^7 + 0 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$

$= 128 + 0 + 0 + 16 + 8 + 0 + 0 + 1$

= 153 (Decimal Number)

1.4 BINARY CODING SCHEMES

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The alphabetic data, numeric data, alphanumeric data, symbols, sound data and video data are represented as combination of bits in the computer. The binary coding schemes that are most used are:

- Extended Binary Coded Decimal Interchange Code (EBCDIC)
- American Standard Code for Information Interchange (ASCII)
- Unicode

1.4.1 ASCII

ASCII code is used extensively in small computers, peripherals, instruments and communication devices. It has replaced many of the special codes that were previously used by manufacturers. It is a 7-bit code. Microcomputers using 8-bit word length use 7 bits to represent basic code. The 8^{th} bit is used for parity, or it may be permanently 1 or 0. With 7 bits up to 128 characters can be coded. A letter, digit or special symbol is called a character. It includes upper- and lower-case alphabets, numbers, punctuation marks, special characters and control characters. They are of two types- ASCII-7 and ASCII-8.

The main strength of ASCII is the elegance with which it represents characters. Because of the way characters are represented, it is simple to write code to manipulate upper/lowercase ASCII characters and check for valid data ranges. The 8th bit (the most significant bit) was used as a check bit in the original ASCII for error checking.

1.4.2 EBCDIC

EBCDIC, or extended binary-coded decimal interchange code, is a data-encoding system developed by IBM and mostly used on its computers that uses a unique eight-bit binary code for each number, alphabetic character, punctuation mark, accented letter, and nonalphabetic character. EBCDIC differs from Unicode and ASCII in several ways, dividing the eight bits for each character into two four-bit zones, with one zone indicating the type of character, digit, punctuation mark, lowercase letter, capital letter, and so on, and the other zone indicating the value—that is, the specific character within this type.

1.4.3 Unicode

The Unicode Standard assigns a unique number to each character, regardless of platform, device, application, or language. It has been adopted by all modern software providers and now allows data to be transported without corruption across many different platforms, devices, and applications. Unicode support is the foundation for language and symbol representation in all major operating systems, search engines, browsers, laptops, and smart phones, as well as the Internet and World Wide Web (URLs, HTML, XML, CSS, JSON, etc.). Unicode is an international character-encoding system designed to support the electronic interchange, processing, and display of written texts in a variety of modern and classical languages. Using a uniform encoding scheme, the Unicode Standard includes

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letters, digits, punctuation marks, and technical symbols for all the world's major written languages, as well as emoji and other symbols. The Unicode Consortium oversees maintaining the standard. Unicode's first version was released in 1991, and the most recent version contains over 100,000 characters. Unicode predates several encoding systems (including ASCII). Unlike previous systems, Unicode maintains the same unique number for each character on any system that supports Unicode.

1.5 BINARY DATA REPRESENTATION

A Binary number may also have a binary point, in addition to the sign. The binary point is used for representing fractions, integers and integer-fraction numbers. Registers are high speed storage areas with the CPU of the computer. All data are brought into a register before it can be processed. For example: if two numbers are to be added, both the numbers are brought in registers, added and result is also placed in the register- fixed point number representation and floating-point number representation.

Fixed Point Number Representation

In fixed point system of number representation all numbers are represented as integers or fraction. Fixed-point number representation is a real data type for a number in computing. Data is converted into binary form using fixed number representation, and then processed, stored, and used by the system. The fixed point number representation assumes that the binary point is fixed at one position either at the extreme left to make the number a fraction, or at the extreme right to make the number an integer. In both cases, the binary point is not stored in the register, but the number is treated as a fraction or integer. For example, if the binary point is assumed to be at extreme left, the number 1100 is treated as 0.1100.

Floating Point Number Representation

Scientists invented floating-point number representation to overcome the limitations of fixed-point notation. To convert input data into binary form, the computer system employs floating-point number representation. The binary form number is converted to 'scientific notation,' which is then converted to floating-point representation.

The floating-point notation has two types of notations:

- Scientific notation
- Normalized notation

The floating point representation of a number has two parts—mantissa and exponent. The mantissa is a signed fixed point number. The exponent shows the position of the binary point in the mantissa.

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For example:

The binary number +11001.11 with an 8−bit mantissa and 6−bit exponent is represented as follows: -

• Mantissa is 01100111. The left most 0 indicates that the number is positive.
• Exponent is 000101. This is the binary equivalent of decimal number + 5.
• The floating-point number is Mantissa x 2exponent, i.e., + (.1100111) x 2+5

IN-TEXT QUESTIONS

1. Which number system is used in binary number?
   (a) Decimal (b) Binary (c) Bit (d) Byte

2. What are the two digits of binary system?
   (a) 1 and 2 (b) 1 and 0 (c) 1 and 4 (d) 1 and 9

3. A computer works on a ……. number system.
   (a) binary (b) hexadecimal (c) decimal (d) octal

4. Binary number system is also called _____
   (a) base-2 system (b) base-8 system (c) base-10 system (d) base-16 system
5. What is the base value of hexadecimal number system?
   (a) 2 (b) 10 (c) 16 (d) 8

1.6 DATA STORAGE

A storage is the component within the computer system that allows to store and access data on a long-term basis.Data storage simply means that files and documents are digitally recorded and saved in a storage system for future use. If necessary, storage systems may rely on electromagnetic, optical, or other media to preserve and restore data. Data storage facilitates the backup of files for safekeeping and quick recovery in the event of a computer crash or cyberattack.

Data can be stored physically on hard drives, disc drives, USB drives, or virtually in the cloud. The important thing is that the files are backed up and easily accessible if the systems fail beyond repair. In terms of data storage, some of the most important factors to consider

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are reliability, the robustness of security features, and the cost to implement and maintain the infrastructure. Examining various data storage solutions and applications can assist you in making the best decision for your company's needs.

1.6.1 Memory Hierarchy

Memory Hierarchy refers to a memory system that is divided into two or more components, ranging from high-volume/low-speed devices for long-term storage to low-volume/high-speed devices for working storage. As the size of the unit of data transfer increases, so does the speed of data access and transfer. Similarly, slower data storage technologies are less expensive per unit of storage than faster technologies.

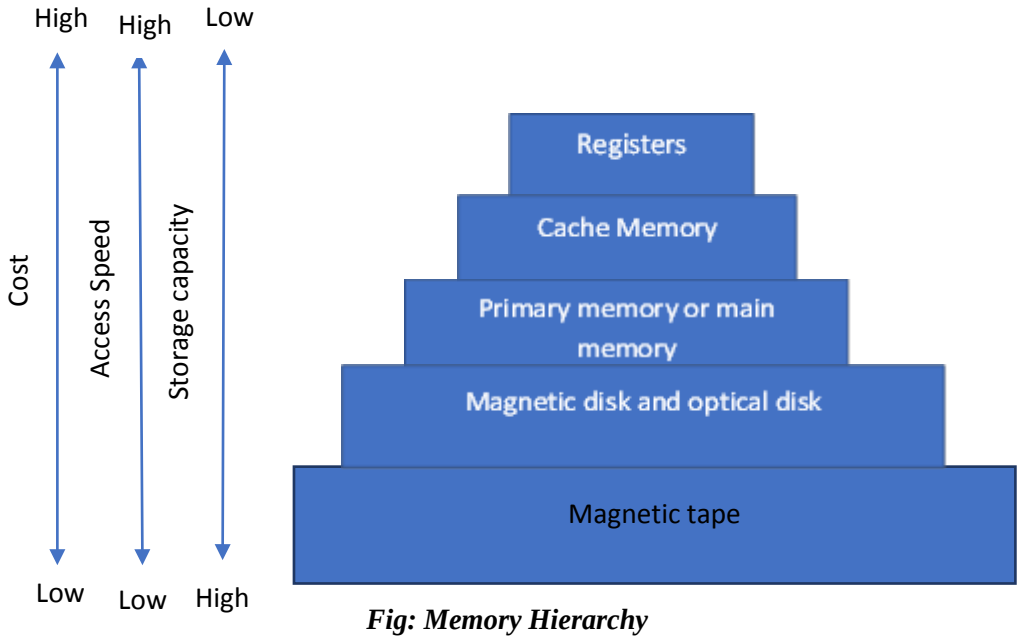

Fig: Memory Hierarchy

Now, Let us discuss briefly about each category in the memory hierarchy given in the above table:

Registers (fastest data access): They are integrated into the CPU. There are various types of registers, and their number and type are determined by the manufacturer's design. An oversimplified generic set of registers (described in subsequent sections) would include the following:

a) accumulator

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b) storage registers
c) decoder
d) instruction registers
e) Moderate address register
f) program register or program counter

Cache Memory (small, fast RAM): They are intended to store frequently used data. Cache (high-speed RAM configured to hold the most frequently used data) is commonly used to improve system performance. The memory cache, also known as the CPU cache, is a dedicated bank of high-speed RAM chips that is used to cache data from primary memory. When data is read from primary memory, a larger block that is immediately required is cached under the assumption that the next data needed by a programme will be located near the data being read; when that data is needed, it will then be waiting in the highspeed cache. Memory cache can be built into the CPU (e.g., Pentiums and PowerPCs) or contained in a separate memory cache.

Primary Memory (Moderate data access): This is also known as primary storage, primary memory, main storage, internal storage, main memory, and RAM (Random Access Memory). The primary memory of a computer is where data and instructions for processing are stored. Although it is closely related to the central processing unit, primary memory is distinct from it. Primary Memory stores programme instructions or data for the duration of the programme to which they pertain. It is not possible to keep these items in primary memory when the programme is not running for three reasons:

- Most types of memory only store items while the computer is turned on; when the machine is turned off, the data is erased.
- If multiple programmes are running at the same time (as is frequently the case on large computers and occasionally on small computers), a single programme cannot claim exclusive use of primary memory.
- There may be insufficient memory space to store the processed data.

Secondary Storage (Slowest data access): Because all of the above memory types are volatile, some mechanism must exist to'save' the data and programme permanently. Secondary storage devices make this possible.

1.6.2Data storage units

Unit	Capacity
Bit	1 or 0 (on or off)
Nibble	4 Bits
Byte	8 Bits

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Kilobyte	1024 bytes
Megabyte	1024 Kilobytes
Gigabyte	1024 Megabytes
Terabyte	1024 Gigabytes
Petabyte	1024 Terabytes
Exabyte	1024 Petabytes
Zettabyte	1024 Exabytes
Yottabyte	1024 Zettabytes

Bits are the fundamental building blocks of all computers, not just data storage. Computers operate in binary digits, combining 0's and 1's in an infinite number of patterns. These binary digits are known as bits, and they are the smallest data storage unit possible.

A byte is formed by combining 8 bits. Bytes are used to store a single character, such as a letter, number, or punctuation marks. Because all memory storage is expressed in terms of bytes, while bits are the foundation upon which data storage is built, bytes are the building blocks that truly denote the usability of any particular storage solution.

Since storage is measured in bytes, all larger units are commonly referred to by their abbreviated names. This means you could keep adding prefixes to discuss more and more data. We have petabyte (PB), exabyte (EB), zettabyte (ZB), and yottabyte (YB) above terabyte (YB).

1.6.3Memory units

Memory units are the internal storage areas in a computer. The term ‘memory’ identifies data storage that comes in the form of chips and the word ‘storage’ is used for memory that exists on tapes or disks. The term memory is referred to as the actual chips that can hold data. Some computers also use virtual memory which expands physical memory onto a hard disk. Every computer comes with a certain amount of physical memory, usually referred to as the main memory or the RAM. It can hold single byte of information. A computer that has 1 megabyte of memory can hold about 1 million bytes or characters of information.
There are two types of data storage devices used:

- The primary storage retains data in RAM (Random Access Memory), ROM (Read Only Memory
- The secondary storage stores data in hard disks, RAID (Redundant Array of Independent Disks Systems), Zip drivers, etc.

1.6.2.1 Random Access Memory (RAM)

The read and write memory of a computer is called RAM. The users can write information in RAM and read information from it. RAM is a high-speed component in devices that temporarily stores all of the information a device requires for the present and future. It is a type of computer memory that can be accessed at random, which means that any byte of

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memory can be accessed without affecting the bytes preceding it. RAM can be found in servers, personal computers, tablets, smartphones, backup drives, and other devices. RAM is now available in the form of integrated circuit chips with metal-oxide. RAM is of two types:

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

Static RAM (SRAM): The term static refers to the fact that the memory's contents are retained as long as power is supplied. However, data is lost when the power goes out due to the volatile nature. SRAM chips employ a 6-transistor matrix with no capacitors. Because transistors do not need power to prevent leakage, SRAM does not need to be refreshed on a regular basis.

Dynamic RAM (DRAM): DRAM, unlike SRAM, must be refreshed on a regular basis in order to keep the data. This is accomplished by connecting the memory to a refresh circuit, which rewrites the data hundreds of times per second. DRAM is used for the majority of system memory because it is inexpensive and small. Memory cells, which consist of one capacitor and one transistor, are used in all DRAMs.

1.6.2.2 Read Only Memory (ROM)

ROM is a non-volatile memory i.e. the information stored in it is not lost even if the power supply goes off. It is used for permanent storage of information. It is an integrated circuit that has been programmed with specific data during the manufacturing process. Not only are read-only memories used in computer systems, but also in many other electronic devices such as digital assistants, smart gadgets smartwatches, and so on.

Following are the 5 types of Read Only Memory:

MROM: MROM is an acronym that stands for Masked Read Only Memory. It is a read-only memory chip that is factory programmed (data is stored in it). MROMs are relatively inexpensive. MROMs, the first ROMs developed, were hard wired and contained a pre-programmed set of instructions or data. A software mask is burned directly onto the chip during the design phase of the MROM manufacturing process.

PROM: The acronym PROM stands for Programmable Read Only Memory. Because they are used in logic designs, PROMs are also known as PLDs. It is a device that contains both the OR plane and the AND plane in a single IC package. The AND plane is fixed, whereas the OR plane is programmable. It is also referred to as an array. A PROM's AND array functions as a decoder. The data from the address lines will be decoded. A PROM's circuits can be easily and quickly designed and modified.

EPROM:EPROM is an abbreviation for Erasable Programmable Read Only Memory. It is a non-volatile chip that was invented in 1971 by Dov Frohman at Intel. If necessary, an

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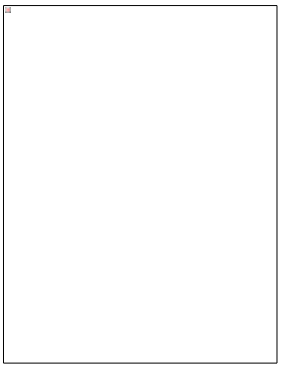
EPROM can be reprogrammed by exposing it to ultraviolet light. However, an EPROM does not save or accept new data. EPROM chips are no longer used in modern computers because EEPROM chips have taken their place. EPROM is used by hardware manufacturers when the data stored in the ROM is changed. EPROM chips are distinguished by a small quartz crystal circle window that exposes the chip and allows it to be reprogrammed.

***EEPROM*:** The acronym EEPROM stands for Electrically Erasable Programmable Read Only Memory. It is non-volatile and is used to store small amounts of data in computer systems or other electronic devices. Write and erase operations in an EEPROM are performed one byte at a time. By applying electrical potential to an EEPROM, an individual byte of data could be erased and reprogrammed entirely. George Perlegos invented EEPROM technology at Intel in 1978. PROMs and EPROMs have been replaced by EEPROMs. To make changes to an EEPROM, it does not need to be ejected from the computer system. One disadvantage of EEPROM chips is that they perform read and write cycles slowly than primary memory (RAM).

Flash Memory:Because flash memory is non-volatile, it has several applications requiring short to medium-term data storage. Flash memory technology implementations include flash USB memory sticks (also known as pen drives), camera memory cards such as compact Flashcards or CF cards, SD memory cards, and solid-state drives (SSDs) in a computer system. Flash memory is one of the most popular types of memory. Flash memory storage was created by combining traditional EPROM and E2PROM (another type of memory). Flash memory employs the same programming method as EPROM and the same erasure method as E2PROM. One important advantage of using flash memory is that it can be erased electrically. It is, however, impossible to erase each cell in flash memory individually. To accomplish this, many circuits must be added to the flash memory chip. However, doing so would significantly increase the price of the flash memory. As a result, most manufacturers abandoned this strategy in favour of a system in which the entire chip or a significant portion of it is flash erased or block erased. Most flash memory chips now have selective erasure. This enables the deletion of sections or parts of memory.



Now, we discuss the three types of media used to store computer data. These are: magnetic storage, optical storage, and solid-state storage.

Magnetic Storage devices

Magnetic storage is one of the most common types of storage used with computers. This technology is found mostly on extremely large HDDs or hybrid hard drives. Some of them include:

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- Floppy diskette
- Hard drive
- Magnetic strip
- Super Disk
- Tape cassette
- Zip diskette

Source: (*What Is a Storage Device?*)

SanDisk Ultra Flair
128 GB USB Flash Drive

Optical Storage devices

This storage device uses lasers and lights as its method of reading and writing data. Some of the common optical storage devices are:

- Blu-ray disc
- CD-ROM disc
- CD-R and CD-RW disc.
- DVD-R, DVD+R, DVD-RW, and DVD+RW disc.

Solid-State Storage Devices

Solid-state storage (flash memory) has surpassed most magnetic and optical media as the more efficient and reliable solution. Some of the common solid state storage devices include:

- USB flash drive, jump drive, or thumb drive.
- CF (CompactFlash)
- M.2
- Memory card
- MMC
- NVMe
- SDHC CardSource: (*What Is a Storage Device?*)
- SmartMedia Card
- Sony Memory Stick
- SD card
- SSD
- xD-Picture Card

Cloud Storage

Compact Disc (CD)

Complete cloud-based or online storage solutions provide virtual data storage and easy access to your materials from any location, not just your local computer or external hard disc.Cloud storage is a type of storage that uses remote servers and can be accessed from any computer with Internet access. It is maintained, managed, and monitored by a cloud storage service provider on storage servers that

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use virtualization strategies. Google Drive, iCloud, Citrix ShareFile, ownCloud, Dropbox, Amazon Cloud Drive, MediaFire, and other cloud storage providers are examples.

There are many cloud storage services available and many offer a free plan for a limited amount of space. Some of them are explained below:

- **Dropbox.com**

Dropbox.com is one of the most well-known cloud storage services. It was founded in 2007 by a man who kept forgetting to bring his flash drive with him. Dropbox encrypts the data to help keep it safe, and everything uploaded is automatically private. Dropbox has different plans for individuals and businesses, but it starts with 2 gigabytes of free storage for everyone.

- **Google Drive**

Users can store a variety of files on Google Drive. It allows users to share files with specific email addresses, publicly, or with anyone who has the link to the file (for example, if you email a link to your friends). It offers free storage of 15 gigabytes, and if one has a Gmail address, Google Drive is already accessible. Users can also collaborate and make changes to files at the same time with Google Drive. This can be beneficial to teams and groups.

- **Apple iCloud**

Apple introduced iCloud in 2011. It provides users with constant access to the most recent information from their Apple devices (iPhone, iPad, Mac, etc.). iCloud is especially useful for sharing photos, calendars, and other files with other users. Users do not need an Apple device to have an iCloud account, but information is accessible when using an Apple device or a PC with the iCloud software installed. You can, however, gain web-only access to your account, which allows to create new documents—use 'Pages' to create letters, flyers, and other documents; 'Numbers' to create spreadsheets; and 'Keynote' to create presentations. it offers 1 gigabyte of free storage in iCloud for the documents.

- **OneDrive**

Microsoft's OneDrive is a cloud storage service. It provides new users with 7 gigabytes of free storage space, and users can purchase additional storage space. It supports Office Web Apps, which allows users to create, edit, and share Microsoft Office documents directly from a web browser.

- **Amazon Cloud Drive**

Amazon.com provides a cloud storage service with 5 gigabytes of free storage. If a user already has an Amazon.com account, they can use you existing username and password to access the cloud storage service.

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1.6.4 Data Storage Format

- Microsoft Word document: .doc and .docx
- Microsoft Works document: .wps
- PDF (Portable Document Format): .pdf
- Rich text format document: .rtf
- Plain text document: .txt

IN-TEXT QUESTIONS

6. The primary memory (or main memory) of a computer consists of?

(a) RAM (b) ROM (c) both RAM and ROM (d) Cache memory

7. 7. In which type of memory, once the program or data is written, it cannot be changed?
8. (a) EPROM (b) PROM (c) EEPROM (d) None of these
9. 8. How many types of RAM are there?
10. (a) 4 (b) 3 (c) 2 (d) 5
11. Any electronic holding place where data can be stored and retrieved later whenever required is?

(a) memory (b) drive (c) disk (d) circuit

Memory is part of?

12. (a) Input device (b) Output device (c) Central Processing Unit (d) Control Unit

1.7 SUMMARY

This lesson covers the data representation in a computer system in detail. The topics covered in this section are number systems, number system conversions, and number system conversions of numbers. It introduces information representation codes like ASCII, EBCDIC, and others and explains the idea of computer arithmetic using 2's complement notation. Additionally, the idea of floating-point numbers has been discussed. The specifics of the computer's memory system have been covered. First, we talked about the idea and significance of the memory hierarchy. Computers need memory hierarchy because it offers

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an efficient, affordable memory system. The unit also includes information on the fundamental traits of RAMS and other ROM types.

1.8 GLOSSARY

Motivation: Physiological feature that arouses an organism to act towards a desired goal.

Attention: Concentration of the mental powers upon an object.

1.9 ANSWERS TO IN-TEXT QUESTIONS

1. Binary 2. 1 and 0 3. binary 4. base-2 system 5. 16	6. both RAM and ROM 7. PROM 8. 2 9. memory 10. Central Processing Unit

1.10 SELF-ASSESSMENT QUESTIONS

1. Differentiate among RAM, ROM, PROM and EPROM?
2. Describe in detail the different types of media used to store computer data?

1.11 REFERENCES

What is a Storage Device? (n.d.). Retrieved July 29, 2022, from https://www.computerhope.com/jargon/s/stordevi.htm

1.12 SUGGESTED READINGS

As per APA style (*APA Manual 6th Edition to be referred*)

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 1.3

INTRODUCTION TO SYSTEM SOFTWARE AND APPLICATION SOFTWARE

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Software: Definition
1.4Classification of software
1.5 System Software
1.4.1 Operating system
1.4.2 Utilities
1.4.3 Device Drivers
1.6 Application Software
1.6.1 Generalized packages
1.6.2 Customized packages
1.7 Difference between system and application software
1.8 Summary
1.9 Glossary
1.10 Answers to In-text Questions
1.11 Self-Assessment Questions
1.12 References
1.13 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson you will be able to:

- Understand the basic concepts of software;
- Differentiate between application software and system software;
- Explain various categories of software;

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1.2 INTRODUCTION

Software is the tool that allows a general-purpose computer system to be configured to carry out particular tasks. Each task is fully and precisely described in terms of the computer's accessible capabilities. In other terms, software may be thought of as a collection of computer programmes. Each programme is an exhaustive description of the processing that will be applied to the data that has been given to the computer.

The term "software" in computer science refers to a collection of instructions that make up a programme and are used to direct a computer's operation. The computer system uses these programmes for a variety of things. A "programme" is a set of instructions that carry out a certain task. Software development is also known as programming.

1.3 SOFTWARE: DEFINITION

Software means computer instructions or data. Anything that can be stored electronically is software, in contrast to storage devices and display devices which are called hardware. The terms software and hardware are used as both nouns and adjectives. For example, you can say: "The problem lies in the software," meaning that there is a problem with the program or data, not with the computer itself. You can also say: "It's a software problem." The distinction between software and hardware is sometimes confusing because they are so integrally linked. Clearly, when you purchase a program, you are buying software. But to buy the software, you need to buy the disk (hardware) on which the software is recorded.

Software is a code or set of instructions that instructs hardware or computers how to function. While software is typically generic, it can also be customized. Generic software is primarily created with a large client base in mind available in the market, and the programmer creates its specifications. Software that has been specifically built to meet the needs of a specific business or organisation is known as customised software.

Computers are incapable of acting independently. The computer is instructed by the user on what to do, how to do it, and when to do it. You must give the computer a certain set of instru ctions in a specific order in order for it to do any task. These instruction sets are referred to as programs.

Both the software help the computer to perform specific tasks and allow the user to interact with the system. Some may consider the two to be the same with minor differences, but they are entirely different from each other. They can be prominently differentiated from each other based on their functioning, purpose, and design. The main difference between both the software is that "*System software acts as the interface between the application software and hardware of the computer system. Whereas, the application software acts as an interface*

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between the system software and the end-user."

1.4 CLASSIFICATION OF SOFTWARE

A software package is a collection of programmes that directs hardware to carry out a specific set of operations in a specific sequence.Early software was created for certain machines and sold alongside the hardware those computers used. Software started to be marketed on floppy discs in the 1980s, and then on CDs and DVDs. Today, Most softwares can be downloaded simply from the internet. Software is mainly classified into two categories namely, System software and Application software.

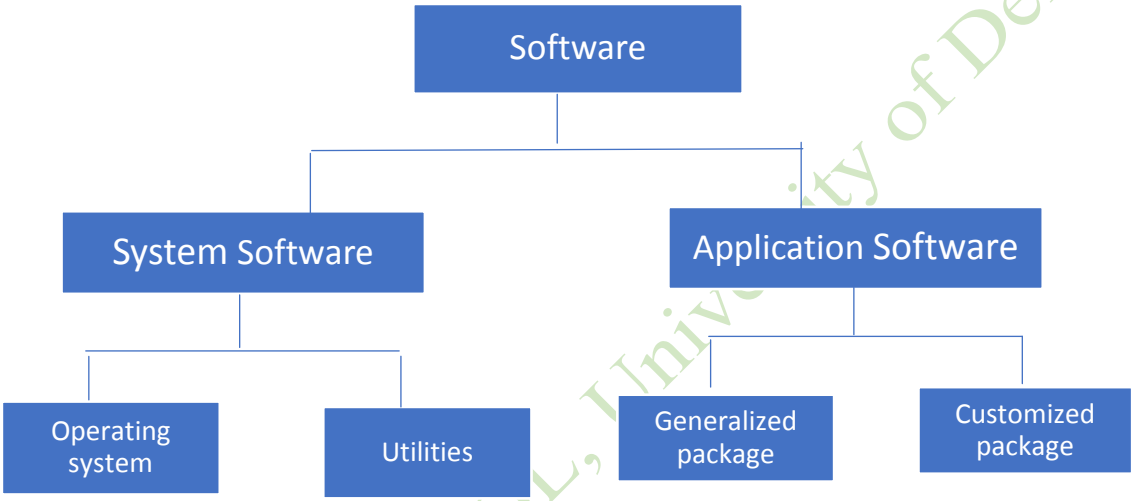

Fig 1.1: Classification of Software

In this section, we are going to discuss the various classification of software in detail.

1.5 SYSTEM SOFTWARE

System software is a collection of applications that are in charge of running the computer, controlling various computer functions, and managing computer resources.A system software assists the user and the hardware in operating and interacting with one another. It essentially manages computer hardware behaviour in order to offer the user with basic functionalities. In layman's terms, system software serves as an intermediary or a middle layer between the user and the hardware. These computer programmes authorise a platform or environment in which other applications can operate. This is why system software is critical in managing the complete computer system. When you power on the computer for the first time, the system software is initialised and loaded into the machine's memory. The system software runs in the background and is not visible to the user.

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System software is software that serves as a platform for other programmes. Operating systems, antivirus software, disc formatting software, computer language translators, and so on are some examples. These softwares are made up of programmes written in low-level languages that are used to communicate with hardware at the most fundamental level.

Fig 1.2 Some common system software.

Source:(*Different Types of Software with Examples*)

System Software is usually written using Low-level language such as Assembly language. Some essential functions of System software are:

- Disk Management
- Memory Management
- Device controlling
- Loading and execution of other programs.

Following are the **features** of a system software:

- System software is extremely tough to design.
- System software is in charge of directly connecting the computer to the hardware that allows it to run.
- Manipulation difficulties.
- It is more compact.
- System software is difficult to understand.
- It is typically written in a low-level language.
- It must be as efficient as possible in order for the computer system to perform properly.

Some of the types of system software are:

- Operating System

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- Language Processors
- Utilities
- Device Drivers

System software (or systems software) is computer software designed to operate and controlthe computer hardware and to provide a platform for running application software.System software includes the following:

- The operating system (prominent examples being z/OS, Microsoft Windows, Mac OS X and Linux), allows the parts of a computer to work together by performing tasks like transferring data between memory and disks or rendering output onto a display device. Italso provides a platform to run high-level system software and application software.
- Utility software helps to analyze, configure, optimize and maintain the computer.
- Device drivers such as computer BIOS and device firmware provide basic functionalityto operate and control the hardware connected to or built into the computer.
- A user interface that "allows users to interact with a computer." Since the 1980s the graphical user interface (GUI) has been perhaps the most common user interface technology. The command-line interface is still a commonly used alternative.

1.5.1 Operating System

It is a set of software that manages resources and provides generic services to the other applications that run on top of it. Although each Operating System (OS) is unique, the majority of them include a Graphical User Interface (GUI) that allows users to manage files and folders as well as execute other functions. Every device, whether a desktop, laptop, or mobile phone, requires an operating system to work properly. Because an operating system impacts how a user interacts with the machine, many users choose to utilise a single OS for their device. Real-time, embedded, distributed, multiuser, single-user, internet, mobile, and many other are some of the types of operating system.

Some of the examples of operating systems are: Microsoft Windows, Android, Linux, Ubuntu, Apple iOS, Apple macOS. You will learn more about operating systems more in this lesson.

An operating system performs some of the important tasks:

Memory Management:Memory management software determines where programmes store their current data in RAM. They clear out some memory-resident things.This significantly increases available memory by bringing all unused bits together in one location.

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File Management:The File Management Program simplifies the management of your files and directories. Many tools have been built to assist users in finding files, creating and organising directories, copying, moving, and renaming files.

Resource Management: The operating system is in charge of successfully allocating various resources like as Input output (I/O) devices, memory, and so on to the user. It schedules processes using time and memory management. It also maintains track of all the I/O devices and CPU so that no time is wasted and all the devices are always occupied.

Data security: The operating system manages various programmes and data in memory so that they do not mix or interfere with one another. It safeguards your computer and data against external threats and damage. With security software, only trustworthy websites and programmes could be permitted to access your computer.

Types of Operating Systems

- ***Single user Operating Systems:***These Operating Systems allow only one user to work on a computer at a time.Example: MS-DOS
- ***Multi user Operating System:*** These Operating Systems allow more than one user to work on the computer at the same time.These operating systems allocate memory in such a way that different users can worksimultaneously without disturbing each other. They also allocate the processing time in such away that every user gets a very quick response from the machine. These are also known as TimeSharing Operating SystemsExample: LINUX, UNIX, XENIX,VMS, Windows NT

1. **Language Processor/Translator**

These are intermediary programmes that allow software to transform high-level language code to simpler machine-level code. Besides simplifying the code, the translators also perform following task :

- Assign data storage
- Enlist source code as well as program details
- Offer diagnostic reports
- Rectify system errors during the runtime

Translators are of three types:

- ***Assembler*** translates assembly language programs into machine code (A binary code that a machine can understand).An assembler is a programme that converts assembly language mnemonic sequences into bit patterns that reflect machine instructions. Assembly language and machine code are one-to-one equivalents; each assembly statement may be turned into a single machine operation.
- ***Compiler*** translates high level language code into object code (which is the machine language of the target machine).A compiler converts source code written in a high-

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level language into object code (machine code) that the computer can execute. To represent a single high-level language statement, many machine actions may be required.

- ***Interpreter*** analyses and executes a high-level language program a line at a time. Execution will be slower than for the equivalent compiled code as the source code is analyzed line by line. Interpreters translate the source code. As the programme runs, the interpreter translates statements one at a time. Because it is faster than compiling the full programme, interpreters are frequently used to execute high-level language applications as they are being written. When the programme is finished and ready to be released, it will be compiled.

1.5.2 Utilities

Utility software is intended to aid in the analysis, optimization, configuration, and maintenance of a computer system. It provides assistance to the computer infrastructure. This software analyses how an operating system works and then decides how to improve the system's performance. Utility tools include software such as antivirus, disc cleanup and management tools, compression tools, defragmenters, and so on.

Some of the utility software categories are:

- **Anti-virus** utilities scan for computer viruses
- **Archivers** output a stream or a single file when provided with a directory or a set of files.Archive utilities, unlike archive suites, usually do not include compression or encryptioncapabilities. Some archive utilities may even have a separate un-archive utility for thereverse operation.
- **Backup software** can make copies of all information stored on a disk and restore eitherthe entire disk (e.g. in an event of disk failure) or selected files (e.g. in an event ofaccidental deletion).
- **Clipboard managers** expand the clipboard functionality of an operating system.
- **Cryptographic** utilities encrypt and decrypt streams and files.
- **Data compression** utilities output a shorter stream or a smaller file when provided with astream or file.
- **Data synchronization** utilities establish consistency among data from a source to targetdata storage and vice versa. There are several branches of this type of utility.
- **File synchronization** utilities maintain consistency between two sources. They may beused to create redundancy or backup copies but are also used to help users carry theirdigital music, photos and video in their mobile devices.
- **Revision control** utilities are intended to deal with situations where more than one userattempts to simultaneously modify the same file.
- **Disk checkers** can scan operating hard drive.

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- **Disk cleaners** can find files that are unnecessary to computer operation, or take upconsiderable amounts of space. Disk cleaner helps the user to decide what to delete whentheir hard disk is full.
- **Disk compression** utilities can transparently compress/uncompress the contents of a disk,increasing the capacity of the disk.
- **Disk defragmenters** can detect computer files whose contents are broken across severallocations on the hard disk, and move the fragments to one location to increase efficiency.
- **Disk partitions** can divide an individual drive into multiple logical drives, each with itsown file system which can be mounted by the operating system and treated as anindividual drive.
- **Disk space**analyzers for the visualization of disk space usage by getting the size foreach folder (including sub folders) & files in folder or drive. Showing the distribution ofthe used space.
- **Disk storage** utilities
- **File managers** provide a convenient method of performing routine data managementtasks, such as deleting, renaming, cataloging, uncataloging, moving, copying, merging,generating and modifying data sets.
- **Hex editors** directly modify the text or data of a file. These files could be data or anactual program.
- **Memory testers** check for memory failures.
- **Network utilities**analyze the computer's network connectivity, configure networksettings, check data transfer or log events.
- **Registry** cleaners clean and optimize the Windows registry by removing old registrykeys that are no longer in use.
- **Screensavers** were desired to prevent phosphor burn-in on CRT and plasma computermonitors by blanking the screen or filling it with moving images or patterns when thecomputer is not in use. Contemporary screensavers are used primarily for entertainmentor security.
- **System monitors** for monitoring resources and performance in a computer system.
- **System profilers** provide detailed information about the software installed and hardwareattached to the computer.

Utility program is used to help a computer system run more efficiently. Utility programmes can be included with the operating system or installed independently. Utility applications typically conduct maintenance, analysis, configuration, and optimization tasks.

1.5.3 Device drivers

Device drivers are computer programms designed to control peripheral devices connected to the computer.Device drivers are types of system software that reduce troubleshooting

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issues in your computer system. Internally, the operating system communicates with physical components. Device drivers make it simple to manage and regulate this connection. To drive the hardware components, the operating system includes a number of device drivers. The majority of device drivers, such as those for mouse and keyboards, are pre-installed in computer systems by computer manufacturers. However, if a new gadget for the operating system becomes available, users can install it via the internet as well. Some devices that require drivers to perform the smooth functions of any computersystem include:

- Keyboards
- Mouse
- Printers
- Function keys
- Network card
- Display card
- Touchpad
- Sound

IN-TEXT QUESTIONS

1. Which of the following is system software ?
   a) Operating system
   b) Compiler
   c) Utilities
   d) All of the above
2. A part of computer system that consist of data on computer instructions :
   a) Software
   b) Chip
   c) Hardware
   d) DOS
3. In computer operating system and utility programs are examples of :
   a) System software
   b) Device drivers
   c) Application software
   d) Customized software

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1.6 APPLICATION SOFTWARE

Application software is a collection of applications designed to accomplish specific tasks. For example, a library information system is an application package used to handle library information such as keeping book details, account holder details, book issuance details, book return details, and so on. Another application package for handling student details is the student information system, which maintains the student's roll number, name, parents' names, address, class, section, examination results processing, and so on.Application software is used for the tasks that have some relationship with the world outside the computer.

Although application software is designed to perform a specific task, some standard functions of application software are given below:

- Data Manipulation
- Writing Reports
- Creating Spreadsheets
- Managing records.

Features of Application Software

- Application software is usually written in high-level languages.
- They are larger, hence need more storage space.
- They are comparatively easy to build than system software and look more interactive.
- Each application software is used to perform a specific task.

Depending on the functions rendered by the application software, there are many types of application software:

a. **An application suite** consists of multiple applications bundled together. They usually have related functions, features and user interfaces, and may be able to interact with each other, e.g. open each other's files. Business applications often come in suites, e.g. Microsoft Office, LibreOffice and iWork, which bundle together a word processor, aspreadsheet, and so on but suites exist for other purposes, e.g. graphics or music.

b. **Enterprise software** addresses the needs of an entire organization's processes and dataflow, across almost all departments, often in a large distributed environment. (Examplesinclude financial systems, customer relationship management (CRM) systems andsupply). Departmental Software is a sub-type of enterprise software with a focus onsmaller organizations and/or groups within a large organization. (Examples includetravel expense management and IT Helpdesk.)

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c. **Enterprise infrastructure** software provides common capabilities needed to supportenterprise software systems. (Examples include databases, email servers, and systems formanaging networks and security.)
d. **Information worker** software lets users create and manage information, often forindividual projects within a department, in contrast to enterprise management. Examplesinclude time management, resource management, documentation tools, analytical, andcollaborative. Word processors, spreadsheets, email and blog clients, personalinformation system, and individual media editors may aid in multiple information workertasks.
e. **Content access software** is used primarily to access content without editing, but mayinclude software that allows for content editing. Such software addresses the needs ofindividuals and groups to consume digital entertainment and published digital content.(Examples include media players, web browsers, and help browsers.)
f. **Educational software** is related to content access software, but has the content and/orfeatures adapted for use by educators or students. For example, it may deliver evaluations(tests), track progress through material, or include collaborative capabilities.
g. **Simulation software** simulates physical or abstract systems for research, training orentertainment purposes.
h. **Media development** software generates print and electronic media for others toconsume, most often in a commercial or educational setting. This includes graphic-artsoftware, desktop publishing software, multimedia development software, HTML editors,digital-animation editors, digital audio and video composition, and many others.
i. **Product engineering** software is used in developing hardware and software products.This includes computer-aided design (CAD), computer-aided engineering (CAE),computer language editing and compiling tools, integrated development environments,and application programmer interfaces

Some of the various types of application software are:

1.6.1 Generalized Packages

These are user friendly software written to cater to user's very general needs such as preparing documents, drawing pictures, database to manage data/information, preparing presentations, play games, etc. It is a group of programs that provide general purpose tools to solve specific problems.

Some of the generalized packages are discussed in detail below:

1. **Word processors**

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Word processing is one of the most widely used types of software nowadays. Word processing programmes, developed as a successor to primitive text editors that were exclusively available on mainframe computers, offer interactive editing of texts, allowing quick redrafting and merging of parts of existing works without the need for considerable retyping. Most popular programmes include functions such as spell checking, outlining, font selection, line drawing, and page layout. The user can manipulate text using word processing software. This is a very useful function for arranging tables or text columns.They are used to create, edit save andprint documents.For Example:

- Abiword
- Apple iWork- Pages
- Corel WordPerfect
- Google Docs
- MS Word

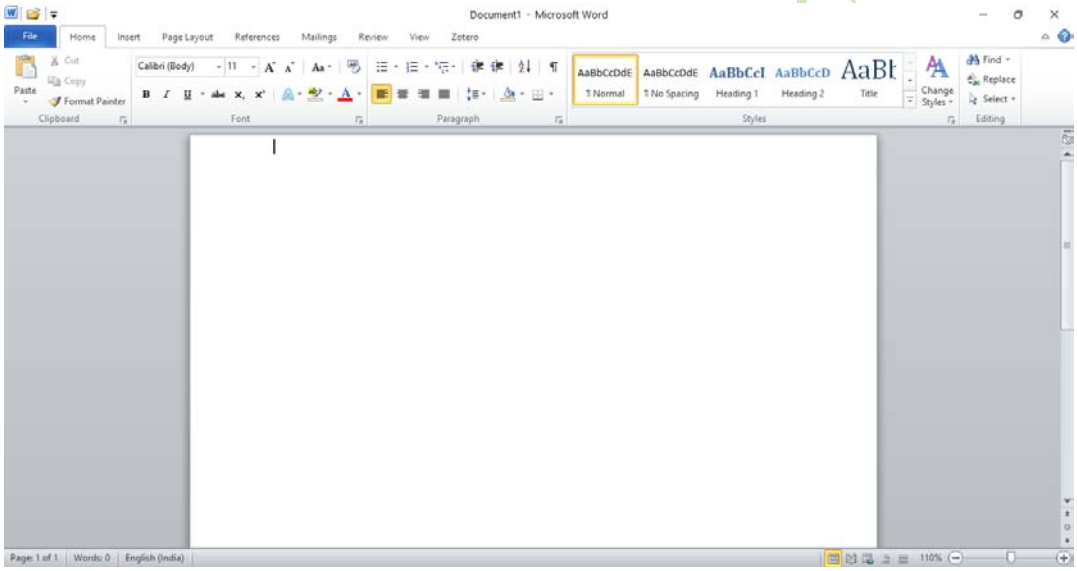

Fig: Screenshot of Ms Word 2010

2. Spreadsheet

Although MS-Word is an excellent word processing software package, it is inconvenient for entering data in tabular form, doing mathematical calculations, and displaying results in graphical form. Management personnel utilise the **MS-Excel software** programme instead of paper sheets or ledgers. It is used to store information in the computer system's memory, calculate the result, and show the information on the computer screen in the desired manner.Some, common applications of MS Excel worksheet are: Inventory control, Payroll,I ncome Tax calculation, Price list and invoice billing.

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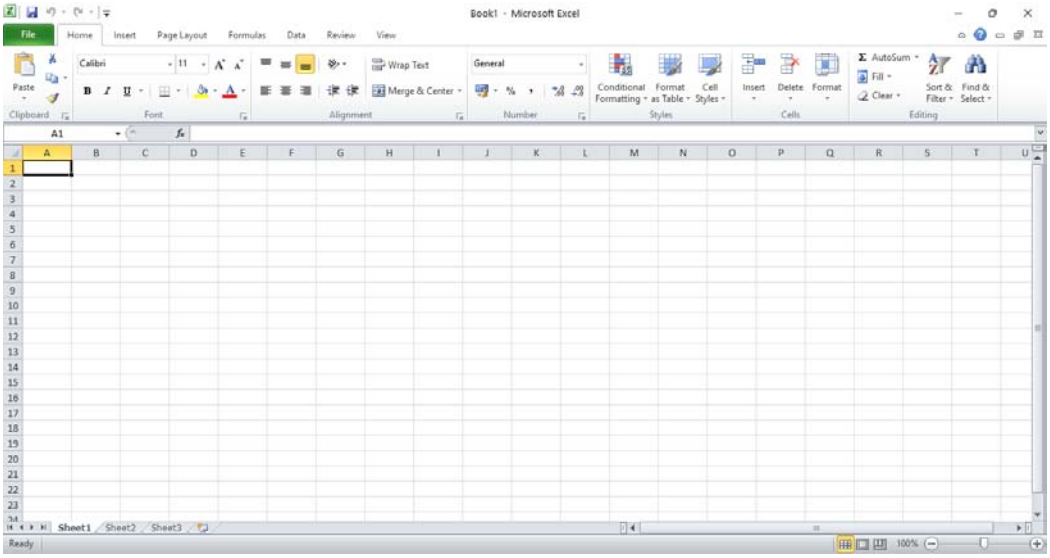

Fig: Screenshot of Ms Excel 2010

3. Graphics Software:

Graphics Software, as the name implies, was created to deal with graphics by allowing the user to modify or update visual data or images. It includes image editors and illustration tools.They are also used to create and manipulate presentation graphics, freehandgraphics, charts etc. For example:

- Adobe Photoshop
- MS Powerpoint
- Autodesk Maya
- Blender
- Carrara
- CorelDRAW
- GIMP
- Modo
- PaintShop Pro

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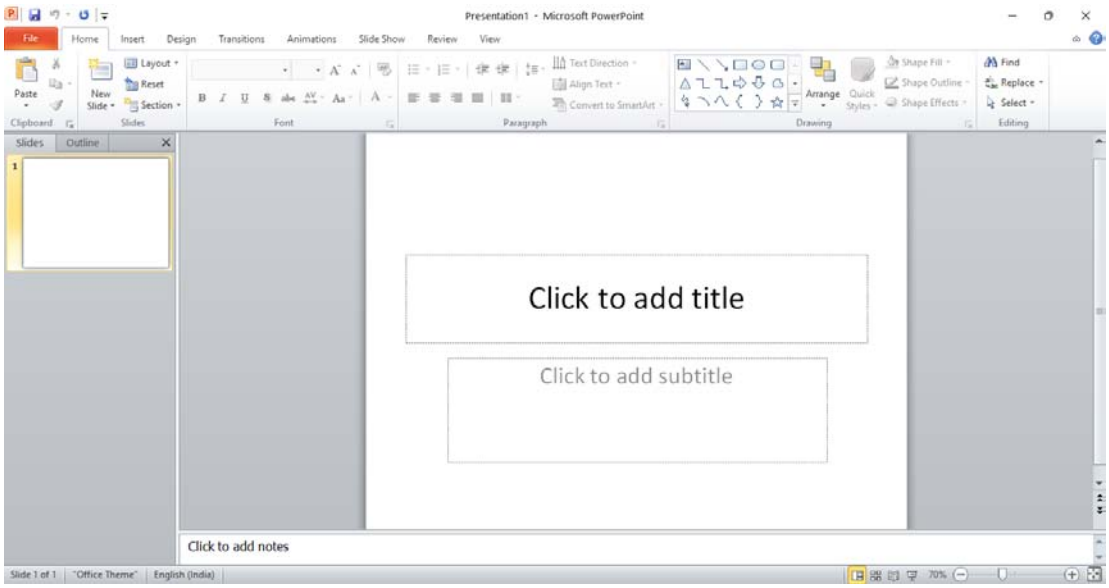

Fig: Screenshot of Ms Powerpoint 2010

4. Database software

Database software is used to create and maintain databases. It is often referred to as the Database Management System (DBMS). They assist with data organising.DBMS is used in practically every aspect of our lives, including education, office, and industry. It enables the storage and management of massive amounts of data. For example:

- Clipper
- dBase
- FileMaker
- FoxPro
- MS Access
- MySQL

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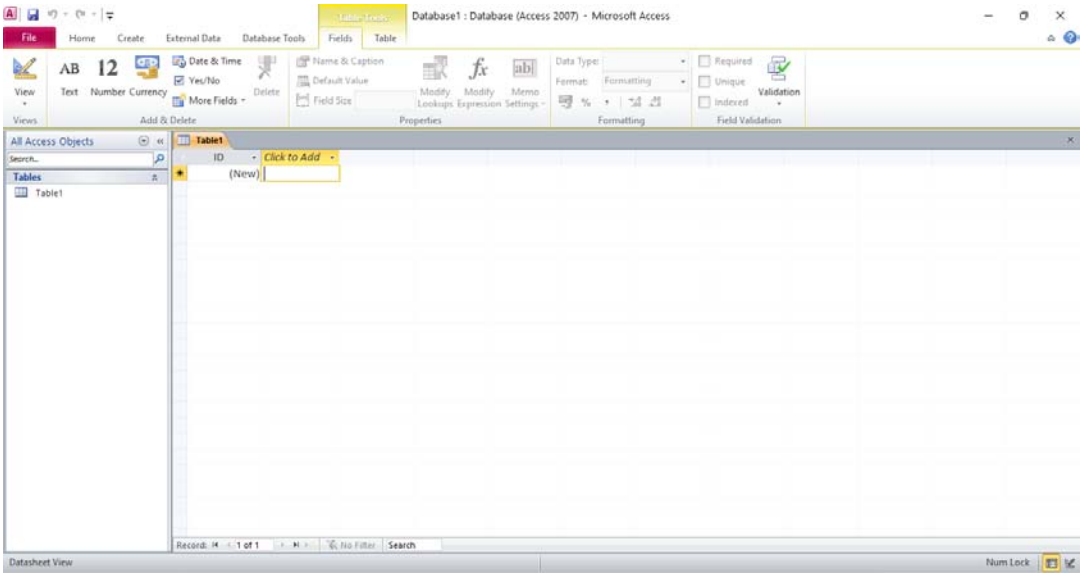

Fig: Screenshot of Ms Access 2010

5. Multimedia Software

It is the software that can play, generate, and record picture, audio, and video data. They are used in video editing, animation, graphics, and image editing, among other things. For example:

- Adobe Photoshop
- Inkscape
- Media Monkey
- Picasa
- VLC Media Player
- Windows Media Player
- Windows Movie Maker

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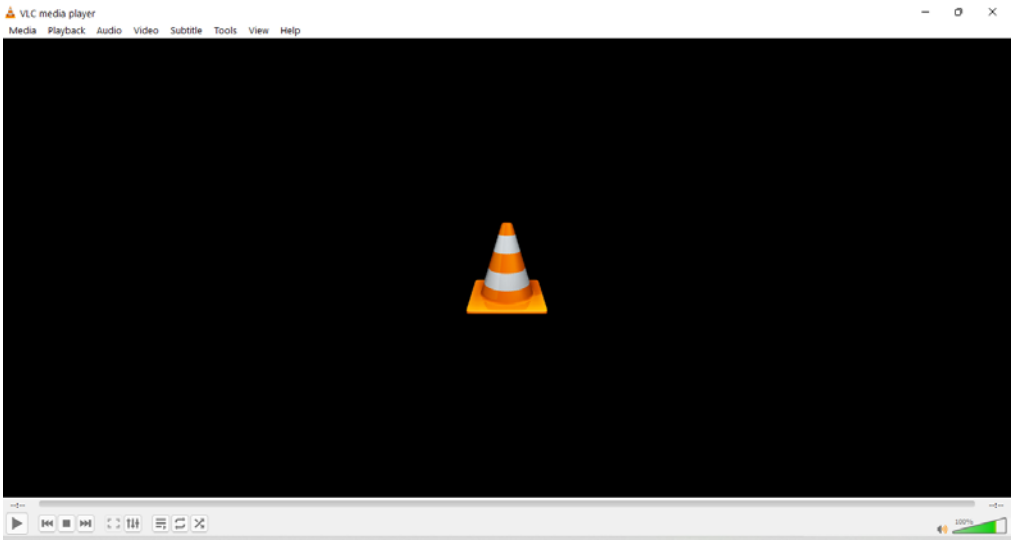

Fig: Screenshot of VLC media player

1.6.2 Customized Packages

These are programmes that have been modified (or produced) to satisfy the special needs of a company or institution. For example, student information, payroll packages, inventory control, library housekeeping software. These programmes are written in a high-level computer language.

The market is flooded with a wide range of software programmes created specifically to support library housekeeping operations like acquisition, cataloguing, circulation management, serials control, and so on. Some of these are integrated packages that cover a wide range of functions, while others focus on specific processes such as cataloguing. For example: Koha, Virtua, Libsys

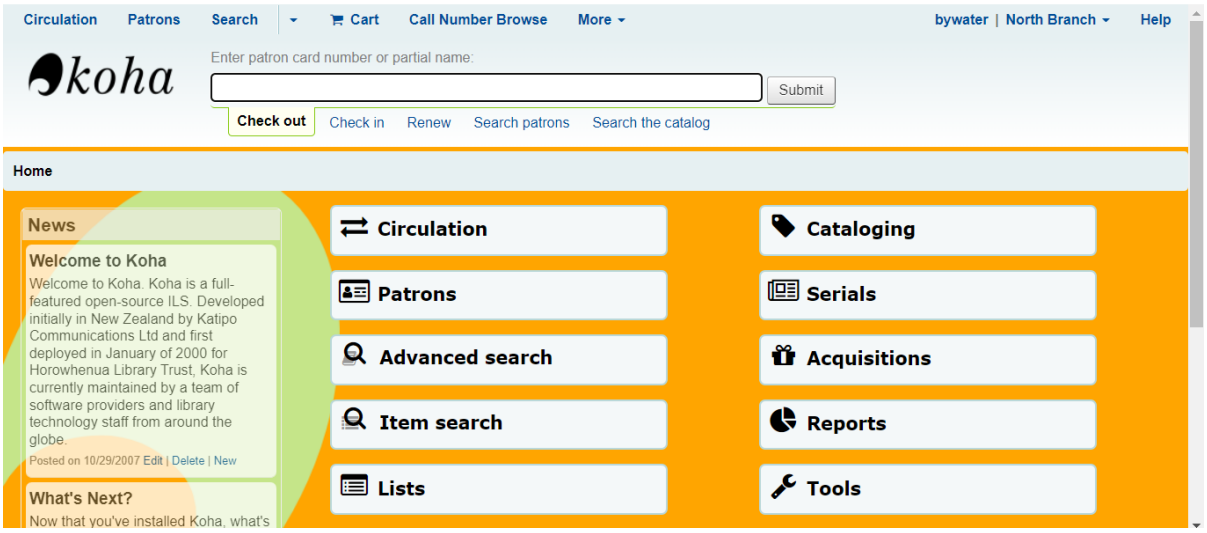

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Fig: Screenshot of Koha library software

1.7 DIFFERENCE BETWEEN SYSTEM AND APPLICATION

SYSTEM SOFTWARE	APPLICATION SOFTWARE
System software is a set of computer programs that is designed to manage system resources.	Application Software is a type of software that is mainly developed to perform a specific task as per the user's request.
It acts as an interface between the Application Software and Computer hardware.	It acts as an interface between the end-user and System Software.
It is a general-purpose software.	It is a specific-purpose software.
System software is usually installed on the computer system at the time of OS installation.	Application Software is usually installed on the system as per the requirement of the user.
This software runs independently and works as a platform for working application software.	This software is not capable of running independently, which means they need system software to work on.
These are usually written in low-level languages such as Assembly language.	These are usually written in a high-level language such as C, C++, Java, etc.
System software work on the background, hence user don't directly interact with them.	Application software work on user-interface, hence user directly interact with them.
A system software starts running as we turn on our computer system and stops when the system is turned off.	Application software runs as per user request. It means when we launch them, then only they start and stop when we close them.
The development of System software is complicated and takes more time compared to application software, as they are built by considering the hardware compatibility.	Development of Application software is comparatively easier and takes less time than system software.
A computer system can't run without system software.	A computer system can always run without application software. However, for users, it is required to have some important application software to work on.
The working of system software is automated and starts functioning automatically after starting the computer system.	The working of application software is manual, which means the user needs to start using it.
Examples of System Software are Operating systems, Compiler, Assembler, Device drivers, etc.	Examples of Application Software are Web browsers, MS office, Graphic design software, etc.

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IN-TEXT QUESTIONS

4. Which of the following is not application software?
   a) Windows 7 c) Wordpad
   b) Photoshop d) MS Excel
5. What is the alternative name for application software?

a) End-user software
b) Utility software
c) Specific software
d) All of these

6. Application software

a) Performs a specific task for computer users
b) Includes programs designed to help programmers
c) Is used to control the operating system
d) All of these

1.6 SUMMARY

In this lesson, you learned about software, types of software, and operating systems. The term software refers to a set of instructions or data that is loaded into a computer system for processing. Software is further classified into two types: system software and application software. System software maintains all of the computer's resources as well as the responsibility of keeping records in files and folders. Application software is used to do specific tasks with the assistance of an operating system and hardware. For example, writing letters, creating presentation slides, drawing, and so on.

Therefore, we can say that although both are types of Software, both are much different from each other. Both are designed in a different way, used in a different way, and also worked in a different way. System software helps the computer system to manage the resources and function smoothly, while application software is user-specific and helps the user to manage and perform their specific tasks.

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1.7 GLOSSARY

Spreadsheet: Software that allows one to calculate numbers in a format that is similar to pages in a conventional ledger.

Word processor:A computer program that you can use that turns your computer into asophisticated typewriter and filing system.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. All of the above 2. Software 3. System software	4. Windows 7 5. End user software 6.Performs a specific task for computer users

1.9 SELF-ASSESSMENT QUESTIONS

1. What is application software? Discuss various types of application software.
2. Explain in detail system software and its various types.

1.10 REFERENCES

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LESSON 1.4

OPERATING SYSTEMS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Operating system
1.3.1 History of OS
1.3.2 Function of OS
1.3.3 Features of OS
1.3.4 Basic components of an OS
1.3.5 Type of OS
1.4 Some examples of operating system
1.4.1 DOS
1.4.2 UNIX
1.4.3 Linux
1.4.4 Windows
1.4.5 Macintosh
1.5 Summary
1.6 Glossary
1.7 Answers to In-text Questions
1.8 Self-Assessment Questions
1.9 References
1.10 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- Describe various functions performed by the OS;
- understand operating system, its types and characteristics.

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1.2 INTRODUCTION

An operating system brings powerful benefits to computer software and software development. Without an operating system, every application would need to include its own UI, as well as the comprehensive code needed to handle all low-level functionality of the underlying computer, such as disk storage, network interfaces and so on. Considering the vast array of underlying hardware available, this would vastly bloat the size of every application and make software development impractical.

Instead, many common tasks, such as sending a network packet or displaying text on a standard output device, such as a display, can be offloaded to system software that serves as an intermediary between the applications and the hardware. The system software provides a consistent and repeatable way for applications to interact with the hardware without the applications needing to know any details about the hardware.

As long as each application accesses the same resources and services in the same way, that system software -- the operating system -- can service almost any number of applications. This vastly reduces the amount of time and coding required to develop and debug an application, while ensuring that users can control, configure and manage the system hardware through a common and well-understood interface.

1.3 OPERATING SYSTEM

An operating system (OS) is a collection of applications that serves as a bridge between a computer's user and its hardware. An operating system's objective is to offer an environment in which a user can run programmes. Operating systems are thought to be resource managers. Computer hardware in the form of processors, storage, input/output devices, communication devices, and data is the primary resource. Implementing the user interface, sharing hardware among users, allowing users to share data among themselves, preventing users from interfering with one another, scheduling resources among users, facilitating input/output, recovering from errors, accounting for resource usage, facilitating parallel operations, organising data for secure and rapid access, and handling network communications are some of the operating system functions.

Operating System (OS) acts as an interface between a user and computer. It controls all computer resources and provides an environment in which a user can execute programs. Operating systems evolved over last fifty years from the earlier resident monitor program to today's distributed operating environment. The history of operating systems is closely associated with the history of computer architecture, one influencing the other. Initially there was only computer hardware which was physically large with limited memory and very slow in operation. Hence, it used to be time consuming and cumbersome operation as

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programmers used spend more time performing the normal operation of entering the programme into the computer in addition to writing the programme.

The next remarkable development at this point was the introduction of punched cards and high speedpunched card readers. Some software was needed to run the card readers. These programs oncedeveloped, tested and debugged could be incorporated in ROM and could be used by every programmer (George, 2003). As the time passed on, additional hardware, software were developed and new media was also introduced like card readers, paper tape readers, magnetic tapes etc. System programs were developed to run the devices. Higher level languages were developed and assemblers, compilers, loaders, linkers etc., became common. High level languages and language systems need the programming tasks much easier. Later, to speed up the process, similar programs were grouped together. These programs were then executed as a batch by the operator.

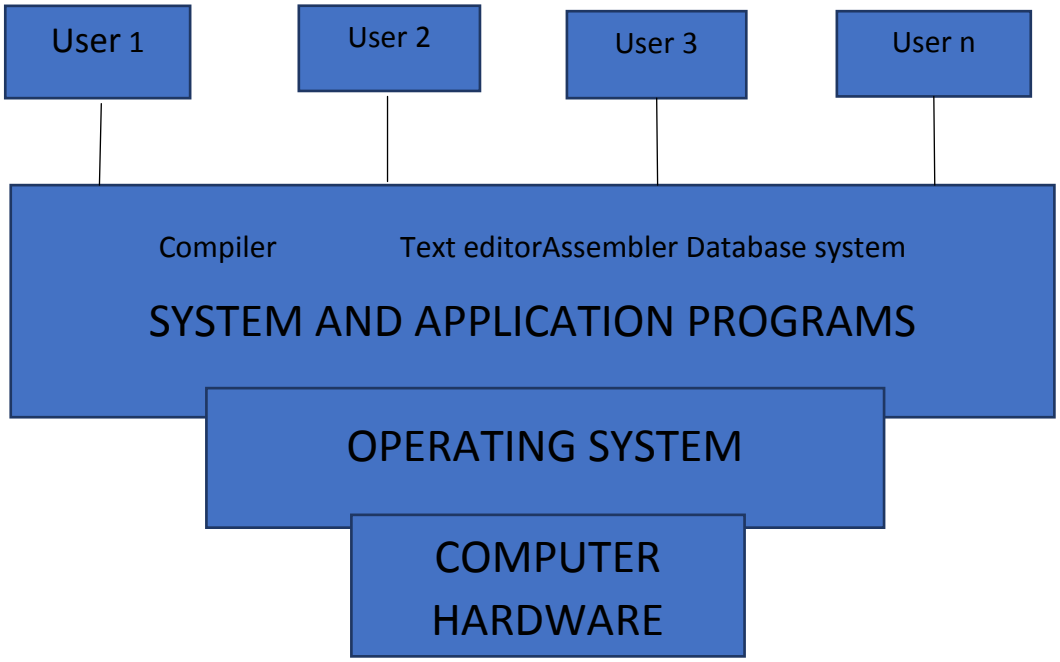

Fig: Conceptual overview of a computer system

1.3.1 History of Operating System:

- Operating systems was first developed in the late 1950s to manage tape storage
- The General Motors Research Lab implemented the first OS in the early 1950s for their IBM 701
- In the mid-1960s, operating systems started to use disks
- In the late 1960s, the first version of the Unix OS was developed

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- The first OS built by Microsoft was DOS. It was built in 1981 by purchasing the 86-DOS software from a Seattle company
- The present-day popular OS Windows first came to existence in 1985 when a GUI was created and paired with MS-DOS.

Table 1.4.1 : Generations of an OS

Generation	Year	Electronic device used	Types of OS device
First	1945-55	Vacuum tubes	Plug Boards
Second	1955-65	Transistors	Batch systems
Third	1965-80	Integrated Circuits	Multiprogramming
Fourth	Since 1980	Large scale integration	PC

1.3.2 Functions of Operating System

An operating system performs following functions:

- ***Process management****:* Process management enables the operating system to generate and deetel processes. It also includes tools for process coordination and communication.
- ***Memory management*****:** The memory management module is in charge of allocating and de-allocating memory space to programmes that require it.
- ***File management***: It handles all file-related tasks such as file organisation, storage, retrieval, naming, sharing, and protection.
- ***Device Management***: All devices are tracked through device management. This module, which is also in charge of this task, is known as the I/O controller. It is also in charge of device allocation and de-allocation.
- ***I/O System Management*****:** One of the primary goals of any operating system is to hide the peculiarities of the hardware components from the user.
- ***Secondary-Storage Management***: Storage levels in systems include primary storage, secondary storage, and cache storage. Instructions and data must be placed in primary storage or cache so that they can be accessed by a running programme.
- ***Security***: Security module protects the data and information of a computer system against malware threat and authorized access.
- ***Command interpretation***: This module is interpreting commands given by the and acting system resources to process that commands.
- ***Networking*****:** A distributed system is a collection of processors that do not share memory, hardware, or a clock. The network allows the processors to communicate with one another.
- ***Job accounting****:* Keeping track of time & resource used by various job and users.
- ***Communication management***: Coordination and assignment of compilers, interpreters, and other software resources among computer system users.

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1.3.3 Features of an Operating System

Some of the features of an operating system are:

- Protected and supervisor mode
- Allows disk access and file systems Device drivers Networking Security
- Program Execution
- Memory management Virtual Memory Multitasking
- Handling I/O operations
- Manipulation of the file system
- Error Detection and handling
- Resource allocation
- Information and Resource Protection

1.3.4 Basic Components of an operating system

Apart from providing a user interface, an operating system has four major components.

- **Memory Manager**

Memory management is the mechanism by which an operating system handles requests for memory.The operating systems allocate memory for various tasks that a user performs. In situations where multiple operations are being performed simultaneously, the operating system manages the system memory in a manner that no clashes occur. After a task is completed, the operating system cleans up the memory by releasing the memory space for other programs or tasks. A multi operating system also has an additional function of managing the memory space of each user in such a way that the operations of one user do not interfere with those of another user.

- **Process Manager**

A program submitted to the computer for execution is called a process. To enable several processes to run concurrently, an operating system has to ration out the microprocessor time. The process manager needs to ensure that all the programs get a fair share of the time and no program monopolizes the microprocessor time.

- **Device Manager**

An operating system needs to mange devices (peripherals) attached to the computer. The device manager handles communication between the devices and the microprocessor. For example, it handles communication between the microprocessor and the scanner.

- **File Manager**

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Computer can store information on various media, such as CD/DVD ROM and hard disk. A file manager provides a logical view of information storage. It allows a user to manage information in the form of files. A file is a collection of related information. These components work closely to help the operating system to function properly. For example while saving a file in a computer, the file manager creates a new file and the device manager allocates a physical location for the file. The memory manger ensures that space is available in the memory while the content of the file is being stored.

1.3.5Types of Operating System

Following are the popular types of OS (Operating System):

- Batch Operating System
- Multitasking/Time Sharing OS
- Multiprocessing OS
- Real Time OS
- Distributed OS
- Network OS
- Mobile OS

Batch Processing OS

Users submit jobs to a central location in a batch processing operating system environment, where they are collected into a batch and then placed on an input queue at the computer where they will be run. In this situation, the user has no contact with the work while it is being processed, and the computer's reaction time is the turnaround time -the period from job submission until execution is complete and the results are ready to be returned to the person who submitted the job.

Multi-Tasking/Time-sharing OS

Time sharing operating systems are another method of offering computing services. In this scenario, a computer provides computing services to multiple users online at the same time. The operating system facilitates, controls, and monitors the multiple users' sharing of the core processor, memory, and other computer system resources. In this setting, the user has practically complete involvement with the application during operation, and the computer's response time should be no more than a few seconds.

Multiprocessing OS

A multiprocessing system is a computer hardware arrangement that contains multiple independent processing units. Large computer hardware complexes seen in major scientific or commercial applications are commonly referred to as multiprocessing.

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Real Time OS

They are intended to serve applications when response time is critical in order to avoid inaccuracy, misrepresentation, or even tragedy. Real-time operating systems include those that handle airline reservations, machine tool control, and nuclear power plant monitoring. In this situation, the systems are built to be disrupted by external signals that require the computer system's urgent attention.

These real-time operating systems govern machinery, research instruments, and industrial systems. An RTOS often has no end-user utilities and very minimal user interface capability. An key aspect of an RTOS is managing the computer's resources so that a specific operation takes exactly the same amount of time every time it occurs.

Distributed OS

A distributed computing system is made up of several computers that are linked and controlled in such a way that the job processing load is automatically split among the component computers, or segregate the job load as needed, specially configured processors. Such a system necessitates the use of an operating system that, in addition to the normal stand-alone functionality, enables operation coordination and exchange of information between the component computers.

Networking OS

A networked computing system is a group of physically linked computers. Each networked computer's operating system must include, in addition to its own stand-alonecapability, provisions for handling communication and programme and data transfer among the other computers to which it is connected.

Network operating systems and single processor operating systems are not fundamentally different. They obviously require a network interface controller and some low-level software to operate it, as well as applications to enable remote login and file access, but these additions do not alter the fundamental core of the operating systems.

Operating Systems for Embedded Devices

As embedded systems (PDAs, cellphones, point-of-sale devices, VCRs, industrial robot control, or even your toaster) become more complex in terms of hardware with each generation, and more features are added to them on a daily basis, the applications that run on them require more and more to run on actual operating system code in order to keep development time reasonable.

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Some of the popular OS are:

- *Nexus's Conix* - an embedded operating system for ARM processors.
- *Sun's Java OS* - a standalone virtual machine not running on top of any other OS; mainly targeted at embedded systems.
- *Palm Computing's Palm OS* - Currently the leader OS for PDAs, has many applications and supporting companies.
- *Microsoft's Windows CE and Windows NT Embedded OS.*

IN-TEXT QUESTIONS

1. What is an operating system?
   a) interface between the hardware and application programs
   b) collection of programs that manages hardware resources
   c) system service provider to the application programs
   d) all of the mentioned
2. Which of the following is not an operating system?

a) Windows
b) Linux
c) Oracle
d) DOS

1.4 SOME EXAMPLES OF OPERATING SYSTEM

The operating system is the software required to run application applications and utilities. It acts as a bridge to improve interaction between application programmes and computer hardware. UNIX, MS-DOS, MS-Windows 98/XP/Vista, Windows-NT/2000, OS/2, and Mac OS are examples of operating systems. In this section, you will learn more about some popular operating systems.

1.4.1 DOS

The first widely used operating system for personal computers was DOS (Disk Operating System). It is a master control programme that is launched automatically when you turn on your computer (PC). DOS is always present on the computer, allowing you to run programmes and manage files. It is a Microsoft single-user operating system for the PC. It was the first operating system for a personal computer and is the underlying control programme for Windows 3.1, 95, 98, and ME. To support current DOS applications, Windows NT, 2000, and XP imitate DOS.1.5.2

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DOS is an interpreter which creates an interface between hardware and software. DOS is a program loaded into the memory (RAM) of user's personal computer before execution of any application. It creates an environment for managing the resources and execution of any program having extension .Exe, .Com, .Bat. Dos are a single user operating system. A single user operating system caters to a single user and all the resources are available to this user. DOS works mostly on Micro Computers. The DOS software is divided into three parts stored in three different files on a disk (Floppy or Hard disk). The disk that contains all the three files is called a Bootable disk or System disk. These three files are:

1) **IO.SYS:** These files have two main parts. In one part device drivers for device like Printer,VDU, Keyboard, and Mouse are configured by the file. It verifies some more input outputdevices and its drivers. Second part of the IO.SYS file is SYS.INI which loads the fileMSDOS.SYS from hard disk into memory.
2) **MSDOS.SYS:** This file is also called DOS Kernel. It is a link between the BIOS (basic inputoutput services) and user application programs which provides the logical interface for theapplication program. The MS-DOS Kernel has four important functions that are as mentionedbelow:
    - Process Control
    - Memory Management
    - Application Program Interface
    - File Management System
3) **COMMAND.COM:** This file contains command processor or command executor and has allmemory resident programs that is it has all internal commands in it. It is the user's interface to theoperating system. This command loads and executes application programs

1.4.2 UNIX

Sun Microsystems, Silicon Graphics, IBM, and a number of other businesses employ UNIX operating systems in widely sold workstation products. The UNIX environment and the client/server programme paradigm were critical components in the development of the Internet and the remaking of computing as a network-centric rather than a computer-centric approach. Linux, a UNIX clone accessible in both "free software" and commercial versions, is gaining popularity as a viable alternative to proprietary operating systems. UNIX is written in the C programming language. AT&T developed both UNIX and C, which were freely supplied to government and academic institutions, allowing it to be adapted to a wider range of machine families than any other operating system.

As a result, the term "UNIX" came to be associated with "open systems." The kernel, file system, and shell comprise UNIX (command line interface). The three main shells are the Bourne shell (original), the C shell, and the Korn shell. The UNIX command set is extensive, with over 600 procedures that alter data and text in every way imaginable. Many instructions are esoteric, but just as Windows concealed the DOS prompt, the Motif GUI provides a more

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friendly appearance to UNIX users. UNIX is frequently used in mission critical applications for client/server and transaction processing systems, despite its various versions. Sun's Solaris, Digital's UNIX, HP's HP-UX, IBM's AIX, and SCO's UnixWare are the most extensively used UNIX versions. UNIX programmes are also run on a huge number of IBM mainframes.

1.4.3 LINUX

Linux is an operating system, just like Windows, iOS, and Mac OS. In fact, the Linux operating system powers one of the world's most popular platforms, Android. An operating system is software that controls all of the hardware resources on your computer or laptop. Simply explained, the operating system oversees communication between your software and hardware. The software would not work without the operating system (OS).

The Linux operating system comprises several different pieces:

1. **Bootloader :** The software that oversees your computer's boot process. For most users, this will just be a splash screen that appears and then disappears before booting into the operating system.
2. **Kernel:** This is the only part of the system that is actually known as 'Linux.' The kernel is the system's heart, managing the CPU, memory, and peripheral devices. The kernel is the lowest level of the operating system.
3. **Init system:** This is a subsystem in charge of booting up the user space and controlling daemons. Systemd is one of the most frequently used init systems, as well as one of the most contentious. Once the bootloader has given over the initial booting, the init system oversees the boot process (i.e., GRUB or GRand Unified Bootloader).
4. **Graphical server:** This is the sub-system that displays the graphics on your monitor. It is commonly referred to as the X server or just X.
5. **Desktop environment:** This is the component with which the users interact. There are numerous desktop environments from which to pick (GNOME, Cinnamon, Mate, Pantheon, Enlightenment, KDE, Xfce, etc.). Each desktop environment comes with pre-installed programmes (such as file managers, configuration tools, web browsers, and games).
6. **Applications:** Desktop settings do not provide the complete range of applications. Linux, like Windows and macOS, has tens of thousands of high-quality software titles that are readily identified and installed. Most current Linux distributions feature App Store-like facilities that centralise and simplify application installation (more on this below). For example, Ubuntu Linux features the Ubuntu Software Center (a rebranding of GNOME Software), which allows you to rapidly browse and install thousands of software from a single spot.

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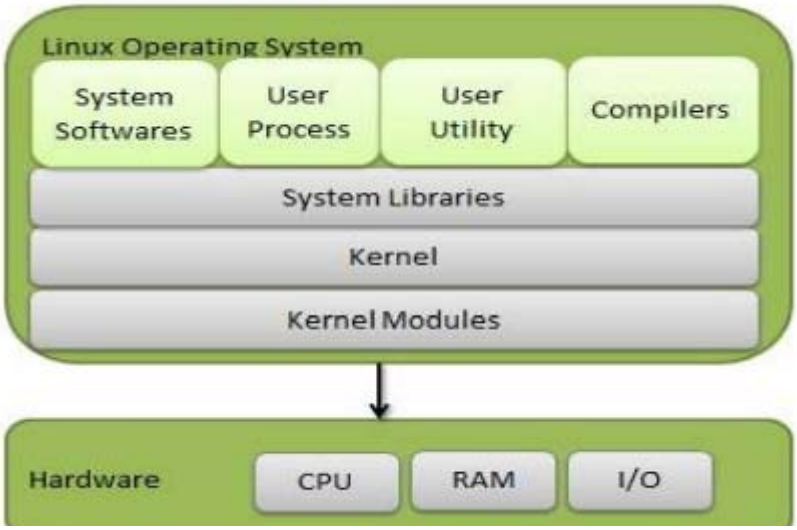

Fig: Linux Operating system

Basic Features of Linux

Following are some of the important features of Linux Operating System.

- **Portable** − Portability means software can work on different types of hardware in same way.Linux kernel and application programs support their installation on any kind of hardwareplatform.
- **Open Source** − Linux source code is freely available and it is community based developmentproject. Multiple teams work in collaboration to enhance the capability of Linux operatingsystem and it is continuously evolving.
- **Multi-User** − Linux is a multiuser system which means multiple users can access systemresources like memory/ ram/ application programs at same time.
- **Multiprogramming** − Linux is a multiprogramming system which means multipleapplications can run at same time.
- **Hierarchical File System** − Linux provides a standard file structure in which system files/user files are arranged.
- **Shell** − Linux provides a special interpreter program which can be used to execute commandsof the operating system. It can be used to do various types of operations, call applicationprograms. etc.
- **Security** − Linux provides user security using authentication features like passwordprotection/ controlled access to specific files/ encryption of data.

1.4.4 WINDOWS

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Windows is a Microsoft personal computer operating system that, together with several widely used commercial software such as Microsoft Word and Excel, has become a de facto "standard" for individual users in most organisations and homes. Windows includes built-in networking, which allows users to share data and applications with one another if their computers are linked to a network. Windows clients are frequently connected to a network of UNIX and NetWare servers in large companies. Windows NT and 2000 server versions are increasing market share, providing a Windows-only solution for both the client and the server. Windows is backed by Microsoft, the world's largest software firm, as well as the Windows industry as a whole, which includes tens of thousands of companies.

This networking support is what propelled Windows to success in the first place. Windows 95, 98, ME, NT, 2000, and XP, on the other hand, are complex operating systems. Certain hardware and software combinations might cause issues, and debugging can be difficult. Each new version of Windows introduces interface changes that confuse customers and keep support staff busy, and installing Windows apps is also hard. Microsoft has made significant efforts to make Windows 2000 and Windows XP more resistant to installation issues and crashes in general.

The client versions of Windows include:

- Windows 11, released in 2021
- Windows 10, released in 2015
- Windows 8.1, released in 2013
- Windows 8, released in 2012
- Windows 7, released in 2009
- Windows Vista, released in 2007
- Windows XP Professional x64 Edition, released in 2005
- Windows XP, released in 2001
- Windows ME, released in 2000
- Windows 2000, released in 2000
- Windows 98, released in 1998
- Windows NT 4.0, released in 1996
- Windows 95, released in 1995
- Windows NT 3.51, released in 1995
- Windows NT 3.5, released in 1994
- Windows 3.2, released in 1993
- Windows NT 3.1, released in 1993
- Windows 3.1, released in 1992
- Windows 3.0, released in 1990
- Windows 2.1x, released in 1988
- Windows 2.0, released in 1987
- Windows 1.0, released in 1985

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The primary features of Windows are:

Start Menu – The Start Menu provides the primary access point for programs and applications

Click the Start Button to open the Start Menu.

• ***Applications and Documents Shortcuts*** – The "Pinned" applications are listed at the top above the divider line. The recently used applications are listed under the divider line. If you hover over or click the arrow to the right of the application, you can access the most recently opened documents list for the associated program.

• ***Start Menu Search*** – The application/document search box can be found near the bottom of the Start menu. This search box is a great way to not only search for your files and documents, but also quickly find applications without hunting through the programs list. For instance, if you want to quickly find and start Microsoft Word, click the Start button and type just the letters "Word" into the search box, Windows will provide a list of search results with application listed at the top, then files and documents containing the search term listed next.

• ***All Programs*** – Clicking the All Programs link will open up a list of the available application shortcuts on your monitor.

Additional Features of the Start Menu are:

- ***Application Pinning*** – Applications icons can be "pinned" to the top of the StartMenu or to the Taskbar by right clicking the application in the All Programs, StartMenu or Taskbar, and selecting the "Pin to Taskbar" or the "Pin to Start Menu" menuitem.
- ***Jump Lists*** – Right-click a program in the taskbar to find and perform most commonfunctions associated withthat specific application. Jump list also acts as a history ofeach application. For example if you right click onInternet Explorer in the taskbar,most browsed websites are displayed.
- ***Quick Peek*** – Drag the mouse over any program on the taskbar to preview any openwindows using that program.
- ***Computer Shortcuts*** – includes shortcuts to user documents, pictures, music and to thecomputer file system.
- ***Shutdown button*** – also includes other options for Restart, Sleep, Hibernate, Lock, Log Off,and Switch User via the arrow icon on the button.
- ***Control panel*** – provides access to operating system control and customization features.
- ***Devices and Printers*** – provides access to installed devices (printers, cameras, scanners,etc…).

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- ***Run*** – provides a method to quickly execute a command line.

1.4.5 MACINTOSH

Apple Computer's Macintosh (often known as "the Mac"), released in 1984, was the first widely-sold personal computer with a graphical user interface (GUI). The Mac was created with the goal of providing users with a natural, intuitively understood, and "user-friendly" computer interface. The mouse, the use of icons or small visual pictures to represent items or activities, the point-and-click and click-and-drag operations, and a variety of window operating principles are all included. In its original Windows operating system, Microsoft was successful in integrating user interface features popularised by the Mac. The main disadvantage of the Mac is that there are less Mac programmes available than there are for Windows.

However, all of the essential apps are available, and the Macintosh is a machine that practically everyone can use. Data compatibility between Windows and Mac is an issue, but it is sometimes exaggerated and easily resolved. The Macintosh has its own operating system, Mac OS, which is now known as Mac OS X in its most recent edition. Originally powered by Motorola's 68000 family microprocessors, Mac versions are now powered by Apple, Motorola, and IBM's PowerPC microprocessor. While Mac users account for only approximately 5% of all personal computer users, they are extremely popular and nearly a cultural need among graphic designers, online visual artists, and the companies for which they work.

IN-TEXT QUESTIONS

3. Which is the Linux operating system?

a) Private operating system
b) Windows operating system
c) Open-source operating system
d) None of these

4. Which of the following is a single-user operating system?

a) Windows
b) MAC
c) Ms-Dos
d) None of these

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1.5 SUMMARY

In this lesson, you learnt that an operating system is a type of system software. An operating system consists of four components: memory manager, process manager, device manager, and file manager. Different types of operating systems are CUI-based & GUI- based and Single-user & multiple-user. The features of an operating system are multitasking and multiprogramming. Multitasking is the ability to handle the execution of 15 multiple tasks at a time. Multiprogramming refers to the ability to enable different users to execute programs simultaneously. The history, generations, and types of operating systems are briefly presented. An operating system is a programme that serves as a bridge between a computer's user and its hardware. An operating system's objective is to offer an environment in which a user can run programmes. An operating system's principal objective is to make the computer easier to use. The other purpose is to make efficient use of the hardware.

1.6 GLOSSARY

DOS: Disk Operating System. An operating system designed for early IBM-compatible PCs.

GUI: Graphical User Interface, a system that simplifies selecting computer commands by enabling the user to point to symbols orillustrations (called icons) on the computer screen with a mouse.

Linux:A UNIX - like, open-source operating system developed primarily by Linus Torvalds. Linux is free and runs on many platforms, including both PCs and Macintoshes. Linux is an open-source operating system, meaning that the source code of the operating system is freely available to the public.

Mac OS: The operating system that runs on Apple computers.

1.7 ANSWERS TO IN-TEXT QUESTIONS

1.All of the above 2. ORACLE	3. Open source operating system 4. Ms DOS

1.8 SELF-ASSESSMENT QUESTIONS

1. What is an operating system? Define main components of an operating system.
2. Discuss in detail the various popular operating systems.

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LESSON 1.5

WORD PROCESSING, SPREADSHEETS, POWERPOINT PRESENTATION

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Starting with libreoffice suit
1.3.1 Advantages of LibreOffice
1.4 Starting With Microsoft Office
1.4.1 Core applications in Microsoft Office
1.5 Word Processing Using Ms Word
1.6 Spreadsheet Using Ms Excel
1.7 Presentation using Ms Powerpoint
1.8 Summary
1.9 Glossary
1.10 Answers to In-text Questions
1.11 Self-Assessment Questions
1.12 References
1.13 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- familiarize with the basics of word processing and outlines the various features and advantages of MS Word
- Learn about functions you need to create an effective presentation.
- Understand the screen display of Excel

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1.2 INTRODUCTION

Office Tools are a sort of software programme. They enable users to complete office-related chores quickly and easily. As a result, these technologies aid in the creation, management, and manipulation of vast amounts of data and documents. Furthermore, they aid in the creation of presentations, reports, databases, and so on. As a result, users can repeat such procedures with less time and effort. Software such as word processors, presentation tools, spreadsheets, database systems, email clients, and so on are examples of these tools.

Open source office tools have the same features as proprietary tools. As a support system, they also provide extensive online documentation and have significant communities of users and developers. These office tools are commonly referred to as an office suite, productivity suite, or applications tools since they are a set of apps that primarily consist of a word processor, spreadsheet, and presentation packed together and frequently sharing a single user interface. **LibreOffice** can be freely used and distributed thanks to its open-source licence.

1.3 STARTING WITHLIBREOFFICE SUIT

LibreOffice is a sophisticated and free office suite that is the successor to OpenOffice(.org), which is used by millions of people worldwide. Its simple design and feature-rich tools allow you to unleash your creativity while also increasing your productivity. LibreOffice features a number of programmes that combine to make it the most versatile Free and Open Source office suite available: Calc (spreadsheets), Writer (word processing), Impress (presentations), Draw (vector graphics and flowcharts), Base (databases), and Math (formula editing).

LibreOffice includes the following components:

Writer (word processor)

Writer is a powerful tool for generating letters, novels, reports, newsletters, brochures, and other types of publications. Graphics and objects from other components can be inserted into Writer documents. Writer supports the export of files to HTML, XHTML, XML, Adobe Portable Document Format (PDF), and numerous versions of Microsoft Word. It also communicates with your email client.

Calc (spreadsheet)

Calc includes all of the advanced analytical, graphing, and decision-making capabilities that one would expect from a high-end spreadsheet. It has about 300 functions, including financial, statistical, and mathematical procedures. The Scenario Manager analyses "what if" scenarios. Calc creates 2D and 3D charts that can be used in other LibreOffice documents. You may also open, edit, and save Microsoft Excel workbooks in Excel format. Calc can also export spreadsheets in a variety of formats, including Comma Separated Value (CSV), Adobe PDF, and HTML.

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Impress (presentations)

Impress has all of the standard multimedia presentation features, including special effects, animation, and drawing tools. It is integrated with LibreOffice Draw and Math components' powerful graphical capabilities. Fontwork special effects text, as well as sound and video clips, can be used to enhance slide shows. Impress supports the Microsoft PowerPoint file format and can save your work in a variety of graphic formats, including Macromedia Flash (SWF).

Draw (vector graphics)

Draw is a vector drawing tool that can produce everything from simple diagrams or flowcharts to 3D artwork. Its Smart Connectors feature allows you to define your own connection points. You can use Draw to create drawings for use in any of the LibreOffice components, and you can create your own clip art and then add it to the Gallery. Draw can import graphics from many common formats and save them in over 20 formats, including PNG, HTML, PDF, and Flash.

Base (database)

Base provides capabilities for day-to-day database work in a straightforward interface. It can build and change forms, reports, queries, tables, views, and relations, making relational database management similar to that of other popular database applications. Many new capabilities are included in Base, such as the ability to analyse and update relationships from a diagram view. HSQLDB and PostgreSQL are two relational database engines included with Base. It can also use dBASE, Microsoft Access, MySQL, or Oracle databases, as well as any ODBC or JDBC compliant database. A subset of ANSI-92 SQL is also supported by Base.

Math (formula editor)

Math is the formula or equation editor in LibreOffice. It can be used to write complex equations that incorporate symbols or letters that are not found in standard font sets. While it is usually used to construct formulas in other documents such as Writer and Impress files, it may also be used as a standalone application. You can store formulas in the standard Mathematical Markup Language (MathML) format for use in web pages and other non-LibreOffice projects.

1.3.1 Advantages of LibreOffice:

Here are some of the advantages of LibreOffice over other office suites (Barton):

- **No licensing fees**: LibreOffice is free for anyone to use and distribute at no cost. Many features that are available as extra cost add-ins in other office suites (like PDF export) are free with LibreOffice. There are no hidden charges now or in the future.
- **Open source**: You can distribute, copy, and modify the software as much as you wish, in accordance with the LibreOffice Open Source licenses.

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- **Cross-platform**: LibreOffice runs on several hardware architectures and under multiple operating systems, such as Microsoft Windows, Mac OS X and Linux.
- **Extensive language support**: The LibreOffice user interface, including spelling, hyphenation, and thesaurus dictionaries, is available in over 100 languages and dialects. LibreOffice also provides support for both Complex Text Layout (CTL) and Right to Left (RTL) layout languages (such as Urdu, Hebrew, and Arabic).
- **Consistent user interface**: All the components have a similar "look and feel," making them easy to use and master.
- **Integration**: The components of LibreOffice are well integrated with one another.
  – All the components share a common spelling checker and other tools, which are used consistently across the suite. For example, the drawing tools available in Writer are also found in Calc, with similar but enhanced versions in Impress and Draw.
  – You do not need to know which application was used to create a particular file. For example, you can open a Draw file from Writer.
- **Granularity**: Usually, if you change an option, it affects all components. However, LibreOffice options can be set at a component level or even at document level.
- **File compatibility**: In addition to its native OpenDocument formats, LibreOffice includes support for opening and saving files in many common formats including Microsoft Office, HTML, XML, WordPerfect, Lotus 1-2-3, and PDF.
- **No vendor lock-in:** LibreOffice uses OpenDocument, an XML (eXtensible Markup Language) file format developed as an industry standard by OASIS (Organization for the Advancement of Structured Information Standards). These files can easily be unzipped and read by any text editor, and their framework is open and published.
- **You have a voice:** Enhancements, software fixes, and release dates are communitydriven. You can join the community and affect the course of the product you use.

You can read more about LibreOffice and The Document Foundation on their websites at http://www.libreoffice.org/ and http://www.documentfoundation.org/.

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IN-TEXT QUESTIONS

1. Main body of the lesson is divided into headings and _____.
2. The language to be used for this purpose should be hard. True / False
3. Following tools can be used to create interest among the learners:
   a) Jargons b) complex language
   c) Charts d) repetitive sentences
4. Charts and Pictures are used to create _____.
5. I-you-me-mode is a _____ style of writing.

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1.4 STARTING WITH MICROSOFT OFFICE

Microsoft Office, also known as simply Office, is a collection of client software, server software, and services created by Microsoft. Bill Gates initially unveiled it on August 1, 1988, at COMDEX in Las Vegas. The initial edition of Office was a marketing phrase for an office suite (a packaged set of productivity apps), and it included Microsoft Word, Microsoft Excel, and Microsoft PowerPoint. Office programmes have gotten significantly closer over the years, with shared capabilities such as a common spell checker, Object Linking and Embedding data integration, and the Visual Basic for Applications scripting language. Under the Office Business Applications brand, Microsoft also positions Office as a development platform for line-of-business software.

It includes a word processor (Word), a spreadsheet programme (Excel), and a presentation programme (PowerPoint), as well as an email client (Outlook), a database management system (Access), and a desktop publishing application (Publisher).

Office is available in a variety of editions tailored to different end-users and computing settings. The desktop version, which is accessible for PCs running Windows and macOS, is the original and most extensively used version. Microsoft also maintains Android and iOS mobile apps. Office on the web is a web browser-based version of the software.

Since Office 2013, Microsoft has promoted **Office 365** as the primary means of obtaining Microsoft Office: it allows users to use the software and other services on a subscription business model, and users receive feature updates to the software for the lifetime of the subscription, including new features and cloud computing integration that are not always included in "on-premises" releases of Office sold under traditional licence terms. Office 365 income surpassed traditional licence sales in 2017. Microsoft has rebranded the majority of its regular Office 365 editions as Microsoft 365 to underline their current product and service inclusion.

1.4.1 Core applications in Microsoft Office:

Microsoft Word

Microsoft Word is a word processing software programme that was created by Microsoft in 1983. It is the most widely used word processing programme. It is used to create professional-quality papers, letters, reports, resumes, and so on, as well as to edit or alter existing ones. The.docx extension indicates that the file was saved with Microsoft Word. It is part of the Microsoft Office package, although it can also be purchased individually and is available for both Windows and macOS. The most recent version of Microsoft Word is 2019.

Microsoft Excel

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Microsoft Excel is a spreadsheet editor that competed with and eventually surpassed the popular Lotus 1-2-3. In 1985, Microsoft launched the first version of Excel for the Mac OS, and in November 1987, Microsoft released the first Windows version (numbered 2.05 to correspond with the Mac).

Microsoft Powerpoint

Microsoft PowerPoint is a presentation programme that allows you to make slideshows out of text, pictures, and other objects that may be exhibited on-screen by the presenter or printed out on transparencies or slides.

Microsoft Outlook

Microsoft Outlook is a personal information manager that began in Office 97 and replaced Windows Messaging, Microsoft Mail, and Schedule+; it contains an e-mail client, calendar, task manager, and address book. Microsoft produced numerous versions of Outlook for the Mac OS in the late 1990s, but solely for usage with Microsoft Exchange Server.

Microsoft OneDrive

Microsoft OneDrive is a file hosting service that allows users to sync files and later access them from a web browser or mobile device.

Microsoft Teams

Microsoft Teams is a platform that combines workplace chat, meetings, notes, and attachments.

1.5 WORD PROCESSINGUSING MS WORD

Microsoft Word is a powerful word processing tool that allows you to easily write and update documents such as letters, articles, term papers, and reports. Because of the numerous built-in functions, such as spell checking and text auto-correction, Word is far more powerful than WordPad. Word makes document creation simple and enjoyable, especially when you use the latest Microsoft Word Wizards. Wizards are handy for constructing complex documents, such as a resume, without advanced word processing skills. (*Kect103.Pdf*, n.d.)

1.5.1 Starting Microsoft Word

To start Microsoft word, we need to perform following task:

1. Click on Start > Program > Microsoft Occice> Microsoft word
2. Or
3. Simple click the icon on the desktop to access Ms word

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1.5.2 Ms word Screen and window

Menu Bar : Provides menu options like File, Edit, View, etc.

Standard Toolbar : Contains tools for standard tasks, like saving, printing, cutting, copying, pasting, etc.

Formatting Toolbar : Provides tools for formatting like bold, italic, underline, etc.

View Buttons : Provides options to switch between Normal, Web Layout, Print Layout, Outline and Reading views.

Tab stop: A position we set for placing and aligning text on a page.

Drawing ToolBar : Provides tools for drawing basic shapes, inserting pictures, changing colors, etc.

Status Bar : This provides information about the current document.

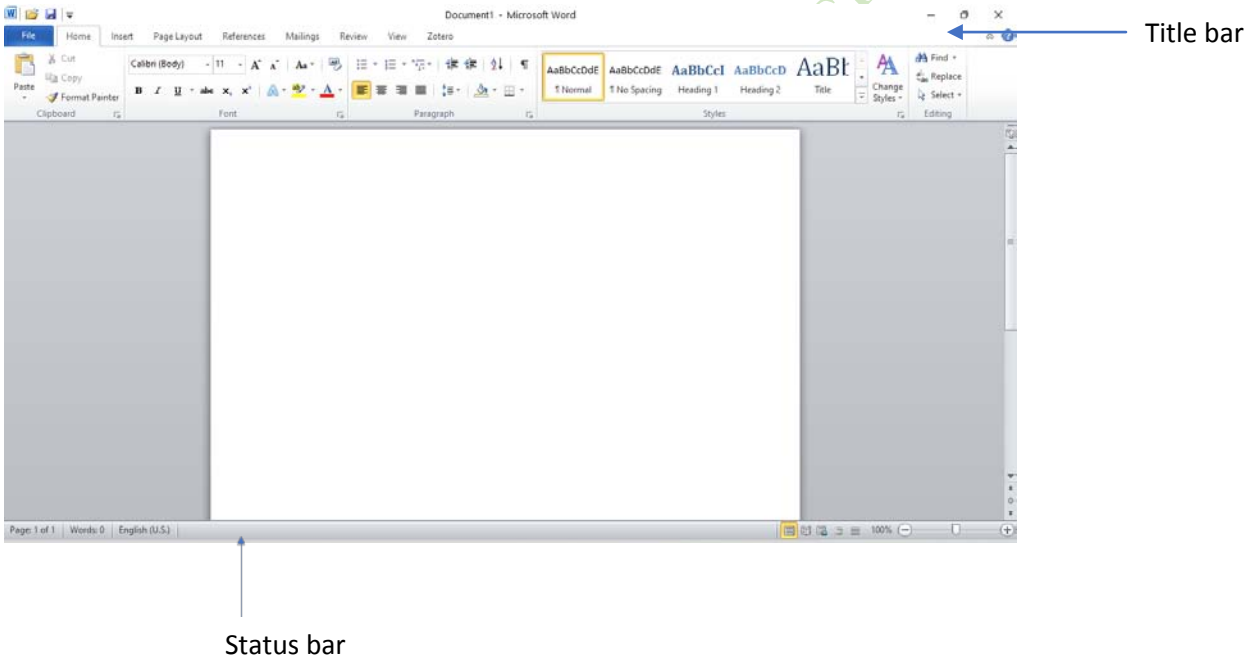

Fig: Screenshot of Ms Word

When we start MS-Word, a blank document opens up.

Word names the document as Document1 (Figure). We can also start a new document in any of the following ways:

- Click on New button on the Standard toolbar, or
- Click on New option in the File menu

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After we have started a new document, type in some introductory text into the document. When we start a new document, the insertion point (the blinking vertical line, also called cursor) appears in the first column of the first line. We can just type the text, and it will appear where the insertion point is.

1.5.3 How to save a document

- Click on Save button on the formatting toolbar, or
- Click on the Save option in the File menu

The Save As dialog box appears (Figure). It's a good idea to give the new document a name and save it as soon as we create it.

- Automatically, it will save our file in My Documents folder. If we need to save in some other location, navigate towards it by clicking on the arrow on the right, and selecting one of the available options. Select the location.
- Type the filename as Document New and Type of document as Word document.
- Click on the Save button.

We can cancel the process at any time by clicking on the Cancel button

1.5.4 How To Open An Existing Document

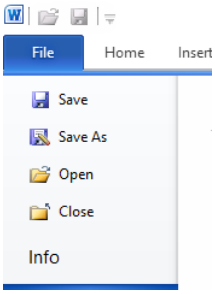
- Click on Open under File menu, or click on tool on the Standard toolbar.
- The Open dialog box is seen on the screen. This is similar to the Save As dialog box.
- Navigate to the folder where our file is located, select the filename.
- Click on Open.

1.5.5 Formatting Text

Formatting refers to the way our text will look like – the design ofthe characters, their size, the space between paragraphs, theiralignment, etc.

First, selection of text.

- By using the mouse, position the insertion point (by clicking themouse) at the beginning or end of the block to be selected and thenclick and drag to the end or beginning of the block.
- By using the shortcuts:
- Double-click on a word to select it.
- Triple-click on a paragraph to select it.
- Ctrl+click on a sentence to select it.



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There are basically two types of formatting:

- Character formatting, and
- Paragraph formatting

Character Formatting

Character formatting is the one which we can apply to any individual character or to a group of characters. It has the following options:

Font: This decides the appearance of our characters.

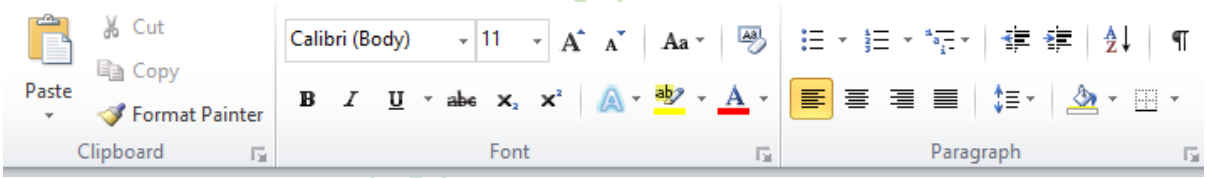
Font Style: We can make characters stand out by making them Bold, Italic or both.

Size: This increases/decreases the size of the characters – the size measured in points (72 points =1 inch)

Font Color : We can apply colours to the characters for printing the final document.

Underline : We can draw attention to some particular text by underlining it.

Effects : We can also apply effects to our text. Two most common ones are Superscript and Subscript. The 2 in 3 2 is a superscript. To make a character into superscript, we need to select only that character, and click the box against Superscript. Similarly, 1 in T1 is a subscript.



Paragraph Formatting

There are some formatting features that get applied to an entire paragraph or paragraphs, but not to any given character or a group thereof. Such formatting features are described as Paragraph formatting. It provides the following options:

Alignment : The alignment of a paragraph may be left, center, right or justify.

Indentation : Indents are the left and right boundaries of selected paragraphs within a document. This may be necessary when different paragraphs have different left and right boundaries. For example, we can see the indentation in poems. The indentation options available in most word processors are:

Alignment	Description
Left Alignment	All the lines of the paragraph will be aligned on the left.
Right Alignment	All the lines of the paragraph will be aligned on the right.
Center Alignment	All the lines of the paragraph will align to the center.

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Justify	The left as well as the right side of the paragraph will be aligned except for the last line.

Table: Different types of alignments

Spacing : This option allows us to have some space before and/or after a paragraph or a group of paragraphs. We can select the paragraph(s) and select or type in the desired value against the appropriate option – Before or After. These values are measured in points. There is also a Line spacing option, which decides on the spacing between the lines of the paragraph. Normally we will type with the value Single for it. But if we want to have more space between the lines, we can select 1.5 lines or Double for it.

ACTIVITY

Type "We are changing the font". Try the activity by using the following options:

- font Arial,
- font style Italic,
- size 10 point,
- font colour blue,
- underline style - a simple line,
- underline colour green,
- effects Small Cap.
- right alignment,
- line spacing 1.5 lines.

1.5.6 Bullets and Numbering

Bullets are small dots, squares, dashes or graphics that are oftenseen before the text (word, line, sentence, paragraph or any otherobject). To add bullets,

- Select the object
- Click on Bullets and Numbering from Format menu to open the Bulletsand Numbering dialog box

Click on the bullet of your choice, and click OK. Instead of a bullet, a number may also precede a group of paragaphs. To do so, proceed as follows:

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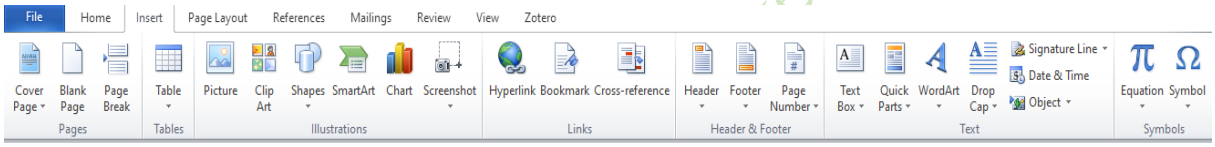
- Choose the numbered tab from Bullets and Numbering of Format menu to view the numbering options.
- Select the numbering option of choice, and click OK. To remove bullet(s) or number(s) applied to paragraph(s), select the paragraph(s), open the Bullets and Numbering dialog box, and select None in Bulleted or Numbered tab. Click on OK.

1.5.7 Create a Table

Tables provide a neat way to present complexinformation in vertical columns and horizontal rowsof cells. Each cell can contain text – a singleparagraph or multiple paragraphs – or graphics. Toinsert a table:

- click on Insert in the Table menu and select onTable from resulting menu.
- This opens up the Insert Table dialog box. Type in some value for the numberof columns and rows… let us type in the values5 and 4 respectively.
- We can now see on thepage – with 5 column

1.5.8 Inserting a picture



We can inser clipart or a picture by:

- Open the Document New file.
- On the Insert menu, select Picture, and then click Clip Art.
- The Clip Art task pane opens up. In the Clip Art task pane, type the search term (for example, “computer”) in the Search for field, and click on the Search button. Select the insertion point in the document where we want to insert clip art
- To insert a graphic from a file, on the insert menu, select picture, and then click from file.
- The Insert Picture dialog box opens up. Browse the graphic file.
- Click the file, and then click Insert. The picture gets inserted where the insertion point was located

1.5.9 To apply wrapping style

We have inserted a clip art or picture, but we do not want blank space to the right and left of the picture. No problem, we can further refinethe layout of the graphic and text. Using the five wrapping styles, wecan create documents with just the look we want.To apply wrapping styles to a graphic:

- Click on the graphic to select it.
- On the Format menu, click Picture.
- In the Format Picture dialog box, click the Layout tab.

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- Click the preferred wrapping style, and then click OK

1.6 SPREADSHEET USING MS EXCEL

Excel is a spreadsheet tool that is used to record and analyse numerical and statistical data. Microsoft Excel includes numerous functions for performing various tasks such as computations, pivot tables, graph tools, macro programming, and so on. It is compatible with a variety of operating systems, including Windows, macOS, Android, and iOS.

A spreadsheet in Excel is a collection of columns and rows that constitute a table. Columns are normally assigned alphabetical letters, and rows are usually assigned numerals. A cell is the intersection of a column and a row. A cell's address is determined by the letter representing the column and the number representing the row.

A **worksheet** is made up of rows and columns. A **cell i**s formed when a row and a column intersect. Cells are used to store information. A cell address is used to individually identify each cell. Columns are typically labelled with letters, whereas rows are typically labelled with numbers.

A **workbook** is a grouping of worksheets. In Excel, a workbook has three cells by default. To meet your needs, you can delete or add more sheets. Sheet1, Sheet2, and so on are the default names for the sheets. You can change the sheets to more appropriate names, such as Daily Expenses, Monthly Budget, and so on.

1.6.1 Starting MS Excel

Running Excel is not different from running any other Windows program. If you are running Windows with a GUI like (Windows XP, Vista, and 7) follow the following steps:

- Click on start menu>Go to all programs>Microsoft Excel

Alternatively, you can also open it from the start menu if it has been added there. You can also open it from the desktop shortcut if you have created one.

1.6.2 Ms Excel screen and its components

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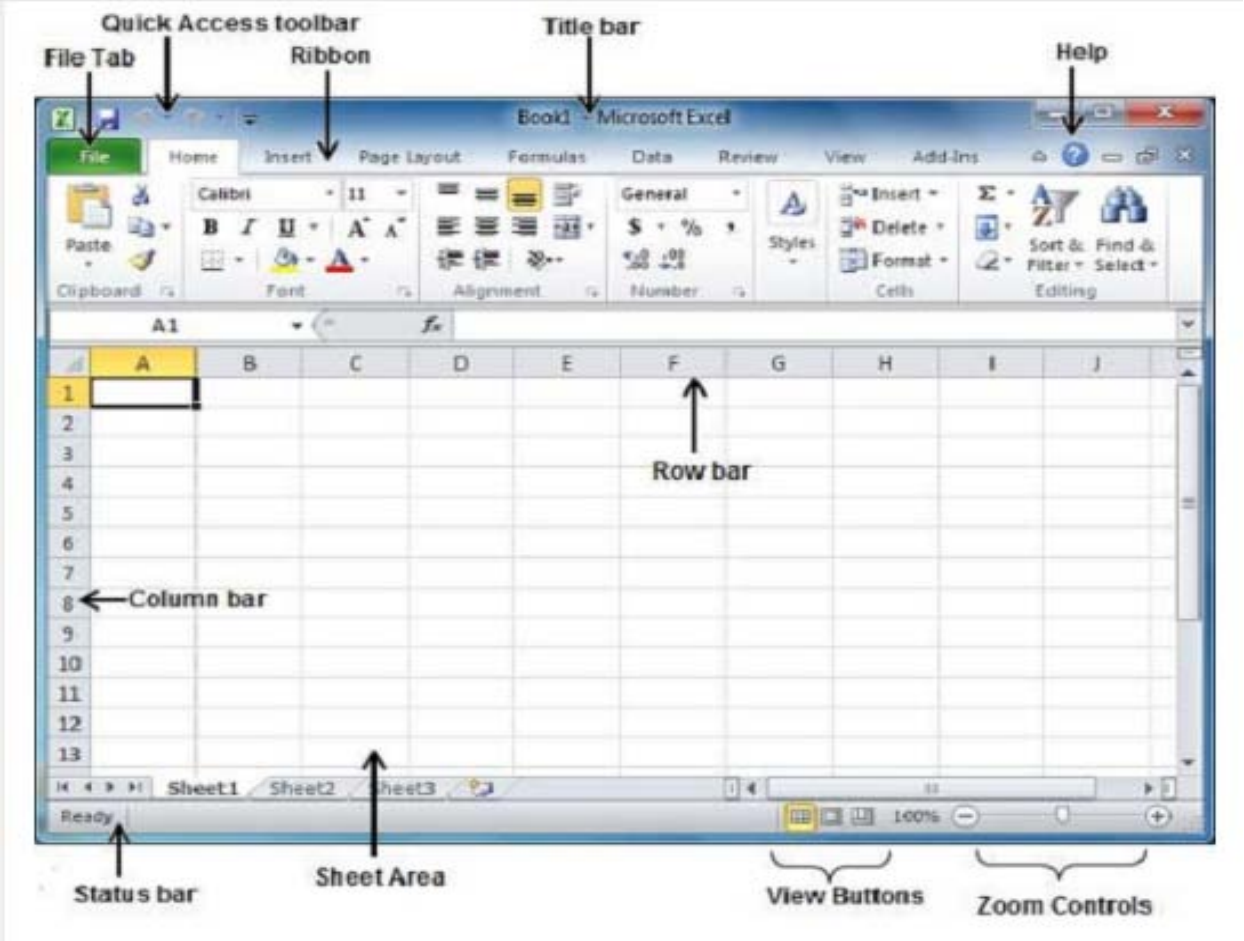

Fig: Ms Excel Screen (Source:*Explore Window in Excel 2010*, n.d.)

1. **Active Cell**: A cell that is currently selected. It will be highlighted by a rectangular box and its address will be shown in the address bar. You can activate a cell by clicking on it or by using your arrow buttons. To edit a cell, you double-click on it or use F2 as well.
2. **Columns**: A column is a vertical set of cells. A single worksheet contains 16384 total columns. Every column has its own alphabet for identity, from A to XFD. You can select a column by clicking on its header.
3. **Rows:** A row is a horizontal set of cells. A single worksheet contains 1048576 total rows. Every row has its own number for identity, starting from 1 to 1048576. You can select a row by clicking on the row number marked on the left side of the window.
4. **Fill Handle**: It's a small dot present in the lower right corner of the active cell. It helps you to fill numeric values, text series, insert ranges, insert serial numbers, etc.
5. Address Bar: It shows the address of the active cell. If you have selected more than one cell, then it will show the address of the first cell in the range.
6. **Formula Bar**: The formula bar is an input bar, below the ribbon. It shows the content of the active cell and you can also use it to enter a formula in a cell.

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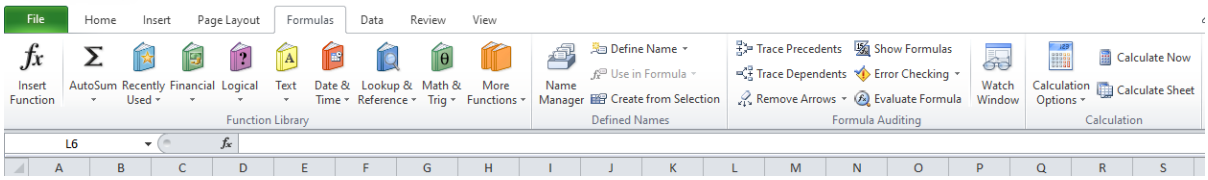

7. **Title Bar**: The title bar will show the name of your workbook, followed by the application name ("Microsoft Excel").
8. **File Menu**: The file menu is a simple menu like all other applications. It contains options like (Save, Save As, Open, New, Print, Excel Options, Share, etc).
9. **Quick Access Toolbar**: A toolbar to quickly access the options which you frequently use. You can add your favorite options by adding new options to the quick access toolbar.
10. **Ribbon Tab**: Starting from Microsoft Excel 2007, all the options menus are replaced with ribbons. Ribbon tabs are a bunch of specific option group which further contains the option.
11. **Insert Tab**: The insert tab contains commands for inserting objects. The commands in this tab are used to add illustrations, tables, links, text, charts in the worksheet.
12. **Worksheet Tab**: This tab shows all the worksheets which are present in the workbook. By default you will see, three worksheets in your new workbook with the name of Sheet1, Sheet2, and Sheet3 respectively.
13. **Status Bar**: It is a thin bar at the bottom of the Excel window. It will give you instant help once you start working in Excel.
14. **View Tab**: the view tab has commands that affects how the document appears on the screen. There are five groups within this tab namely, Workbook view, Show/Hide, Zoom, Window and Macros.

1.7 POWERPOINT PRESENTATION USING MS POWERPOINT

Microsoft Powerpoint is used in making/creating presentation where one can add animation, photos, videos, and sound making it more readable and presentable.Some of the features of powerpoint are:

1. **Designs**

It may be found under PowerPoint's "Design" tab. When you arrive, you will see two distinct regions. The first segment will be a theme, and the second will be a variation on that topic. These are the topics for each slide. Design Ideas in PowerPoint automatically and instantly presents you with numerous design possibilities for a certain slide based on the content that is present on the presentation.

2. **Animation**

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MS PowerPoint animations helps you to emphasize certain points of your present. There are primarily 3 categories of animations in PPT.

a. Entrance Animation
b. Emphasis Animation
c. Exit Animations

Each animation category gives you a list of additional options to choose from.

3. Slide transition

While animation allows you to animate elements within your slide, transitions allows you to change how slides change from one to another. This can have a remarkable impact on a slide's first impressions. Some of the most important transitions are:

- Reveal
- Cut
- Shapes
- Uncover
- Wipe

4. Images

There are two main ways of adding images.You could either add an image from your Personal Computer or you can embed an image from the internet

5. Videos

Videos can be easily added from the storage on your Personal Computer.Videos can also be selected from the internet.It also allows you to trim, cut portions of a video out, and even add.

6. Icons

With the feature to add icons into your presentations, it just gives you some freedom to add a personal touch to the presentation.

7. Charts

Charts are used in presentations to illustrate data in an easy-to-understand way for your audience.Charts can be linked to external data sources or even excel sheets.The charts also easily getup dated automatically in PPT when the data is edited in excel.

1.7.1 Components of MS Powerpoint

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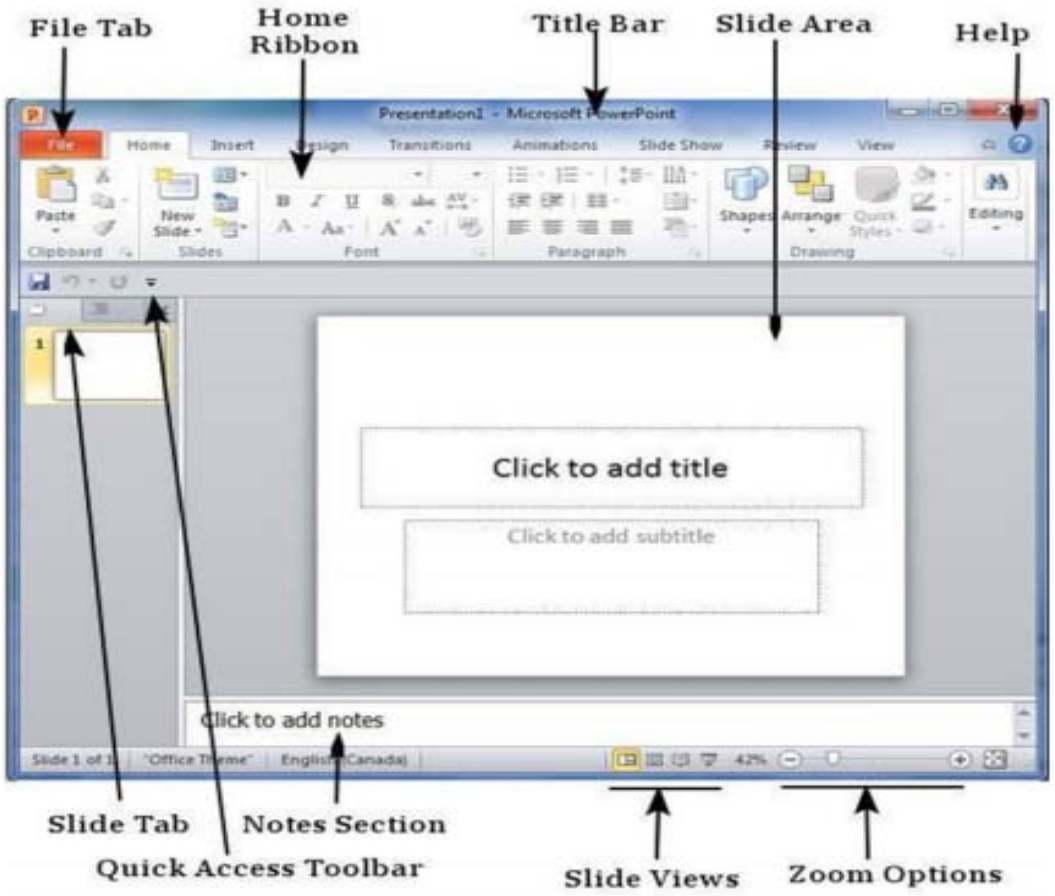

Fig: Screen of Ms Powerpoint (Source: *Powerpoint_tutorial.Pdf*, n.d.)

1. **File Tab**: This tab opens the Backstage view which basically allows you to manage the file and settings in PowerPoint. You can save presentations, open existing ones and create new presentations based on blank or predefined templates. The other file related operations can also be executed from this view.
2. **Ribbon Tabs**: They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are examples of ribbon tabs.

Menu Category	Ribbon Commands
Home	Clipboard functions, manipulating slides, fonts, paragraph settings, drawing objects and editing functions
Insert	Insert tables, pictures, images, shapes, charts, special texts, multimedia and symbols
Design	Slide setup, slide orientation, presentation themes and background
Transitions	Commands related to slide transitions
Animation	Commands related to animation within the individual slides
Slideshow	Commands related to slideshow set up and previews
Review	Proofing content, language selection, comments and comparing presentations

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View	Commands related to presentation views, Master slides, color settings and window arrangements

3. **Title Bar**: This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.
4. **Slide Area**: This is the area where the actual slide is created and edited. You can add, edit and delete text, images, shapes and multimedia in this section.
5. **Help**: The Help Icon can be used to get PowerPoint related help anytime you need. Clicking on the "?" opens the PowerPoint Help window where you have a list of common topics to browse from. You can also search for specific topics from the search bar at the top.
6. **Zoom Options:** The zoom control lets you zoom in for a closer look at your text. The zoom control consists of a slider that you can slide left or right to zoom in or out, you can click on the - and + buttons to increase or decrease the zoom factor. The maximum zoom supported by PowerPoint is 400% and the 100% is indicated by the mark in the middle.
7. **Slide Views:** The group of four buttons located to the left of the Zoom control, near the bottom of the screen, lets you switch between PowerPoint views.
   • Normal Layout view: This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows you to edit individual slides and also rearrange them.
   • Slide Sorter view: This displays all the slides as a matrix. This view only allows you to rearrange the slides but not edit the contents of each slide.
   • Reading View: This view is like a slideshow with access to the Windows task bar in case you need to switch windows. However, like the slideshow you cannot edit anything in this view.

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IN-TEXT QUESTIONS

1. Statistical calculations and preparation of tables and graphs can be done using
   a) Adobe Photoshop
   b) Excel
   Notepad
   Power Point
2. How do you wrap the text in a cell?
   Format cells font
   Format cells protection
   Format cells number
   Format cells alignment
3. In a spreadsheet, letters are used to represent _____
4. Cells are identified by a combination of letters and numbers.
   a) True
   b) False

1.8 SUMMARY

In this lesson, we have looked at how to start up the MS Word, Ms Excel, Ms PowerPoint in My Computer. We have also looked at the various system tools found in these applications. We showed the various steps involved in working with Microsoft office and have also identified the icons of these applications.

Multimedia components are extremely useful instruments for improving communication. They are widely used in PowerPoint presentations to improve their effectiveness. PowerPoint is used to create a variety of presentations on a variety of topics, such as educational presentations, business presentations, social awareness presentations, and so on. You also learned What is an Excel workbook and worksheet, and how to work in it. Data is entered in the cells and can be edited, if required.

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1.9 GLOSSARY

Active cell: The selected cell in which data is entered when you begin typing. Only one cell is active at a time. The active cell is bounded by a heavy border.

Address: The path to an object, document, file, page, or other destination. An address can be a URL (Web address) or a UNC path (network address), and can include a specific location within a file, such as a Word bookmark or an Excel cell range.

Animations: Animation is a visual or sound effect accompanying text or graphics. For example, you can have an Excel pie chart appear one slice at a time, allowing you to discuss one slice before the next appears.

Slide Show: A Slide Show is the presentation of your PowerPoint slides. A slide show can be viewed online, on a computer (e.g., set to loop continuously in a display booth), or projected to a screen (e.g., live conference presentation).

Template: A Template contains slide default settings. These characteristics include colors, fonts, bullet types, and special elements such as graphics.

Transitions: A Transition is the effect that takes place when you advance from one slide to the next. This feature is available only with Slide Shows.

Wizard: A Wizard is a step-by-step guide for completing a task.

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. Excel
2. Format cells alignment
3. Columns
4. True

1.11 SELF-ASSESSMENT QUESTIONS

1. What is PowerPoint? Why is it used?

1.12 REFERENCES

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1.13 SUGGESTED READINGS

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LESSON 1.6

GRAPHICS SOFTWARE: BASIC FUNCTIONS AND POTENTIAL USES

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Graphics software: Definition and Types
1.4 Bitmap/Raster graphics
1.5 Vector graphics
1.6 Functions of Graphics Software
1.7 Use of graphics software
1.8 Summary
1.9 Glossary
1.10 Answers to In-text Questions
1.11 Self-Assessment Questions
1.12 References
1.13 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- Understand graphics software and its types
- Differentiate between bitmap and vector graphics
- Know the functions of different graphics software
- Explain the potential use of graphics software.

1.2 INTRODUCTION

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Two-dimensional images are created, edited, and managed using graphics software. Clip art, web graphics, logos, headings, backdrops, digital pictures, and other types of digital images are examples of computer graphics.It includes programmes for generating images on the CRT screen, manipulating the visuals, and achieving various sorts of user-system interaction. Computer graphics is the art of drawing drawings, lines, charts, and other objects using computers and programming. A computer graphics image is made up of pixels. The smallest addressable graphical unit depicted on a computer screen is the pixel.

1.3 GRAPHICS SOFTWARE: DEFINITION AND TYPES

Communication through images is easier to understand. The most crucial aspect of multimedia is graphics. Graphics software is a programme or group of programmes that allows a person to manipulate images or models visually on a computer.Graphics are used extensively in multimedia presentations. Graphics elements in a multimedia system are visuals that can be still images (such as photographs) transformed to digital format using scanners or images generated on a computer. They can be two-dimensional, like images, or three-dimensional, like the objects around us.Computer Graphics is used in a variety of field ranging from routine everyday activities to very specialized area in widely different fields, including business, industry and engineer, medicine, government work, education and Training, advertising research art and entertainment and communication in general. They can be either static or animated graphic components. An image in computer graphics is always a digital image.

Image Resolution: The number of pixels in a digital image related to the physical size of the underlying material is referred to as its resolution. The resolution of an image is measured in dots per inch (dpi) and is applied to the image as well as the input and output devices used to scan or print the image. Monitor resolution is typically 72 pixels per inch. The higher the resolution, the better the image.

Image Colour: There are two image colour models: RGB (Red, Green, and Blue) and HSL (Hue, Saturation, and Lightness). By simply adding colours, the three hues—red, green, and blue—provide us with a rather vast spectrum. The classification of the colour circle in HSL is based on three colour qualities known as Hue, Brightness, and Saturation.

Image File Size: The image that was made must be saved to the computer. A digital graphic's size is determined by the size of the graphics file on the computer. The size of graphic files is determined by three factors: (i) the physical size (maximum height and width in pixels), (ii) the quantity of colour information recorded in each pixel, and (iii) the compression employed to store the image. The degree of compression applied determines the quality and size of the graphics file.

Image Compression: The adoption of compression technologies is critical, particularly for graphics used on the Internet, because download time increases dramatically with growing

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file size. The image's quality must not suffer when it is compressed. JPEG(Joint Photographic Experts Group) and Graphical Interchange Format (GIF) are two picture compression methods that are commonly used on the Internet.

- ***JPEG:***JPEG compression is effective with 24-bit colour photos (true color). It is appropriate for images with a lot of colours (such as photographs).
- ***GIF:***GIF can store 8 bits of colour data (Grayscale, Color map). GIF compression is appropriate for pictures such as line drawings, graphics with text, and cartoons with no more than 256 colours. It is favoured over the Internet for vector graphics.
- The most frequent file types used on the web are.jpg (for JPEG) and.gif (for GIF). A relatively new file format, portable network graphic (.png), enhances some of the advantages of.gif. Plug-ins for.png are required by web browsers.

Image Capture: Graphic images on the computer can be made with editors or loaded from devices that capture graphics images. Images are loaded onto computers via devices such as scanners, digital cameras, digital video cameras, and clip art. Scanners resemble photocopiers and are used to copy images to computers. It transforms an analogue image into a digital image. On the computer, digital cameras save digitised images, and digital video cameras store digitised images with motion. Many word processors include a built-in collection of images known as clip art.

There are two types of digital graphics—bitmap graphics and vector graphics.Before we get into what vector graphics and raster graphics are, let's define a few terms:

Pixel: A pixel, dot, or picture element is a physical point in a picture in computer graphics. A pixel is simply the most basic addressable element of a picture displayed on a screen.
The vast majority of images we see on our computer screens are raster images. Another example of a raster image is the selfie you take with your phone. A bitmap is a collection of pixels that is used to create an image.

***Bitmap*:** A bitmap in computer graphics is a mapping from one domain (for example, a range of integers) to bits, or values that are either zero or one. It's also known as a bit array or bitmap index. The more general term pixmap refers to a pixel map in which each pixel can store more than two colours, requiring more than one bit per pixel. Bitmap is frequently used for this as well. In some contexts, the term bitmap refers to images with one bit per pixel, whereas pixmap refers to images with multiple bits per pixel.

1.4 BITMAP/RASTER GRAPHICS

Computer programmes in bitmap graphics store images as pixel maps (bit-maps or raster images). The monitor is divided into a pixel grid (short form of picture elements). On the Windows platform, a screen area of 800 600 pixels is standard. Each pixel includes a value that represents a specific colour. A graphics driver translates picture data to pixel values on the display when a picture is supplied to the screen.

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Bitmap editors allow you to create and edit graphics as bitmaps. To retouch a photograph, for example, simply scan it and alter it with a bitmap editor. Paint and photo editing software are bitmap-based tools. Lview Pro, GIF 89a, Paint Shop Pro, Adobe Photoshop, Fractal Design Painter, Flash, Corel Draw, Corel Photo Paint, and 3D Studio are some popular bitmap editors.

The bit-mapped (or raster image) file format is used to store bitmap images. Bitmap images are stored in scanners, digital cameras, and digital video cameras.

GIF, JPEG, BitMaP (BMP), PostScript (PS), IRIS, and Tagged Image File Format are some formats for storing bitmap graphics files (TIFF).

Examples of bitmap graphic formats include:

- JPEG or JPG (Joint Photographic Expert Group)
- GIF (Graphics Interchange Format)
- PNG (Portable Network Graphics)
- BMP (Bitmap)
- TIFF (Tagged Image File Format)

1.5 VECTOR GRAPHICS

Vector images are created using multiple mathematical tracks. It represents the location, size, colour fill, pattern fill, and so on using mathematical equations. Vector graphics are best suited for graphic pictures that need to be resized (small or large) and repositioned frequently.

Vector editors allow you to create and modify vector graphics. A vector editor is used to produce or change more complex graphics, such as pictures, as well as to draw cartoons. A mathematical equation, for example, can be used to draw a geometric figure (straight line or circle) on the monitor. Vector editors include Adobe Illustrator. Vector-based programmes include computer-aided design (CAD), 3-dimensional modelling, and animation.

When a photograph is saved as a vector graphic, it appears sharper on the screen than a bitmap picture when enlarged. This is due to the fact that resizing vector images necessitates the use of new values in the mathematical equation that represents the visuals. Clip art images can be saved in both bitmap and vector formats.

Examples of vector graphic formats include:

- EPS (Encapsulated PostScript File)

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- AI (Adobe Illustrator File)
- CDR (CorelDraw File)
- DXF (Drawing Interchange Format)
- SVG (Scalable Vector Graphics)

Bitmap graphics	Vector graphics
They are composed of pixels	They are composed of paths
Refresh process is independent of the complexiy	Vector displays flicker when the number of primitives in the image become too large
Graphic primitives are specified in terms of end points and must be scanned converted into corresponding pixels	Scanned conversion is not required
They can draw mathematical curves, polygons and boundaries of curved primitives only by pixel approximation	Vector graphics draw continuous and smooth lines
They cost less	They cost more as compared to raster graphics
They occupy more space which depends on image quality	They occupy less space
File extensions include: .BMP, .TIF, .GIF, .JPG	File extensions include: .SVG, .EPS, .PDF, AI, .DXF

1.6 FUNCTIONS OF GRAPHIC SOFTWARE

Access to technology is required for computer graphics. The Process visually transforms and shows information. Insensible role of computer graphics Computer graphics has now become a common part in user interfaces, television advertising motion movies, and other applications.

Computer graphics is the generation of images using a computer. The result of computer graphics is a visual, which could be a business graph, artwork, or engineering.

Computer aided Drawing:

- Computer graphics is widely used in design processes, notably in engineering and architectural systems.
- Buildings, automobiles, and aircraft are designed using computer aided drawing, which aids in supplying minute details to the drawing and producing more precise and sharp drawings with higher specifications.

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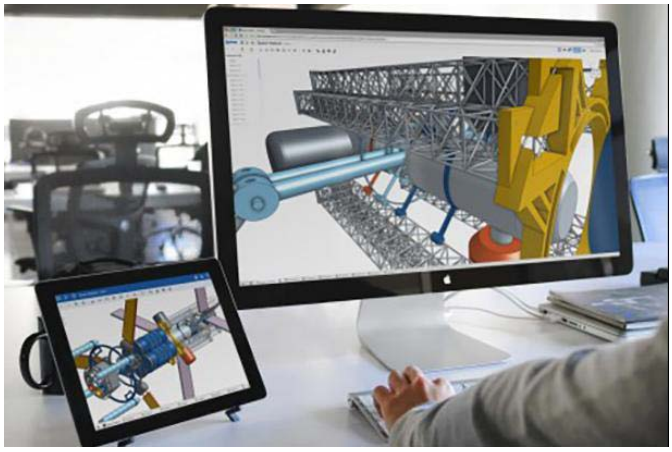

Fig: Computer aided design (Source: (*Behind MIT's New Advances in Computer-Aided Design for Manufacturing Summer Course | Professional Education*, n.d.)

Computer Art:

- We can create beautiful and commercial art using computer graphics, which includes animation and painting packages. These packages include tools for creating object forms and specifying object motion. Cartoon drawing, paintings, and logo design are all possible.
- Fine painters create images using a range of other computer technologies. The artist creates images using a combination of 3D modelling applications, texture mapping, sketching programmes, and CAD software, among other things.
- These "painting" techniques are also used in commercial art to create logos and other designs, page layouts mixing text and graphics, TV advertising spots, and other applications.

Presentation Graphics:

- The tools available in computer graphics can be used to create bar graphs, pie charts, and time charts, as well as summarising financial, statistical, mathematical, scientific, and economic data for research reports and managerial reports.
- Graphs and charts are often used in research reports, managerial summaries, and other types of publications to summarise functional, statistical, mathematical, engineering, and economic data.

Entertainment:

- Computer graphics is used extensively in the film and video gaming industries. Used in the production of movie pictures, music videos, television shows, and cartoon animation films.
- Computer graphics aids in the efficient provision of such aspects in the game industry, where focus and interactivity are major roles.

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- Some television shows also employ animation techniques to blend computer-generated representations of humans, animals, or cartoon characters with the actor in a scene, or to change the shape of an actor's face.

Education and training:

- Computer-generated models are incredibly effective for teaching a wide range of topics and basics in a simple and straightforward manner. Many instructional models can be made using computer graphics, which can promote more interest in the subject among students.
- Special hardware systems are intended for particular training applications. Simulators for practise sessions, aircraft pilots, and air traffic control employees are examples of such specialised systems.

Visualization:

- Today, the need to visualise things has increased dramatically. Visualisation can be seen in many advanced technologies, data visualisation helps in finding insights from data, we need appropriate visualisation to check and study the behaviour of processes around us, which can be achieved through proper use of computer graphics.

Image Processing:

- The modification or interpretation of existing pictures, such as photographs and TV scans is called image processing.
- Various types of photographs or images must be edited before they may be used in different contexts. One of the many applications of computer graphics is the refinement of existing images for better interpretation.
- Image processing technologies are utilised in robotics applications to increase image quality, analyse images, and recognise visual patterns. Image processing techniques are also widely used in medical applications for image improvement in tomography, simulations, and surgical operations.

Graphical User Interface:

- The use of pictures, images, icons, pop-up menus, and graphical objects aids in the creation of a user-friendly environment in which working is simple and enjoyable. Using computer graphics, we can create an environment in which everything can be automated, and anyone can easily perform the desired action.
- A window manager, which allows a user to display several rectangular screen areas called display windows, is an important component of a graphical interface.
- Each screen display area can have a different process, displaying graphical or nongraphical information, and multiple mechanisms for activating a display window.
- On some systems, we can activate a display window with an interactive pointing device, such as a mouse, by positioning the screen cursor within the window display area and pressing the left mouse button.

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1.7 USE OF GRAPHIC SOFTWARE

Editing and distributing digital pictures, generating logos, drawing and manipulating clip art, creating digital fine art, creating web graphics, designing commercials and product packaging, touching up scanned photos, and drawing maps or other diagrams are all frequent uses for graphics software. There are other unusual applications, such as video editing in Photoshop or 3D drawing in Illustrator.

Vector technology is used to make graphics that are infinitely scalable and of great quality. This means you may scale your visuals to any size with high precision and no loss of quality. It is made up of pathways that are defined by a beginning and an end point. The clean and smooth borders of the vector parts are the key advantages of this graphic depiction.The high-quality images are needed in many sectors; therefore, vector graphics software have unlimited number of uses. Some of the uses of vector arts are:

1. **Printing**

Vector pictures are utilised in paper and clothing printing. It is necessary to use raster images; however, employing vector graphics allows you to fully utilise the printer resolution. They are also used in printed advertisements, journals, and brochures.

Furthermore, the publishing industry finds vector art useful for book illustrations, book covers, comic books, and a variety of other printed media. This is why many graphic design software programmes use this technique.

2. **Sign making/Signage**

Signs must be manufactured in a variety of shapes and sizes. And vector art graphics are ideal for this purpose since they can be resized immediately and seamlessly without the need for additional editing. You can, for example, make banners, open and closed signs, yard signs, flood decals, and so on.

3. **Embroidery**

Embroidery differs from clothing printing in several ways. You can stitch your chosen garment designs rapidly utilising a computer-aided sewing machine that requires vector images as input.

4. **Graphic design**

An excellent general graphic design can be created using either raster or vector graphics. However, vector-based graphic design software is more commonly utilised when creating logos and images. Vector graphics are the most useful when creating designs that will be used in a variety of ways.

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Logo design is the most widespread application of vector graphics, as evidenced by the abundance of logo design programmes and software. Logos must be placed on various supports; they may be developed for print or digital media. The vector-based logo will remain the same whether you use it on a little business card or a large billboard! Furthermore, vector is used to create icons, infographics, drawings, and computer typefaces.

5. **Animation**

To create seamless and well-made animation videos, you must employ high-definition images for motion graphics and transitions. Vector drawings are also used in embedded web content via HTML5 and Adobe Flash animations. Many motion graphics software and even vector animation software use this technology by incorporating it into the core framework. Not to add that there are numerous Android and iOS apps specialised to 2D animation utilising vector graphics.

6. **Video games**

Video game companies use vector art technology to design the characters and backgrounds of the games.

7. **Computer Aided Design (CAD) technology**

Computer Aided Design (CAD) technology is one of the industries that largely relies on vector-based visuals. For design and technical documentation, CAD software is widely utilised. Vector art is specifically utilised for 3D rendering and animation.

8. **GIS**

GIS, or Geographic Information Systems, create maps using vector graphics. The usage of vector graphics in GIS is due to the ability of interaction, which allows the user to scale up and down maps and geographic cards extremely smoothly.

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IN-TEXT QUESTIONS

1. Main body of the lesson is divided into headings and _____.
2. The language to be used for this purpose should be hard. True / False
3. Following tools can be used to create interest among the learners:
   a) Jargons b) complex language
   c) Charts d) repetitive sentences
4. Charts and Pictures are used to create _____.
5. I-you-me-mode is a _____ style of writing.

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IN-TEXT QUESTIONS

6. The language to be used for this purpose should be hard. True / False
7. Main body of the lesson is divided into headings and _____.
8. Following tools can be used to create interest among the learners:
   a) Jargons b) complex language
   c) Line Diagrams d) repetitive sentences
9. I-you-me-mode is a _____ style of writing.
10. Charts and Pictures are used to create _____.

1.6 SUMMARY

So here we have seen various applications of computer graphics. These are some computer graphics applications as their popularity has increased tremendously and will continue to increase with technological progress.

Communication software provides users with a rapid and efficient way to communicate and provides a time-saving alternative to passive channels such as emails or in-person meetings.

1.7 GLOSSARY

Motivation: Physiological feature that arouses an organism to act towards a desired goal.

Attention: Concentration of the mental powers upon an object.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Sub-headings	9. Conversational style
2. False	10. Interest to learn
3. Charts	11.Interest to learn
4. Interest to learn	12. Conversational style
5. Conversational style	13. False
6. False	14. Sub-headings
7. Sub-headings	15. Pictures

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8. Line diagrams	

1.9 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.

1.10 REFERENCES

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LESSON 1.7

COMMUNICATION SOFTWARE

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Communication software: Definition
1.4 Types of communication software
1.4.1 Communication software packages
1.5 Features of communication software
1.6 Benefits of communication software in libraries
1.7 Summary
1.8 Glossary
1.9 Answers to In-text Questions
1.10 Self-Assessment Questions
1.11 References
1.12 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson, you will be able to:

- Learn about communication software
- Know the features of communication software
- Learn the benefits of communication software

1.2 INTRODUCTION

Communication is essential to both relationships and to business success. A Harvard Business Review study found that employees in the modern workplace now spend around 80

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percent of their time on activities that require collaboration with other workers. In today's business world, digital communication and the tools used are key to maximising these interactions.

The modern workplace is well on its way to a total digital transformation, especially as the need to effectively manage the growing number of remote employees becomes a priority. However, all too many businesses suffer from disparate, disjointed in-house applications. Your company relies heavily upon key systems and applications for productivity and communication. Is your current network of platforms and software as efficient, effective and reliable as it could be?

Communication platforms and software can be indispensable in facilitating better collaboration and connection in-house as well as with clients and partners. Your portal, intranet, learning management and website can also benefit from these solutions.

1.3 COMMUNICATIONS SOFTWARE: DEFINITION

With the increased popularity of remote jobs& remote education, having appropriate communication tools is critical.Businesses must continue to operate smoothly and rapidly navigate how communication will work for them. Finding the proper software to meet your requirements is critical.Communication software refers to a set of applications or systems you can use to communicate with other people in real-time. These apps are capable of transmitting information to each other.The word communication software can refer to a variety of systems that may or may not exclusively provide communication functionality.Among the most notable are:

- Companies that specialise on customer assistance and relationship management, as well as those looking to add call centre capabilities.
- Headquarters of huge corporations that have a large number of phone lines and in-house customer support.
- Businesses with offices and clients in multiple locations. This is handy for remote engagement, training, and conference calls, among other things.
- Small-scale businesses that offer customer phone assistance.
- Call centres with a high volume of consumers that require desktop devices for their agents.
- IT companies and ecommerce sites that offer live help to improve the consumerexperience.

Communication software is usually synchronous or asynchronous.

- Synchronous communications are those that happen in real-time. Instant messaging, video chat, phone conversations, web conferences are a few examples of synchronous types of communication.

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- Asynchronous communications involve a time delay. The transfer of files or content takes a while, such as sending an email, forum discussions, news stories, and comment sections.

1.4 TYPES OF COMMUNICATION SOFTWARE

Communication software enables you to communicate with other computers or mobile devices in synchronous or asynchronous mode using text, video, or audio formats. While email is an asynchronous mode of communication, Web conferencing and video chat are synchronous, allowing all participants to speak in real time. Video messaging allows you to use either way. Some communication software is solely available for mobile devices, while others are also available for laptops.

1. ***Unified communications system.***This service includes phone assistance, ticketing, an intranet, VoIP, and other enterprise capabilities such as reporting and analytics. As a help desk or contact centre solution, it is typically utilised for customer assistance or outbound sales.
2. ***Web conferencing.***This includes the ability to transmit text, audio, and video and is used for a variety of applications including video presentations, employee training, conference calls, client onboarding, tutorials, and webinars. It is useful for businesses with international clients, remote teams, or a large web email list. Example: GoToMeeting
3. ***Live chat.***This is a stand-alone app that may be integrated into digital channels such as a website, social media page, newsletter, or bespoke app. Live chat programmes can also give marketing software capabilities such as lead qualification and nurturing, analytics on web visits and FAQs, and integration with CRMs for shared data.

1.4.1 Here are some of communication platforms and software that can be used to connect. Some of the communication software packages available in the market today are:

1. **Dropbox**

Dropbox is one of the most efficient and user-friendly cloud sharing solutions. Teams can use Dropbox to better manage shared files, reducing the need for email and improving the collaboration between employees.

Integrate with your intranet solution so team members can easily insert their content into a team workspace with just one click. Content can then be uploaded into Dropbox and visually displayed. A content search function is also included.

2. **Google Workspace**

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Google Workspace's (formerly G Suite) secure collaboration and productivity apps for businesses.

It includes Gmail, Calendar, Drive, Docs, Sheets, Slides, Meet and more. Because it's web-based, G Suite works in most browsers on any operating system. You also have a centralised administration interface that makes setup and management of users fast and easy.

3. **Microsoft 365**

Microsoft is a productivity software for organisations and individuals. With Microsoft 365 you have one integrated solution including Teams, OneDrive cloud storage, and Office apps with advanced security options. Connect it with your content management platform to easily browse, edit and save stored documents directly from Microsoft Office.

For example, the OneDrive Connector allows you to easily access files and documents stored in OneDrive within your intranet or portal solution. Open, comment on, adjust and save documents within the browser using Office 365 integration. This platform facilitates much more effective collaboration.

SharePoint is another tool available with 365. It is a web-based collaborative platform or an on-premise software for your employees. Connect this with your intranet to map SharePoint content to folders to allow for manual or automatic synchronisation. You can also centrally publish documents and SharePoint pages as well as images to your intranet.

4. **Microsoft Teams**

Microsoft Teams (previously Skype for Business) now comes bundled with the Standard and Premium Business Packages. It allows you to collaborate with other people within a dedicated online workspace where you can have conversations and share documents. It offers messaging, voice and video calls between people or groups of people.

Channels - group chat rooms - can be set up around specific topics such as work projects and can be private or public. This is a cost effective communication platform to communicate with individuals located in a different country.

5. **Slack:**

A cloud-based messaging solution that is ideal for businesses of all sizes looking to improve team communication. This programme consolidates all of your discussions onto a single platform. You can use the app to send, archive, or search messages, make video or audio calls, and exchange files with other users. Furthermore, it has a wide range of integrations. The tool integrates nicely with all main social media networks as well as other office apps such as Google Drive, Dropbox, Zendesk, and others. It also has many amazing features, like as single sign-on, data encryption, synchronisation, and file browsing, to name a few. Furthermore, the majority of these features are included in their free plans.

6. **Zoom:**

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Corporations, educational institutions, healthcare organisations, etc can utilise this cloud-based online video conferencing and meeting platform to host seminars, conduct online training, virtual meetings, video demonstrations, and video conferences. It supports up to 10,000 view-only participants and 100 interactive participants on video webinars and provides high-quality video, audio, and screen sharing capabilities, as well as collaborative features.

7. **Skype:**

A web-based communication platform known for offering excellent yet low-cost VoIP services. It's not unexpected given that the platform allows users to send and receive real-time messages, share documents and photographs, and perform free group video conference, group chat, or video chat. All fundamental services are provided at no cost. There are complex features, such as the ability to call mobile phone numbers and actual landlines through Skype. These are frequently charged afterwards, but the fee is generally little.

1.5 FEATURES OF COMMUNICATIONS SOFTWARE

The most obvious and important function of communication software is that it facilitates and streamlines communication among concerned parties. Here are some of the important features of communication software:

Auto Receptionist

Some communication software can handle calls without the need for human participation. They serve as the front-desk receptionist for a company's visitors. They can also route the call to the best available agent based on the customer's needs or preferences.

Voicemail and Greetings

It allows you to record a message that will play automatically when you are unavailable and someone calls you. Other tools provide an abundance of bespoke greetings that can be used for the same purpose.

Video Conferencing

You can use this tool to hold group video calls. It is especially useful for teams with members who live thousands of miles apart. Instead of having everyone travel and congregate in one area, you may arrange virtual meetings.

Audio Conferencing

You can phone and converse to more than one person with this feature. It enables multiple people to converse with each other at the same time.

Call Recording

Various communication platforms provide the capacity to record audio and video conversations. This is handy since the recorded call can be used in a variety of ways. You can, for example, use it as a future reference or as proof to help resolve disputes and concerns. It's also great for training or as a review of past meeting sessions.

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Live Chat

This type of software, which is commonly deployed on websites, enables businesses to provide more tailored customer service to their current and prospective customers. It's also the easiest to use of the communication software family because it's generally placed on business websites, and everyone who visits them will be greeted by either a bot or a live agent via chat. Live chat is also a useful analytics tool because it provides you with statistics on your visitors' surfing habits. This, in turn, can be leveraged to provide clients with personalised support and chat experiences. The data acquired can also be utilised to create and manage advertising campaigns.

Web Conferencing and Video Software

This type of solution, which is ideal for remote locations, allows you to conduct meetings, conferences, webinars, and other events even if the participants are unable to see you physically. It's also available on a variety of platforms, including desktops, laptops, tablets, cellphones, and others. Advanced features such as screen-sharing and live document transmission are also supported. For example**:** GoToMeeting, GoToWebinar

1.6 BENEFITS OF COMMUNICATIONS SOFTWARE

Many firms benefit from anything that enables clear, fast, and easy communication. This is something that communication software excels at. Here are some of the advantages of using a good communication platform in particular:

Remote Work: To perform regular operations, cooperate, or solve critical circumstances, global firms demand communication solutions that keep people connected in real-time. A set of communication software solutions that leverage the cloud and mobile allows teams to assign work, coordinate, and transmit instructions from any location with an internet connection.

Productivity: Direct communication with teams reduces errors like as missed deadlines, and the use of recording features in live chat, email, and VoIP applications ensures that employees are accountable for their tasks. Remote teams can communicate with the office via mobile devices to quickly organise daily work.

Improved Communication**:** Clear and efficient communication is critical since it is one of the most important factors in preventing costly errors such as missed deadlines and inaccurate outputs. To that end, communication software provides your company with a plethora of tools to ensure that the correct message is conveyed. Furthermore, because there are histories and digital trails, the approach promotes employee accountability. Furthermore, because of the collaboration features provided by the system, remote teams would be able to enjoy coordination virtually as if they were working with their peers in the same office.

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Better Information Capture: One key advantage that communication software offers is the ability to automatically record data. This is because, in addition to being the sender and receiver of messages, the system also functions as their store. Some tools even include archival options for messages, video/audio conversations, emails, etc. This can then be used to conveniently search for information anytime you need it, such as when referencing a discussion topic or preparing meeting minutes.

Easy to Integrate: Most communication technologies, such as messaging apps or emails, can interact with other systems that you use because they are almost ubiquitous in every firm. This is a great approach to automate specific procedures, making workflows more fluid and efficient. Examples include the ability to transform emails into tickets, funnel live messages into the CRM system for leads, and record webinars that are directly uploaded to your knowledge base.

Lower Expenses*:*Many communication systems are readily accessible via mobile devices such as smartphones. As a result, hardware expenses can be decreased. Furthermore, many communication applications are free and can be used endlessly to exchange messages, share files, and make video/audio conversations.

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IN-TEXT QUESTIONS

11. Charts and Pictures are used to create _____.
12. I-you-me-mode is a _____ style of writing.
13. The language to be used for this purpose should be hard. True / False
14. Main body of the lesson is divided into headings and _____.
15. Following tools can be used to create interest among the learners:
    a) Jargons b) complex language
    c) Pictures d) repetitive sentences

1.6 SUMMARY

Virtually everyone uses communication software.Software that assists a computer operating system (OS) in managing local and remote terminal access to host resources, managing security, and performing certain checkpoint activities. Communications software generally is embedded in the OS, although it can take the form of a systems task under the

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control of the OS. Communications software, for example, is used to control a modem, performing terminal emulation and file transfer tasks.computing, broadcasting andtelecommunication facilities influences library services and have positive influence on servicesrendered in the library

1.7 GLOSSARY

Motivation: Physiological feature that arouses an organism to act towards a desired goal.

Attention: Concentration of the mental powers upon an object.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Sub-headings 2. False 3. Charts 4. Interest to learn 5. Conversational style 6. False 7. Sub-headings 8. Line diagrams	9. Conversational style 10. Interest to learn 11.Interest to learn 12. Conversational style 13. False 14. Sub-headings 15. Pictures

1.9 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.

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LESSON 2.2

IN-HOUSE OPERATIONS: ACQUISITION, CATALOGUING, CIRCULATION, SERIAL CONTROL, OPAC, ETC.

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1.1 Learning Objectives
1.2 Introduction
1.3 Acquisition
1.3.1 Objectives of an Automated Acquisition System:
1.4 Cataloguing
1.4.1 Objectives of an Automated Cataloguing System:
1.5 Circulation
1.5.1 Objectives of an Automated Circulation System:
1.6 Serial Control
1.6.1 Objectives of an Automated Serial System:
1.7 OPAC
1.7.1 Objectives of OPAC
1.8 Summary
1.9 Glossary
1.10 Answers to In-text Questions
1.11 Self-Assessment Questions
1.12 References

- To understand basic functioning of different housekeeping sections of a Library

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- To streamline bibliographic records of the Library with automated housekeeping operations
- To eliminate time spent in duplication of effort and reduce paperwork of Library professionals
- To ensure easy retrieval of information/ reading material upon queries of the reader
- To make services productive by adopting automated means of performing day-to-day routine activities

"Library automation may be defined as the application of automatic and Semiautomatic data processing machines (computers) to perform traditional library Housekeeping activities such as acquisition, circulation, cataloguing and reference and serials control. Today "Library Automation" is by far the most commonly used terms to describe the mechanization of library activities using the computer." (Uddin,2009).

The performance of a Library hugely depends upon its housekeeping operation. The housekeeping operation were earlier performed manually while most of the Libraries have switched to an automated means of performing these operations i.e. with the assistance of a Library software or ILMs (Integrated Library Management Software). This increases the productivity of Library professionals as duplicity of work is eliminated by limiting clerical routine work and enhances the overall performance in providing required information to its readers. The basic housekeeping operations include Acquisition, Cataloguing, Circulation, Serial Control OPAC among others depending on the type of Library and the diversity of readers it caters to.

While all the operations of a Library are interlinked and largely depends upon the functioning of other operation, acquisition is considered most crucial. As acquisition process is the first entry point for entering bibliographic details of reading material procured by a Library, the information entered on this stage gets reflected in all other operations.

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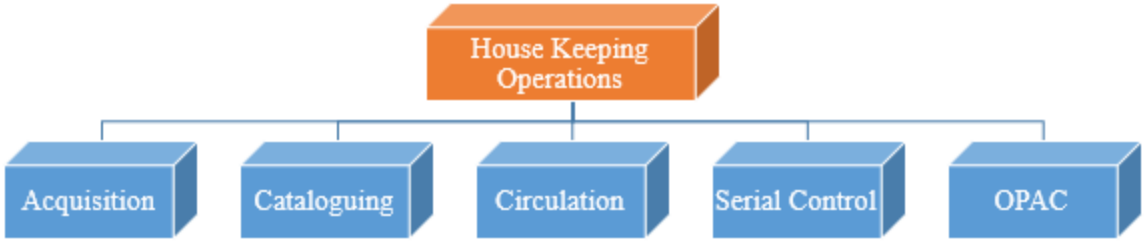

Figure 1.1: In House Operations in an Automated Library

Acquisition function is most crucial in acquiring reading material (like Books, e-books, maps etc). for the Library in order to satisfy the information needs of its readers. A good collection of reading material is directly related to an increased footfall of its readers or prospective readers. Hence, there the recommendations from the readers should also be taken for procuring reading material of their interest and scrutinize their recommendations to check duplicity, relevancy of the titles recommended etc. A list of selected books is prepared for placing the order after considering the budgetary constraint to ensure that budget is judiciously divided into procuring reading material of all categories like subject related books, general awareness, literature among others, depending upon the interests of readers of the Library.

Once the list of books to be procured is finalized and approved by the Competent Authority, vendors are approached from the available database of authorized book vendors to discuss the terms and conditions for delivery, mode of payment, order cancellation policy etc. After considering all pre-order parameters, the order is placed.

Upon the receipt of the ordered books, the details of books in invoice are tallied with the list of books ordered. All the books upon receipt are physically checked to ensure no page is missing or damaged. Thereafter, the books are assigned an Accession Number in sequence and its bibliographic details are entered in the current volume of the Accession Register.

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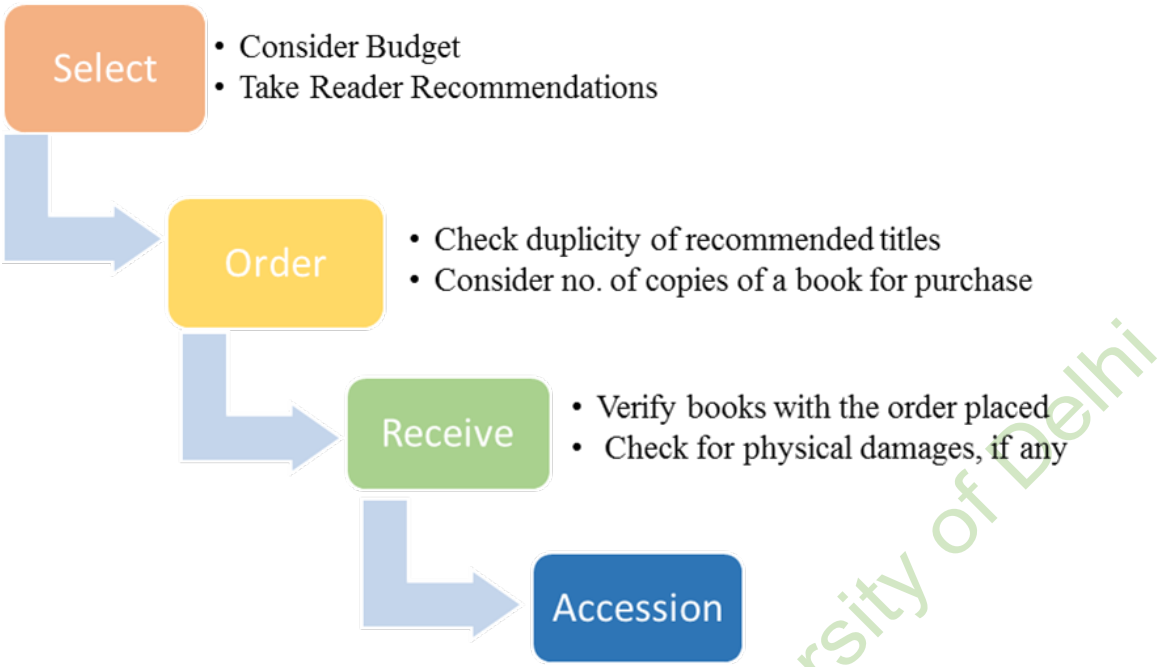

Fig 1.2: Process of Acquisition

In an automated system, these tasks are done with the help of computers which saves the time of Library professionals by a great deal. Their efficiency in performing Library functions increases manifold. While processing an invoice, entering the details of reading material purchased by a Library can be mechanized by preparing a Master list of authorized vendors, publishers etc. Once the data is entered, generating category reports and statistics as required gets easier and the data can be made available to the Library Authorities on demand.

1.3.1 Objectives of an Automated Acquisition System:

- Effective and efficient management of record files
- Easy cross checking for availability of recommended titles
- Autofill vendor details like address, telephone, mail id etc. once entered
- Elimination of manual files thereby reducing chance of clerical errors
- Faster processing of Invoice and submission of bill for payment
- Generating Acquisition report and other financial data recording with accuracy
- Eliminate procedure to calculate discount, foreign exchange rates etc.

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In context of Libraries, a catalogue is usually prepared in the form of a card. Once the books are received and accessioned, the next step is to classify and catalogue the books. Classification means grouping related subjects and assigning a subject code to the book as per the schedules of available Classification schemes like Dewey Decimal Classification, Universal Decimal Classification, Colon Classification etc.

Thereafter, the books are catalogued to browse the collection of a Library through different approaches. In manual system of Cataloguing, Catalogue Cards of size 12.5 cm X 7.5 cm are prepared which bear bibliographic details of books/ documents. Separate cards are prepared for each book for Author, title, series etc. In order to maintain uniformity, there are standard schemes for Cataloguing like Anglo-American Cataloguing Rules (AACR) and Classified Catalogue Code (CCC) among others. A Library may select any cataloguing scheme as per its requirements.

These catalogue cards are then arranged in a Catalogue cabinet in which cards are placed in a systematic order like, by Title, Author, Subject etc. In this method, a lot of effort goes into preparation of catalogue cards for each category namely, Author, Title, Subject, Series etc. The checking of cross reference entries and browsing collection through these cards by a reader is difficult and also time consuming.

In automated system of cataloguing, an Authority File is created to maintain uniformity in entering bibliographic terms or headings. This authority file may be downloaded from union catalogue of existing Libraries on web or can be created in house. This Masterfile is updated from time to time to include more vendors, publishers etc.

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To generate an automated catalogue for a new procured item, it's bibliographic details are incorporated from the acquisition module and other required details are entered in a pre-designed worksheet following a standard format like MARC 21 (Machine Readable Cataloguing), CCF (Common Communication Format), UNIMARC (Universal MARC) etc. The details are entered in the worksheet with required fields to generate machine readable catalogues for easy retrieval of data. These auto-generated cards can also be printed in case a hybrid mode of cataloguing is to be followed by a Library. Automation system also enables easy updation of status of records of the Library like if a book has been sent for binding or has been weeded out due to wear and tear, it may be reflected in the cataloguing module. This module also enables import/ export of data in suitable file formats to help Library professionals in day to day routine jobs.

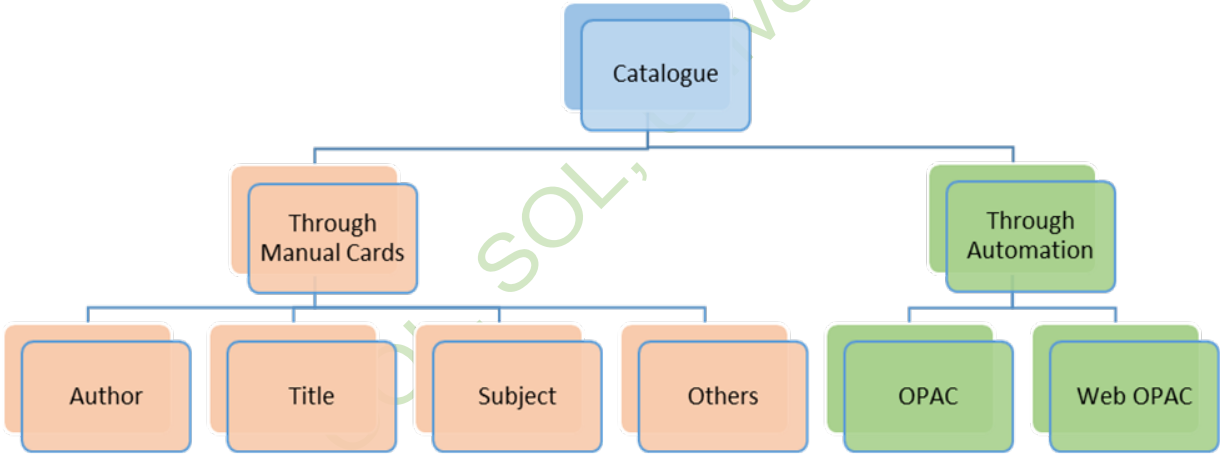

Figure 1.3: Methods of Cataloguing in Manual and Automated System

1.4.1 Objectives of an Automated Cataloguing System:

- Eliminating the task of manually printing book cards, catalogue cards and updating the same
- Saves space occupied by large cabinet cards
- Save time by downloading readymade catalogue entries from the databases available on Cloud

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- Enable keyword search by readers
- Easy to generating Barcode Labels for scanning
- Ease of cataloguing in case of multiple copies of a book
- Efficiency in generating report in suitable file formats
- Import/ Export of record of Library items

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The sole motive of effective accessioning and cataloguing by a Library is to be able to serve its readers with greater efficiency and save their time. The Circulation Section involves core activities of the Library like Charging/ Discharging/ Reissue of books, sending reminders for Overdue Books among others. In manual method, these tasks may involve clerical or human error. Also, it is difficult to answer queries of readers as to when a requested book is due to be returned and hence reservation service is not so effective.

In automated system, the circulation activities take place by the help of a software in which the records of books are entered during the acquisition and cataloguing modules as discussed above. Once the record of books is processed, barcodes are generated which are pasted on the books to enable scanning during circulation activities. This saves the time of both readers and library professionals and also reduces human intervention thereby eliminating the chances of error. Ever since the Libraries have adopted to an automated means, the readers are being benefitted with the services of reissue of books, reservation requests, check their circulation history among others through the comfort of their home.

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Now, a few Libraries have already incorporated RFID (Radio Frequency Identification) in which a small chip is pasted inside every book and sensors are installed at the entrance gate. These sensors give out an alarm if a book is passed through these gates without being issued, this technology prevents the theft of books thereby reducing loss of books.

1.5.1 Objectives of an Automated Circulation System:

- Ease in updating Membership records of existing readers
- Identification of items on loan to a particular borrower or class of borrowers.
- Efficient and error free transactions of Charging/ discharging/ Renewal of reading material using barcodes
- Intimation to readers through auto-generated overdue reminders via mail
- Calculation and printing receipts of Fine collected
- Notification to the Library staff for reservation for issued items
- Automated intimation mail to the reader upon availability of the reserved item
- Ease in generating category-wise statistics to identify most borrowed items
- Ease in generating reports like overdue report, most borrowed titles, most frequent members etc.

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Serials include magazines, journals and periodical publications like newsletters, newspapers, annual reports, conference proceedings, monograph series etc. Procuring a serial is different from procuring books as these are generally paid for in advance and are

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subscribed by local vendors, agents, direct from publishers against online payment in advance etc.

A library need to identify relevant serials for subscription based on readers and their interest. Thereafter, the serials can be subscribed on annual basis but keeping a track of serials subscribed by a Library and details w.r.t. its subscription start date, periodicity, price, ISSN etc. is a cumbersome task as these are recurring in nature and differ in periodicity. Also, a list of non-receipt of serials needs to be prepared which is difficult to maintain in manual method. A follow up of non-receipt of serial is then taken up with vendor in order to procure complete volumes. Once the volume of a serial is complete as per its frequency, it is sent for binding. The list of serials must be annually updated to add new titles or cancel serials which are no longer required.

Managing such a diversified range of serials with different periodicity gets lot easier to manage by adopting an automation system as with the help of a library software, the above tasks are performed in more efficient way than manual method. Upon receiving a new serial, its detail need to be entered once in the Master File w.r.t. Title, Publisher, Volume No. Issue No., Periodicity etc. Thereafter, upon receipt of a new issue, only the detail of issue no. or special issue received needs to be entered. On monthly basis, a report of non-receipt of serials can be generated for sending reminders to the vendor in order to ensure the volume series is complete before it is sent for binding. “Computer based serials control systems may be predictive or non-predictive. Predictive systems predict the arrival of individual journal issues and can generate reminders in case of non-receipted issues. Prediction means the ability to inform that a named issue of a named journal will arrive in the library within a stated time interval. Modern library management software supports predictive mode of serials control with the facilities of online acquisition and access of journals through World Wide Web (WWW).” (Dhawan, 2017).

1.6.1 Objectives of an Automated Serials System are:

- Registering a serial by entering its bibliographic details
- Assigning Accession Numbers to journals upon receipt
- Keeping a track of non-receipt of issues and sending reminder to the vendor

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- Generating required report w.r.t. subject, frequency, publisher, budget spent among others
- Provision for entering details of special issues, supplementary editions
- Facilitates change of name of publisher, serial in case of merger or split.
- Ease in processing invoice
- Preparing Indexes for Indexing services, if provided by the Library

OPAC stands for Online Public Access Catalogue. It is an automated catalogue of the holdings of a Library through which it's readers can browse collection of the Library through computers using keywords like Title, Author, Publisher. This feature is usually a module of Library software or ILMS and enables a reader to search for the availability of a book/ reading material. This service may be provided on the Intranet by setting up a few computers within the Library premises to make data accessible through LAN. Another way is to make data accessible on Internet to extend its services to the world through the services of Web OPAC.

OPAC is a window to the holdings of a Library and enables a reader to use combination of keywords for searching required books or reading material. The effectiveness of this module largely depends on data entry at the earlier stages of acquisition and cataloguing. For this, uniformity in data entry, spell checks, highlighting keywords are some of the parameters which can contribute to the effectiveness of OPAC in drawing results to a user query.

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If a reader is unable to draw search results by title, author or subject then he can approach keyword search facility of OPAC to see results of material available. Hence keyword searching plays an important role in getting more specified results. For this, Boolean operators and combination of keywords may be used in order to broaden the search stream.

1.7.1 Objectives of OPAC:

- Ease of searching books through keywords like Title, Author, Publisher, ISBN etc. or applying a combination of keywords using Boolean operators like AND. OR, NOT.
- Ease of checking availability of books in case of a network of Libraries with multiple branches.
- Filter search by limiting keywords like publication year, language, record type etc.
- Allows readers to manage account and login credentials
- Renewal of books using login credentials
- Facilitates publishing their catalogue using Web services called the Web OPAC wherein users can search the books remotely
- Online request for reservation of books and its cancellation thereof
- Generate cataloguing statistics and reports w.r.t. publishers, language, item type etc.

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Computers have been a part of our everyday routine since a long time, adopting these in the Libraries has gradually geared up pace as many Libraries are now functioning on an automated system as to perform routine chores with enhanced efficiency. Libraries differ in terms of size, space, collection, type of readers etc and need to plan its services accordingly. But adopting to an automated means will only add to its performance. Switching from manual to an automated system can be cumbersome for large libraries, but once the data is uploaded it is easier to update the same and fetch reports as and when required. This data can also be extracted and downloaded in required file formats and can be used to analyze demand for a particular subject or title. The statistics and quarterly reports of borrowing patterns helps a Library in planning any new services or enhancing the existing services. A Library is efficient only if there is an increased membership which leads to an increased footfall of readers, but this can only happen if the library has required reading material to offer. Hence, Libraries need to consciously make decision in order to procure a good ILMS which supports all features of housekeeping operations.

MARC- Machine Readable Cataloguing

OPAC- Online Public Access Catalogue

RFID- Radio Frequency Identification

AACR- Anglo-American Cataloguing Rules

CCC- Classified Catalogue Code

ILMS- Integrated Library Management Software

1. All of these 2. Select 3. True 4. Machine Readable Catalogue 5. 12.5 cm X 7.5 cm 6. False 7. Circulation 8. Radio Frequency Identification	9. Barcodes 10.Pamphlet 11. Binding 12. World Wide Web 13. Web OPAC 14. OPAC 15. IF

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Q1. Give a brief account of main library housekeeping operations

Q2. How can we eliminate the chances of human error by an automated circulation method?

Q3. Discuss the advantages of automated housekeeping operations.

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LESSON 2.3

BIBLIOGRAPHIC STANDARDS: MARC AND CCF

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STRUCTURE

1.1 Objectives/Learning outcome
1.2 Introduction
1.3 Standardization in Libraries
1.3.1 Bibliographic and Machine Record Format
1.3.2 Machine Record Format
1.4 Bibliographic Standard
1.4.1 Universal Machine-Readable Catalogue (UNIMARC)
1.4.1.1 UNIMARC FORMAT
1.4.2 Functional Block of UNIMARC
1.4.3 Common Communication Format (CCF)
1.4.3.1. Structure of CCF
1.4.3.2. Limitations of CCF
1.4.4 Machine Readable Cataloguing (MARC)
1.4.4.1Record Structure and Field Designations
1.4.4.2 Structure of MARC Tages
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1.4.5 Machine Readable Cataloguing (MARC-21)
1.4.5.1 Need of MARC 21
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1.4.5.3 Standard used in MARC 21
1.5 International Standard for Bibliographic Description (ISBD)
1.6 Indian Format
1.7.1 Shortcomings in Indian Standard
1.7 BIBFRAME
1.8 Summary
1.9 Glossary
1.10 Answer to In-text Question
1.11 Self-Assessment Question
1.12 Reference and Suggested Readings

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1.1 LEARNING OBJECTIVES

After reading this chapter, you will be able to know:

- After reading this chapter, you will be able to know:
- the different bibliographic standards
- Standardization in libraries
- Bibliographic and Machine Record Format
- Limitations of these standards
- Different standards such as: ISBD, MARC, CCF, MARC 21, Indian standard

1.2 INTRODUCTION

A standard is a harmonized, agreed and documented way of doing something. It ensures the safety, quality and reliability of the product and service. The process of developing and implementing regulations for a systematic approach to a certain activity for the benefit of all concerned involved is known as standardization. Standardization is done and required to be done at all, Regional, National, International level.

Today standardization is becoming increasingly important to ensure greater effectiveness of information services in all the countries and the use of information and information systems across national, regional and borders. Standardization is the setting up by authority of common consent of a quality, quantity, pattern, method on unit of measurement for adoption. This can be helpful in developing an adequate book stock, employing trained staff and occupying suitable quarters. Bibliographic standard also facilitates in transferring the videographic data between videographic agencies at national and international level. There should be a suitable, feasible and widely acceptable format.

1.3 STANDARDIZATION IN LIBRARIES

Standardization is the result of a particular standardization effort approved by recognized authority. The importance of standards in libraries are for bringing out the uniformity and order, guiding for the establishment of new libraries and for the improvement of the existing libraries, it is also to guide to the level of financial, materialistic and human support necessary to ensure that the libraries will be able to fulfil their commitments to the users. Further, for the essential planning and evaluation of library services and also to upgrade libraries, providing sub-standard institutions with yardsticks by which to measure their deficiencies.

In the library and information field, a number of standardizing agencies have been established to bring uniformity in processes, procedures, products, tools, etc. The rules for

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the heading of the author and title entries in catalogues and bibliographies were established by the International Conference on Cataloguing Principles (ICCP), which was held in Paris in 1961. The conference was supported by IFLA with the goal of creating a set of fundamental principles that will act as standards for cataloguing codes all around the world. Some national codes may be affected by the Paris Principle. Different headings persisted in various catalogues and bibliographies, nevertheless, and they prevented the sharing of information. The major effort for standardization of record formats started from the development of ISBD. In any case the database must adopt a standard bibliographic record format, where bibliographic record is defined as the sum of all the areas and elements, which are used to describe, identify or retrieve any document or a publication of information content. For each designed item, a bibliographic record is constructed according to the agreed rules and standards of the system.

There are certain areas in the library and information field in which standards have been adopted such as library classification and cataloguing, alphabetical arrangement, transliteration, library building, equipment, furniture and fittings, lighting arrangement, book binding, and computerization.

1.3.1 Bibliographic and Machine Record Format

It is necessary to know about the key concept for an understanding of bibliographic data formats. They are as described in the following: (i) Records, Fields, and Subfield. record is a set of related data elements that somehow a computer programme considers as a unit to carry a specific procedure. Each record provides information that relates to a distinct entity, item, or unit that the system has identified. In bibliography and library applications the units are books, journals, articles, etc. (ii) Character or Character Sets, where records can also be described as string of characters, which is any symbol representing a letter of the alphabet, a digit or a sign. A record is described as 500 characters in length or May regarded as a string of 500 characters. A character set is a group of machines (binary) equivalents of the total number of characters that can be exactly represented within a given computer system (iii) Record Format, refers to the arrangement and identification of data for computer handling. A machine format may be fixed or variable. It is arranged according to a particular format. Fixed records, the length can be adjusted to suit the bibliographic data.

1.3.2 Machine Record Format

The existence of a Machine Format for bibliographic records is essential to any storage and retrieval system of documents. For a machine-readable record format, however, one needs a more explicit way of determining the end of one data element and the beginning of another.

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Various approaches are taken for the identification, organisation and storage of data in machine readable format.

The machine format consists of (i) data elements (ii) field, i.e. a collection of elements, e.g. a field relating to authorship consisting of the fields, which contain data elements that are always expressed in a pre-determined number of characters; (b) variable field, which contain data elements with no pre-determined length. (iii) Record, which is the complete collection of files treated as unit. As far as the Components of Machine Record Format are concerned. It has three record format. All the three (3) formats have been discussed one by one (i) Structure of a Record which is a physical representation of data on the machine readable medium. The structure of record is compared to an empty container that provides a basic framework for the record and allows its contents to be transported form one center to other. (ii) Content Designators are the means of identifying the data elements or providing additional information about each data element or sometimes referred to as codes to represent data elements, and (iii) Content of the Record. These are the data elements themselves.

1.4 BIBLIOGRAPHIC STANDARDS

There are several Bibliographic Standards available. The countries around the world are choosing the bibliographic standards which are convenient, cost effective and easy to use for them. The chapter discusses some of the popular Bibliographic Standards being used across the globe. Some of the well-known Bibliographic standards have been discussed in detailed manner. They are:

(i) ISBD
(ii) MARC
(iii) CCF standard
(iv) MARC 21 standard
(v) Indian standard

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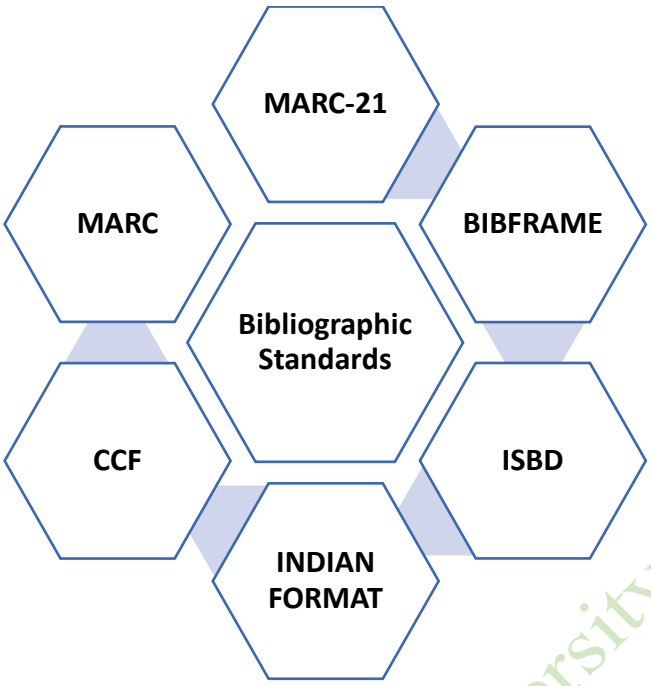

Fig. 1.1: Different bibliographic Standards

1.4.1 Universal Machine-Readable Catalogue (UNIMARC)

As and when the need or demand was felt, different Bibliographic Standards came into existence such as: UKMARC, INTER-MARC, USMARC etc. It has also been observed that after 1970s, an extended family of more than 20 MARC formats have come into existence. These standards share almost all the features and functionalities except data content. Majority of them requires the editing before the exchange of the records. In the similar direction, a section on cataloguing and mechanization of International Federation on Library Association (IFLA) has taken an initiative to develop a format for 'Exchange of Bibliographic Standards' of both National and International standards. In order to make the international interchange of machine-readable bibliographic data easier, the first iteration of the Universal Machine-Readable Catalogue (UNIMARC) for monographs and serials debuted in 1977. The ISO-2709 communication format is used by UNIMARC (1981). Not only this, some other notable formats among them are also available such as, AGRIS, International Nuclear Information System (INIS), As a standard exchange format for bibliographical records, UNESCO's CCF and the UNISIST Reference Manual are both used.

Earlier, every country were making emphasis on developing their own standard whereas just after the development of UNIMARC each country will be requiring two programs only namely; To convert into a UNIMARC and to covert from UNIMARC, you need two different programmes. For example, INTERMRC to UKMARC, USMARC to UKMARC (to and from).

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1.4.1.1 UNIMARC FORMAT

This format (UNIMARC) also consists of different elements just as MARC format consists of. They are:

(i) Record Structure

This structure is projected to control the way data is represented by storing this in the form of strings of characters. Record structure is used to identify various elements in a record.

(ii) Content Designation

There are certain ways in which data elements are identified within records. The access elements that include the title, subject and author are further distinguish. The data can be manipulated for a variety of purposes.

(iii) Data Content

The content of the records is the data which is stored in the fields within them. Data can be either coded one or bibliographic data.

1.4.2 Functional Block of UNIMARC

It has been observed that fields with three-character numeric tags tend to be grouped together in functional blocks. These blocks organize the data according to its traditional cataloguing functions. The content of the record and data element have been functionally divided into ten (10) different types of blocks. It has been mentioned below:

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Block No	Field tag	Data Type	Example
0	000-099	Identification Block	Contains numbers that identify the record. Eg. 010 International Standard Book Number.
1	100-199	Coded Information Block	Contains Fixed length data element describing various aspect of the record or data. Eg. 101 Language of the work
2	200-299	Heading Block	Contains the authority, reference or general explanatory heading for which records have been created. Eg. 205 Edition Statement
3	300-399	Information Note Block	Contains note, intended for public display that explain the relationship between the record heading and other heading.
4	400-499	See Reference Tracing Block	Contains variant heading from which a reference is to be made to see the heading of the record. Eg. 452 Edition in a different medium
5	500-599	See Also Reference Tracing Block	Contains related uniform heading from which a reference is to be made to see also the heading of the record. Eg. 516 Spine title
6	600-699	Classification Number Block	Contains classification number that are related to the heading of the record. Eg. 676 Dewey Decimal Classification.
7	700-799	Linking Heading Block	Contains a form of the record heading in another language or script and links to another record in which that form is the heading. Eg. 700 Personal name.
8	800-899	Source Information Block	Contains the source of the record and catalogues notes about the data not intended for public display. Eg. 801 Origination Source
9	900-999	National use Block	Contains data local to the originator of the record.

Source: Barman, Badan (2013)
Fig. 1.2: Funcitional blocks of UNIMARC

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This is very much clear with the above table which states that agencies involved in bibliographic matters in different countries are responsible for converting authority records into UNIMARC/authorities for transmission to other national agencies and receiving machine-readable records in UNIMARC/authority format from other national agencies. It was also noted that, despite IFLA's best efforts, UNIMARC was not given the attention it deserved.

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1.4.3 Common Communication Format (CCF)

May it be technology, equipment or standard, they are acquired or chosen to ease the process. In case of bibliographic standard Common Communication Format have come out as well-established, renowned and easy to use bibliographic standard. The CCF structure format is a format for creating bibliographical record and for exchange of records between group of information agencies and libraries. Seeing the incompatibilities, a symposium was organized by the initiative of UNESCO in Taormina, Sicily in the month of April 1978 So many stalwarts were invited from different corners of the globe in the area of information community to discuss on the about International Bibliographic Exchange format and its shortcomings. The ad-hoc group on the formation of a Common Communication Format was constituted by UNESCO and PGI in response to the Symposium's recommendation (CCF). The first version of the Common Communication Format (CCF) was released in 1984, and the second edition, having two volumes in CCF / B and CCF / F, was released in 1998. Many nations have embraced and are successfully using this standard for the generation and interchange of bibliographical records at the national level. Below mentioned picture shows the volumes of Common Communication Format.

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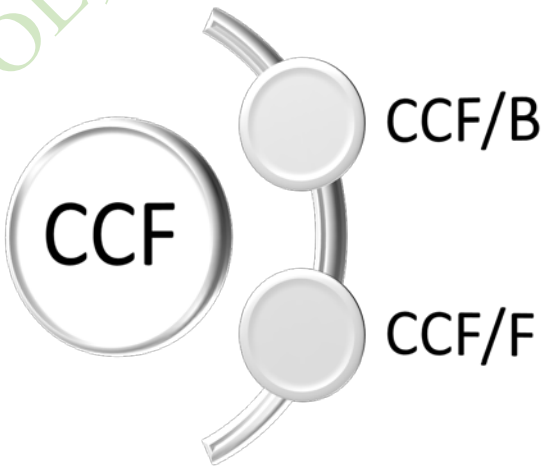

Fig 1.3:.Different volumes of Common Communication Format

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1.4.3.1 Structure of CCF

The ISO-2709 is implemented in the Common Communication Format (CCF) structure. The following are features of the CCF's current structure:

(i) Record Lable

Each CCF record has a set record label that is 24 characters long and provides the data element that the record is made up of. The relative character positioning of the label serves as an identification for each data element.

(ii) Directory

This is made up of five (5) components and has a length of fourteen (14) characters. A particular variable is matched to each directory. The record's data fields are divided into four (4) sub sections or parts, each of which contains information for the following data element: the data field's length, the starting character position, and the section established by the implementation.

(iii) Data Fields

It has basically the four components to a data field, that are indicators subfield identifier, subfield, and field separator.

(iv) Record Separator

The last data field separator is followed by the record separator which is considered as the final character of the record.

The above-mentioned details are the structure of Common Communication Format defined in detailed manner. Further, the CCF has five segment linking fields, for linking record segments of which 080 is meant for general vertical relationship and 081, 082 for vertical relationship from monograph, multi-volume monograph and serial respectively. 085 is meant for horizontal relationship. The segment linking filed (SLF) represents the relationship between items appearing in different segments and appears in the segment where from the link is to be made.

1.4.3.2 Limitations of CCF

Common Communication Format (CCF) is not intended to satisfy every local implementation requirement of every type of library and information organisation. Additionally, it is not anticipated that institutions will employ the CCF record format for internal processing and storage. The following are the main CCF drawbacks:

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(i) It does not define or cover all of the data items required to build a bibliographical database for a specific library.

(ii) It does not adhere to the specific cataloguing code or set of rules directed towards a particular or fixed type of information output form, nor does it include its cataloguing standards.

(iii) The CCF suggests using alphanumeric code for tags, with the exception of normal CCF fields, however it may not always be practical to do so (for instance, when library systems employ CDS/ISIS, this advice cannot be carried out).

(iv) Although it is possible to add new data components and their associated content designators to the CCF, unconstrained interpolation by various users may make it difficult for libraries to exchange data. In certain situations, the newly added data items' content designators are likely to change, which could make it difficult to transfer data between databases.

1.4.4 Machine Readable Cataloguing (MARC)

An initiative was taken by library of congress in the year 1966 as a pilot project to develop MARC format. This is how the MARC came into existence. An idea was developed in the mind of Henriette Avram while working at library of congress in US to develop the Machine-readable catalog (MARC) format in the year 1960 which is based on ISO 2709 ‘format for exchange of information’. The organization of record data elements in a particular record is called Record Format (structure) for entering the information and to display output in a particular database. It was the designing of a format capable of incorporating bibliographic description for all forms of materials, i.e., books, periodicals, articles, etc. Before MARC, there was no standard for bibliographic format. Each library was using different tag numbers to represent the data. The problem led to emergence of MARC (Machine Readable Catalogue). The objective behind designing this format was to communicate bibliographic and related information in machine readable form in such a way that records could be reformatted under any conceivable purpose. Further, the original markup frame work for MARC was based on nonintuitive alphanumeric tag. MARC stands for Machine Readable Cataloging and refers to the ability computers to read interpret the data in the cataloging record. A bibliographic record typically includes:

(i) A description of item
(ii) Main entry and added entries
(iii) Subject heading
(iv) Classification of call number

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1.4.4.1 Record Structure and Field Designations

As far as the MARC structure is concerned, it has three aspects. They are (i) structure of the record, (ii) actual content of the record and (iii) the field designation with each record. Theses record structure have been discussed one by one in details:

(i) Field Designation

Every field in the MARC format gives specific details regarding the item. It provides the details on author, tittle, publisher, date, language and type of media. It was initially created at a time when processing power was limited. It has been seen that in the record each fields are identified by three digit numeric code starting from (001-999) in Machine readable cataloguing (MARC).

(ii) Record Structure

It has also been seen that the records (MARC) generally saved and delivered in binary files. This file consists of many records. Further, the well known standard ISO-2709 being used by MARC specifies every record structure. The Library of Congress created the MARCXML scheme in 2002, which is regarded as an alternate record structure for every single document.

(iii) Content of Structure

MARC reveals details on Bibliographic items, it is a metadata transmission standard. Except some of the fixed field, MARC field is governed by standard outside of MARC. In easy words if we understand, Except for a small number of fixed fields defined by the MARC standards themselves, the actual material that a cataloguer enters into each MARC field is often governed and defined by standards outside of MARC.

1.4.4.2 Structure of MARC Tages

(i) Leader

Leader provides details about ensuring records, like the type of record, the length of the record overall, etc. It has a length of twenty-four (24) characters (00–23).

(ii) Record Directory

The record directory, which is twelve (12) characters long, lists the variable fields that are included in the record as well as where in the record they are located.

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(iii) Variable Field

The variable fields are of two types- variable Control Field (001-009) and Variable Data Field.

1.4.4.3 Advantages of Using MARC

Using MARC has a lot of benefits. They have been listed in detail, one by one, they are as follows:

(i) Individual libraries may use MARC tapes to create their traditional card catalogues, books as catalogues, etc.
(ii) It aids in the development of a catalogue that is prepared centrally.
(iii) MARC tape distribution prevents duplication.
(iv) MARC tapes facilitate the exchange of bibliographical data.
(v) Computerized SDI services can be provided using MARC cassettes.
(vi) MARC tape users make various library software platforms compatible with one another.

MARC FORMAT

NAME	Description
Authority records	provide information about individual names, subjects and uniform titles. An authority record establishes an authorized form of each heading, with references as appropriate from other forms of the heading.
Bibliographic records	describe the intellectual and physical characteristics of bibliographic resources (books, sound recordings, video recordings, and so forth).
Classification records	MARC records containing classification data. For example, the Library of Congress Classification has been encoded using the MARC 21 Classification format.
Community Information Records	MARC records describing a services providing agency such as a local homeless shelter of tax assistance provider.
Holdings records	Provide copy specific information on a library resource (call number, shelf location, volumes held, sand forth).

Fig. 1.4: MARC Format
Source: Barman, Badan (2013)

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1.4.5 Machine Readable Cataloguing (MARC-21)

It is undeniable that the standard format, known as MARC 21, was designed to reimagine the original MARC record format for the needs of the modern generation and to make it easier, more convenient, and more readily available to us by the global community. Five different forms of data, including the bibliographic format, authority format, holdings format, community format, and classification data format, are supported by MARC21. Currently, The British Library, European Institutions, and the major library institutions in the United States and Canada have effectively incorporated MARC 21. MARC 21 is the result of combining the USMARC and CAN/MARC MARC formats from the United States and Canada, respectively. The ANSI standard Z39.2, which enables data exchange and communication among users of various software programmes, serves as the foundation for MARC21. Additionally, it permits the usage of MARC8 and Unicode encoded as UTF8 character sets. MARC8 is based on ISO 2022 and allows the use Hebrew, Cyrillic, Arabic, Greek, and East Asian scripts. MARC 21 in lUTF8 format allows all the languages supported by Unicode.

1..4.5.1 Need of MARC 21

The necessity of Mark 21 is highlighted by a number of considerations. MARC-21 is required due to the following reasons:

(i) Lack of uniformity among various national MARC formats;
(ii) The lack of Internationally recognised cataloguing code in a MARC record
(iii) various roles that bibliographic agencies play;
(iv) The absence of consensus among various bibliographic communities.

1.4.5.2 Maintenance of MARC 21

MARC 21 is maintained by the National Library of Canada and the Library of Congress. The Machine-Readable Bibliographic Information Group (MARBI), an ALA committee, is in charge of the documentation, review, and amendment of the MARC21 format. Each American Library Association (ALA) conference has joint meetings of the MARC advisory committee and MARBI. The different flavors of the standard followed by its development, e.g. USMARC, AUSMARC, CANMARC, UNIMARC, the current generation of the system is known as MARC 21 and results from the combination of the USMARC and CANMARC version. There are actually five MARC 21 communication formats. They are:

(i) Bibliographic information in MARC 21 format
(ii) Authority Data in MARC 21 Format
(iii) Holding Data in MARC 21 Format
(iv) Classification data in MARC 21 format

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(v) Community Information MARC 21 format

1.4.5.3 Standard used in MARC 21

MARC 21 continues to be one of the standards that is commonly used. Any standard has a number of requirements before it may be used. The main standards are being used in MARC-21 have been listed below:

(i) AACR II: as the cataloguing code
(ii) LCSH: as the subject heading
(iii) DDC: as the classification scheme
(iv) ISO 2709 and ANSI/NISO Z39.2

It has been observed from the studies that the MARC-21 standard remains widely acceptable at both National and International level and coming up with flying colours in accomplishing the requirement of the end user.

1.5. International Standard for Bibliographic Description

The incredible and speedy growth of knowledge and information in the documents has increased the curiosity among the scholars to know all ins and outs on the area (subject). The number of agencies are available at National and International levels in the form of International Federation of Library Association and Institutions (IFLA) and FIDs, they have made immense contribution in the world of international standards in the field of documentation.

In 1969, a conference of cataloguing experts had taken place in Copenhagen where the report by Michel Gorman was discussed at the event and a working group was formed to for its detailed study which was finalized in 1971 and International Standard for Bibliographic Description (ISBD) come into being. Its first edition was published in 1974 by the name ISBD (M) and its latest consolidated edition was published in 2011. The main objective behind this was removing the language barrier, machine readable conversion and international exchange. The below mentioned table shows ISBD for different types of items.

ISBDs	**Items in ISBD**
ISBD (M)	Monograph
ISBD (S)	Serials
ISBD (CM)	Cartographic Materials
ISBD (NBM)	Non-Book Materials
ISBD (PM)	Printed Music
ISBD (CF)	Computer Files

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At present, some new features in the year 2021 is being added to ISBD after a long time. Earlier it was done in 2011. In the update, the additions and modifications to the 2011 consolidated edition of the ISBD are in red print to facilitate their identification and maximize their usefulness to the users. Further, the examples have also been added to the new stipulations to support implementation by the users of the standard.

1.6. INDIAN FORMAT

Variety of Bibliographic Standards are available for use, Indian standard is one of them. Theses standards are very important and helpful in completion of research activities. Undoubtedly, these standards plays a key role in research activities. Bureau of Indian Standard (BIS) which was earlier known as Indian Standard Institution come out with an Indian standard in 1963. Understanding the other requirement, the standard was produced again after certain modified in 1973. Now a days when we compare the Indian standard, we find that the standard is getting outdated as it has not been supporting electronic resources.

1.6.1 Shortcomings in Indian Standard

The Indian standard is having some of the problems which have been mentioned below:

(i) It has been seen that the standard is not well-maintained
(ii) It has limited coverage to support web-based item like email, twitter, e-documents.
(iii) The standard lacks in meeting the requirement of the stockholders.
(iv) The preference is given to adopt the international standard to meet the requirement and to save time and money.

1.7. BIBFRAME

Bibliographic Framework Initiative was taken by Library of Congress which is a data model for Bibliographic description. This initiative was to replace MARC standard and to make bibliographic data more useful for the libraries. The major focus of this 'data exchange' format is cost saving on cataloguing and supporting resource sharing. A well-known technologiestRoy Tennant described the MARC standard as old and should be replaced. Further, in the year 2012, Library of Congress with the help of Zepheira which is a data management company started working on the standard and come up with a model called MARC Resources (MARCR). In the same year, the draft of the model renamed as BIBFRAME. The library of congress released the second version (2.0) of BIBFRAME in 2016. As far as the Level of Abstraction is concerned, the BIBFRAME organizes the information at three level of abstraction i.e. Work, Instance and Item.

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IN-TEXT QUESTIONS

1. **Which one is not the Bibliographic Standard ?**

(i) ISBD **(iii) MARC**
(ii) CCF **(iv) CDS/ISIS**

2. **When was the Indian Bibliographic Standard come in to existence?**

(i) 1955 **(iii) 1963**
(ii) 1960 **(iv) 1965**

3. **which one is not the element of UNIMARC format?**

(i) Record Structure **(iii) Content Designation**
(ii) Field Tag **(iv) Data content**

4. **Common Communication Format was published in?**

(i) One Volumes **(iii) Five Volumes**
(ii) Two Volumes **(iv) Ten Volumes**

5. **First edition of Common Communication Format was published in?**

(i) 1983 **(iii) 1985**
(ii) 1984 **(iv) 1988**

1.8 SUMMARY

As we are aware that a standard is a documented method of doing something which guarantees the safety, quality and reliability. The process of developing and implementing regulations for a systematic approach to a certain activity for the benefit of all concerned involved is known as standardization. Now a days, standardization is becoming increasingly important to ensure greater effectiveness of information services in all the countries. There are well-known Bibliographic standards available such as ISBD, MARC, CCF, MARC 21 and Indian standard. Each of the standard have their own importance but the primary job of these standards are creating bibliographic record and for exchange of records between group of information agencies and libraries. There is no doubt that they have their own limitations but at the same time they have merits also. It has been observed from the studies that the MARC-21 standard remain widely acceptable at both National and International level and coming up with flying colours in accomplishing the requirement of the end user. As far as Indian standard is concerned, it is getting outdated where as if we look in to ISBD it has been making changes or adding features in the existing standard even planning to come up with a

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ISBD consolidated edition. The development in the present edition extend the coverage of ISBD to a larger array of resources, optimize its ability for granular description, clarify and develop some of the elements, and bring more organisation and refinements into the description of some types of resources.

1.9. GLOSSARY

Standardization	Standardization is the process of formulating and applying rules for an orderly approach to a specific activity for the benefit of all concerned
CCF	The Common Communication Format (CCF) is a structured format for creating bibliographical record and for exchange of records between group of information agencies and libraries.
MARC	Machine Readable Cataloguing. It is a format for exchange of information.
ISBD	International Standard for Bibliographic Description. The main objective behind this was removing the language barrier, machine readable conversion and international exchange

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. CDS/ISIS 2. 1963 3. Field Tag	4. Two Volumes 5. 1985

1.11. SELF-ASSESSMENT QUESTIONS

1. What are the different bibliographic Standards available and also discuss any one standard?
2. Discuss the need and standards used in MARC-21 Bibliographic Standard?
3. Discuss the structure of MARC and mention the advantages of using MARC ?

1.12. REFERENCES&SUGGESTED READINGS

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LESSON 2.4

Introduction to Metadata: Types of Metadata Dublin Core

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Historical Account
1.4 Benefits of Metadata
1.5 Types of Metadata
1.6 Standards of Metadata
1.7 Principles of Metadata
1.8 Metadata Vocabularies and its Use
1.9 Tools for Creating Dublin Core Metadata
1.10 Tools for Creating Dublin Core Metadata
1.10.1 Dublin Core Metadata Examples
1.10.2 Case Study Of Using DCfor Different Types of Resources
1.11 Metadata Creation
1.12 Summary
1.13 Glossary
1.14 Answers To In-Text Questions
1.15 Self-Assessment Questions
1.16 References
1.17 Suggested Readings

1.1 LEARNING OBJECTIVES

This topic aims to comprehend the concept of metadata and its different types so that learners do not face any problem in metadata creation in practical librarianship. Furthermore, the topic helps learners to understand what are Dublin Core metadata

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elements and how metadata process can be followed in metadata creation with case studies.

1.2 INTRODUCTION

First time Philip Bagley in 1968 started using the term metadata. Later, Dublin Core (DC) was developed to describe the web-based resources. It is originally developed in 1995 during OCLC/NCSA Metadata Workshop (DCMI, 1995). The participantsin the workshop aim to address the description, organization and discovery of content. In order to find the information on the internet, mainly there are four major methods i.e. (i) Uniform resource locator (URL) (ii) Using hypertext link (iii) Portals and (iv) Use of search engine to locate content (Gordan and Pathak, 1999). Therefore, metadata is crucial is discovering the resources. Thus, we need to comprehend its meaning and use in information organizing and discovery. Metadata by definition mean "data about data" National Library of Australia (2000) described the term in lucid way as "data that record information about a resource". Metadata are the keys to access the content in present and future. Further, it can describe the resources collection or an individual item. Varied types of resources printed and electronic cab be described viz. text, images, video, audio, map. It assists in discovering the resources and organize the electronic resources. Further, help in resource integration, interoperability, archiving, and preservation (Riley, 2017). In summary, metadata can be used to perform the following tasks:

- It can be used to describe the resources, and organizing them
- Using the suitable criteria, resources can be found and resources can be aggregated. Further, metadata can be used in providing pathways to the location of resources.
- It can used to exchange metadata which further lead to interoperability
- Metadata can be used in digital identification, and describing resources for preservation and archiving (NISO, 2004).

Moreover, metadata registry stores and manage the metadata. It is difficult to identify the metadata only through looking at it. Therefore, one should have a point of reference and context beforehand. For instance, data containing 13 digits could be list of numbers to plug

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into an equation. These 13 digits can be a random number or a list, which may be considered as data. However, using the context of books, these 13 digits can be identified as ISBN and contains information about the book. Therefore, the context and point of reference is also important to identify the data (Huner, Otto and Osterle, 2011; Bargmeyer and Gillman, 2000; Thornely, 1998).

1.3 HISTORICAL ACCOUNT

History of metadata go back to 19th century, Antonio Panizzi and his team at British Museum implemented the Ninety-One Cataloguing Rules (Panizzi, 1841). Later in 1850, Charles Coffin Jewett started building the Smithsonian Institution's library by soliciting catalogues from catalogue entries in different libraries by duplicating. Another major development in the filed happened when Charles Ammi Cutter issued his roles for a Printed Dictionary Catalogue (Cutter, 1875). Majority of libraries since 1960 started using Anglo-American Cataloguing Rules revised second edition (AACR2). However, in recent years the AACR2 have been replaced by latest Machine-Readable Catalogue (MARC) format and Resource Description and Access (RDA), which was released in 2010. MARC has boosted the interchange of machine-readable catalogue codes which foster the interoperability and emergence of several union catalogues at national and international levels (Kilgour, 1997).

The major developed was related to print resources in libraries. However, the use of cataloguing rules and standards for describing the physical resources was challenging and cumbersome task because of complex nature of rules of standards. These rules of standards in pre-internet era played vital role in finding desired information to users in various ways. Mainly the pre-internet cataloguing rules had two purposes i.e. (i) Establishing rich bibliographic description and relationship among data of heterogenous items, and (ii) sharing of bibliographic data. Undoubtedly, MARC and AACR2 have been successful a lot in achieving these two purposes. However, in Internet era the shortcoming of MARC and AACR2 are identified in handling the digital objects especially digital rights management, preservation, authenticity evaluation of resources,and user profile etc. Therefore, these lead to emergence of new guidelines and architecture. Development in metadata in Internet time accelerated in 1990 and academic community started thinking for a solution to organize the

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scientific data which lead to emergence of Text Encoding Initiative (TEI) and international organization in 1987. OCLC initiated the project to experiment to catalogue web resources using MARC and AACR2 in 1994 wherein more than 200 volunteers created 2500 records. Later in 1995 at OCLC in Dublin, Ohio one workshop was held (Weibel et al, 1995). After the workshop, the community fostered the metadata movement in Government, academic, and research institutions and several standards and metadata structures were developed such as:

- Dublin Core Metadata Element Set (DCMES)
- Learning Object Metadata (LOM)
- Encoded Archival Description
- Visual Resources Association Core Categories (VRA Core)
- Friend of a Friend (FOAF)

Metadata can describe variety of information resources irrespective of their varied types and number of resources. Using the different standards listed above, many metadata vocabularies have been developed and built on these standards. In 2015, a service has been started called Linked Open Vocabularies which has registered 470 metadata vocabularies. Notably, a metadata vocabulary went online accessible through Schema.org in 2011 and this vocabulary is created by search engines such as Bing, Google etc. In recent years, research on metadata have accelerated at fast pace and researchers worked extensively on metadata. Also, many repositories were established by institutions worldwide such as National Science Digital Library (NSDL), Digital Public Library of America (DPLA) and National Digital Library of India (NDLI)etc. These repositories aggregate metadata from several repositories and provide content to people using their own platforms. Invention of technology such as Linked Open Data, Semantic Web have further enhanced the value of metadata creation. In recent years, structured and encoded data have also been used widely by repositories of all types.

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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.

1.4 BENEFITS OF METADATA

There are numerous benefits of metadata such as:

- Discovering the resources - It helps in ascertaining the resources and bringing them together and categorizing the resources. It also gives the information relating to location which lead to resource discovery effectively.
- Better organizing the resources is possible - It assist in better organizing the resources by linking different resources to metadata in databases. Consequently, it leads to optimum use of resources because users easily locate the resources which otherwise is cumbersome for users.
- Interoperability become reality - Metadata empowers multiple system interact with each other even using different software and hardware. Thus, with the help of metadata schemas, shared transfer protocols, resources can be searched seamlessly.
- Digital identity of resources - Resources can get digital identification using URL and DOI identifiers and other persistent identifiers. In digital identification, Persistent identifiers are most suitable because object locations may change. Consequently, resources may not be accessible using URL and become invalid.
- Archiving and preservation of resources - Digital resources after sometime may not be accessible. Therefore, metadata ensure access to resources by archiving and preservation by tracking linage of resource (Riley, 2017).

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1.5 TYPES OF METADATA

Gilliland (2008) defined five types of metadata. These are as follows:

- Administrative metadata- It is a type of metadata which is used to administer collection and information resources. It helps in managing the information relating to acquisition, rights, legal access and location information. It covers the information relating to creation of resource and access rights.

- Descriptive metadata: This type of metadata describe print, electronic and other types of information resources. This describes the content of book such as title, author, keywords, subject, abstract etc. These types of metadata assist users in discovering content. It also helps in distinguishing the versions and curatorial information.

- Technical metadata: This type of metadata is used to store the information about hardware and software, technical information relating to digitization such as format of file, File type, File size, date of Creation, Compression scheme and security related data.

- Preservation metadata: Metadata which is used for preservation management of collections and information resources. It helps in maintaining the record of preservation of collections such as physical condition of resources, changes occurring during preservation of resources.

- Use metadata: It is related to levels, types and collections and information resources usage such as record of items circulation , use, reuse, search etc.

1.6 STANDARDS OF METADATA

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Metadata standards are essential for creating uniform criteria, methods, processes and practices. It helps in design, creation and implementation of structure, data value and data content which improve the efficiency and consistency (Zeng and Qin, 2016). Mainly metadata can be divided into four categories viz. (i) Standards for data structure (ii) Standards for data content (iii) Standards for data exchange and (iv) Standards for data value

- Standards for data structure: It is also called metadata vocabulary and used to define the structure and semantics. The DCMES is most popular in the category. It is general use standards and can be used for all types of data. International Press Telecommunications Council (IPTC), developed the IPTC Core Standard which is mainly for news and stock photos. Metadata standards can be arranged in a flat, and nested style.
- Standards for data content: It is used to guide and practices of metadata generation and cataloguing. Rules and guidelines regarding cataloguing levels, relationship between works, image, terminology sources, rules for vocabulary sources, authority control are some of the examples of standards for data content.
- Standards for data value: This type of standards are also referred as value vocabularies or value encoding schemes. Some of these include the thousands of terms and establish relationship between concepts and terms. The recommendation for using these are usually spelled out in the texts of standards.
- Standards for data exchange: This is mainly relating to format and used in the context of data exchange. MARC 21 which is mainly an exchange format help in interoperability. Further, it helps in interacting the system when exchange of data is done. It also helps in achieving the union catalogue and related services.

1.7 PRINCIPLES OF METADATA

Duval et al (2002) defined that principles are to be common to all domains and inform and guide in deigning of metadata schemas while practicalities are rules of thumb. Therefore, practicalities help in translating theory into practice. Consequently, new system emerges on basis of theory to practice. The principles of the metadata are as follows:

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- Modularity - It characterises the varied content and their sources, content style and numerous approaches regarding description of sources. It helps in creating new assemblies using existing schemas, and best practices. The modularity helps in building blocks using existing schemas and vocabularies. Consequently, making the systems semantically interoperable. Thus, it helps in building blocks which eventually lead to larger structures. Modular structure also helps in meeting the specific needs of an application by assembling the sets.
- Extensibility – In order to meet the specific needs of any application, the extension provision must be existed in metadata. Therefore, extensibility is essential principle of metadata. The architecture of metadata should be accommodated to additional elements and basic schemas so that it can suit to the tailor-made needs and domain specific needs of an application without compromising the interoperability of the system.
- Refinement – It is also possibility that an application domain may not agree with necessary details. Mainly two notions are popular in refinement viz. addition of qualifiers that refine such as specific meaning of an element. Examples are creator *for sculptor, illustrator, editor while Date of creation, date of modification,* and *date of acceptance* are all narrower senses of a date attribute. In a given metadata application, refinement is imperative but for general interoperability purposes, the values of such elements can be thought of as subtypes. It is always expensive creating metadata of content; therefore, it is always advocated to create the metadata with full details so that it can meet the functional requirement of any application.
- Multilingualism - While creating metadata cultural and linguistic diversity need to be maintained. Therefore, it is essential to adopt metadata architectures which adhere to such diversity. Seamless access to web resources need to provide to users over the web. Thus, disseminating the content in vernacular language is imperative to reach to maximum over the web. Thus, creating the multilingual metadata can help reaching to wider users. Consequently, in real sense global information system can be attained having the multilingual metadata. Varied standard deal with these issues through the complementary processes

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of *internationalization* and *localization:* one is for creation of "neutral" standards, and other refers to the adaptation of such a neutral standard for localization. Global metadata structure needs to developed which can assure underlying infrastructure.

In DCMI, metadata can describe the language and character set of a resource. Further, it can ascertain the different versions of the resources in original and language in which content is translated. Multilingualism supports the multiple cultures including the dates of different calendars. It also helps in displaying and reading the text in their own style/direction. Further, it supports cons and pictograms used in different languages. Standards of practice including order of name, standards etc.

Duval et al (2002) defines the metadata practicalities which represent the metadata management and creation. The metadata practicalities are as follows: application profile, syntax and semantics, association models, identifying and naming metadata elements, metadata registries and completeness and description, mandatory versus optional elements, subjective and objective metadata and automated generation of metadata.

- One of the practicalities of metadata is an organizing principle for content come from diverse sources, content management varied style, and approaches to resource description. It help in creating new assemblies.
- An assemblage of metadata elements which are selected from one or multiple metadata schemas is application profile. Application profiles is to adapt and tailored it to the functional requirements. It helps in interoperability and original base.
- Semantic and syntax are also necessary for sharing metadata. However, metadata cannot be shared until a shared convention for value encoding and identify persist. Thus, these two should also exist for metadata sharing.
- HTML and XML have been vital for metadata creation. Moreover, bacuase of stability is lacking in structured markup realm, it is the necessity of maintaining independence between the semantics of metadata elements.
- The XML Schema specification defines a schema language. In order to achieve interoperability, it allows for the specification of application profiles.

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- **One has to remember that; Embedded metadata** shall be found within markup language of the resource. Such metadata records are created while creating the resource and tightly couples. Further, problem associated with such metadata is that their types of metadata create problem in harvesting.

1.8 METADATA VOCABULARIES AND ITS USE

Metadata vocabularies are essential to ensure the access of content in way that everyone using the word for accessing the content. Therefore, the metadata vocabularies enhance access of content to users. Thus, information system should continuously strengthen the controlled vocabularies being used by information system. It shall also enhance the interoperability of content across repositories. Further, metadata vocabularies help in formulating better searches because it helps in selecting better search term. It also helps in lining two or more related terms in a logical way. It is not mandatory that metadata vocabularies contain synonyms. In addition, terms near synonyms, technical terms, acronyms may also be used in metadata vocabularies. Terms which are synonyms to the terms used are called preferred term while other are called non-preferred terms (Hedden, 2010). Interestingly, such terms make the metadata vocabularies more effective. This work requires the expertise of expert creating taxonomies. Further, along with the resources, effectiveness also depends on search mechanism. The metadata vocabularies have been growing at fast pace. Therefore, we need to understand the sources of reusable elements. Thus, we need to metadata elements and application profiles (Aps) that exist and available for reuse need to be ascertained. CORES registry (Cores.dsd.sztaki.hu) include large activity reports that describe metadata-related activities. Further, Linked Open Vocabularies (LOV) is another registry which is recently developed and accessible at http://lov.okfn.org/dataset/lov/) which contains information pertains to metadata vocabularies mainly expressed using Web Ontology Language or RDF Schema. Further, LOV also facilitate searching the vocabulary at element and vocabulary level.

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DCMES also refer other vocabularies which also help in searching and exploring the metadata. Another registry which contains metadata vocabularies is Open Metadata Registry, which is accessible at: metadataregistry.org. It contains the content in machine readable catalogue code (MARC) 21, resource description and access (RDA) and international standard book description (ISBD). It is certainly the case that metadata fields depend on several factors such as what is the need and current policies and structure in the organization. This, person names and corporate names could be used in controlled vocabularies for a creator/publisher metadata field. However, while describing any assets which is digital then we need to use 'about' a person/corporate body. Besides this, following need to be consider such as: Size of subject-descriptive controlled vocabulary (ii) What the ratio of names to topical subjects is – if names are few (iii) How users are likely to search names. After addressing these questions, one should take decision about it in metadata vocabularies.

US Santa Cruz Library (2022) described variety of tools for creating metadata creation

1.9. TOOLS FOR CREATING DUBLIN CORE METADATA

such as:

- **Schema** – It is a list of elements which contains data points. These data points are defined. Thus, these data filed are used basically to capture the data points. These data points are used to record and store information relating to a resource which include as follows: an identifier, title, a creator name, or a publication date etc.

- **Standards–**It guide us how to populate each of the data elementswithin a schema. There are three types of standards:

  - **Content standards-** It describe the use of elements and which information will go to different elements. It provides guidance on record, and transcribe information which help users in locating the content. It also enhances the visibility of content. Further, it answers where information be coming from? What is the best source of information? Which elements should require the use of data values standards using which value standards?

  - **Data value standards**

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It is a list of subject terms such as genre terms, names, etc Examples of standard data value include Library of Congress Subject Headings and other discipline-specific thesauri

- **Data structure standards**

  It helps in encoding and structure the metadata record. It should be machine readableand two users of metadata: humans and machines. Thus, metadata you create must be intelligible to both.

1.10. DUBLIN CORE METADATA ELEMNTS SET

Dublin Core (DC) was found in 1995 in Ohio, it has been used worldwide for the description of metadata of electronic resources. It is also approved by NISO standard in 2001 (NISO, 2007). Mainly, it was developed for the description of cross-domain information resources. (Park, 2009 & Park and Childress, 2009). It is easy to use and applicable in varied situation and system. Therefore, its adoption rate is much higher compared to other schemas. Interestingly, a group of professionals from the field of library and information science, computer science, museum community and professionals from allied profession worked together and developed it (Hillmann, 2009).

Dublin Core metadata elements represent resource description and representation. In DC metadata relationships are typed but essentially non-hierarchical. A bibliographic record or surrogate record is the description of the information package. It is a surrogate for the item being described and not the actual item. Interestingly, surrogate has to assist the user in locating information. Table 1 shows the 15 elements of DC.

Table 1. DC 15 Elements

Element Label	Definition	Comment
Contributor	The one who make contributions to the resource.	Contributor can be a person, an organization, or a service.

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Coverage	Spatial applicability of the resource, or the jurisdiction under which the resource is relevant.	It can be a period, date, or date range. Moreover, a jurisdiction may be a named administrative entity/geographic place.
Creator	The one who is responsible for resource creation	Creator can be a person/ organization/ service. Creator should be used to indicate the entity.
Date	Date in which a resource is created	Date in which resource is created
Description	An account of the resource	It includes an abstract/table of contents or a graphical representation, or a free-text account relating to a resource.
Format	File format (physical medium, or dimensions)	Size and duration. Use of a controlled vocabulary
Identifier	Identification of a resource	formal identification system.
Language	A language in which a resource is created.	Controlled vocabulary should be used
Publisher	The one who makes the resource available	It can be a person/organization/service
Relation	Any resource which is related to a resource	A formal identification system to establish relationship
Rights	Rights related a resource	All rights covering IPR
Source	Using which a described resource is derived	From where described source is derived
Subject	Subject of a resource	It can represent through subject headings/phrases/classification schemes and its coding system.
Title	Title of a resource	It is used by which resource is known.
Type	Nature/ genre .	DCMI Type Vocabulary

The elements of DC cover the interdisciplinary consensus. The occurrence of each element in DC elements are repeatable. These elements can occur in many orders. Overall, the 15 elements can be grouped in three categories viz. content, intellectual property and instantiation (Dublin Core Version 1.1, 2022). Grouping of all 15 elements in three categories has pragmatic approach which is useful in application of the standard. Making the metadata sharable is essential because of several reasons such as bring closer the collection of library, archives and museum and varied types of libraries. Shreves, Riley and Mileqicz (2006) given a framework to make the metadata sharable lucidly which is as follows:

- Content: It should be optimized so that content can be shared widely
- Consistency: Consistency in maintaining the record semantically and syntactically
- Coherence: Record should be maintained properly
- Context: Context should not be lost while maintaining the metadata
- Communication: Consistent communication between metadata providers and aggregators

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- Conformance: Creation of metadata should adhere to standards.

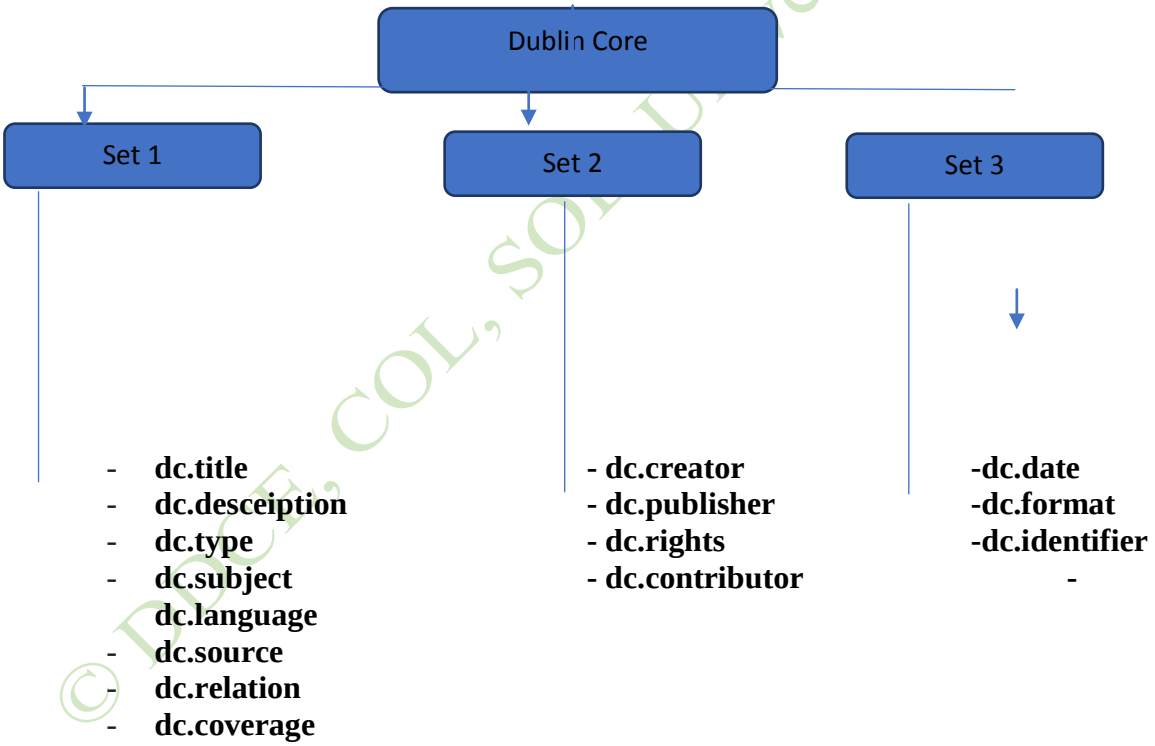

Figure 1. Three categories of DC elements

1.10.1 DUBLIN CORE METADATA EXAMPLES

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Title="Research Data Access and Management in Modern Libraries"

Creator="Bhardwaj, Raj Kumar"

Subject="Research Data Management"

Description="It deals with research data access and management in libraries."

Publisher="IGI Press"

Publisher="IGI Press"

Date="2019-05"

Type=" Text"

Format="application/pdf"

Identifier=" 10.4018/978-1-5225-8437-7"

Language= "en"

1.10.2CASE STUDY OF USING DC FOR DIFFERENT TYPES OF RESOURCES

Practical use of DC is essential to comprehend so that it can used conveniently by professionals in libraries. The Table 2 shows the DC elements for different types of resources such as: Book,CD/DVDs, Journal Articles, YouTube Video, Speech, Newspaper and Thesis. It will help the students how the DC metadata elements can be assigned to varied type of resources.

Table 2. Dublin Core (DC) metadata elements

Element	Book	CD/DVDs	Journal Articles	YouTube Video	Speech	Newspaper	Thesis
dc.title	Title	Title	Journal Title	Title	Title	Title	Title
dc.creator	Author(s)	Author(s)	Author (s)	Author(s)	Author(s)	Author(s)	Author(s)

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dc.subject	Subject	Subject	Subject	Subject	Subject	Subject	Subject
dc.description	Content	Summary	Abstract	Summary	Gist	Summary	Abstract
dc.publisher	Publisher	Publisher	Publisher	Publisher	Publisher	Publisher	Publisher
dc.contributor	Contributor(s)	Contributor(s)	Contributor(s)	Contributor(s)	Contributor(s)	Contributor(s)	Contributor(s)
dc.date	Date	Date	Date	Date	Date	Date	Date
dc.type	Print/electronic/talking	Video/Audio	Print/electronic/talking	Video	Print/electronic/talking	Print/electronic/talking	Print/electronic/talking
dc.format	Text, audio, video	Text, audio, video	Text, audio, video	Video	Text, audio, video	Text, audio, video	Text, audio, video
dc.identifier	ISBN	ID	DOI	URL	DOI/URL	DOI/URL	DOI/URL
dc.source	Publisher/Institutions	Publisher/Institutions	Publisher/Institutions	Publisher/Institutions	Publisher/Institutions	Publisher/Institutions	Publisher/Institutions
dc.language	English/Hindi/Others	English/Hindi/Others	English/Hindi/Others	English/Hindi/Others	English/Hindi/Others	English/Hindi/Others	English/Hindi/Others
dc.relation	Book	CD/DVD	-	-	-	-	-
dc.coverage	Date, Institution, Place	Date, Institution, Place	Date, Institution, Place	Date, Institution, Place	Date, Institution, Place	Date, Institution, Place	Date, Institution, Place
dc.rights	Public/private	Public/private	Public/private	Public/private	Public/private	Public/private	Public/private
dc.audience	Reader	Reader	Reader	Reader	Reader	Reader	Reader
dc. provenance	Proprietary/Open Access	Proprietary/ Open Access	Proprietary/Open Access	Proprietary/Open Access	Proprietary/ Open Access	Proprietary/Open Access	Proprietary/Open Access
dc.rightholder	Creator/Institutiom/Publisher/Public	Creator/Institutiom/Publisher/Public	Creator/Institutiom/Publisher/Public	Creator/Institutiom/Publisher/Public	Creator/Institutiom/Publisher/Public	Creator/Institutiom/Publisher/Public	Creator/Institutiom/Publisher/Public
dc.instructionalMethod	Educational/context	Educational/ context	Educational/context	Educational/context	Educational/ context	Educational/context	Educational/context
dc.accrualMethod	deposit	deposit	deposit	deposit	deposit	deposit	deposit
dc.accrualPeriodicity	Regular	Regular	Regular	Regular	Regular	Regular	Regular
dc.accrualPolicy	Active	Active	Active	Active	Active	Active	Active

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1.11 METADATA CREATION

- Metadata can be created thorough the following steps:
- (a) Firstly, you need to make sure for what you are going to create metadata. Is it a digital resource or print resource? Afterwards, also need to ascertain what information you need to record and what information need to contextualize properly. Once it is

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done, person creating metadata need to ponder upon that how people will search information and how I expect them to use it currently and in future?

- (b) Once, above question is fixed then list the information that you would like to include such as title, subject, year of publication, rights etc. Thereafter, make sure descriptive information you have and which kind of information are recorded. Also need to ask whether information is missing about your resources or not? If yes, the need to find the missing information and if its challenging in finding or creating it.
- (c) Thirdly, metadata creator needs to make sure about essential information which is require for discovering the information, identification, and help in contextualizing content.
- (d) Ascertain the data points and codify the list as own metadata schema, and
- (e) Metadata creator you need to make sure whether using data value standards such as controlled vocabularies, thesauri, encoding or any standard for formatting. Metadata creator can also create won subject vocabulary for specific collection of resources.

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CASE STUDY

Practical use of DC is essential to comprehend so that it can used conveniently by professionals in libraries. The Table 2 shows the DC elements for different types of resources such as: Book, CD/DVDs, Journal Articles, YouTube Video, Speech, Newspaper and Thesis. It will help the students how the DC metadata elements can be assigned to varied type of resources.

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IN-TEXT QUESTIONS

i. Metadata can be created for print and _____ resources.
ii. DC was founded in year _____.
iii. DC was first discussed in meeting at _____.
iv. One of principles of metadata is _____.
v. **Schema** is a list of elements which contains _____.

1.12 SUMMARY

The chapter shall help the learners to understand the concept of metadata and its varied types. Learners are able to understand that metadata can be used todescribe the resources, and organizing them. Metadata using the suitable criteria, resources can be found and resources can be aggregated. Further, it can used to exchange metadata which further lead to interoperability Metadata can be used in digital identification, and describing resources for preservation and archiving (NISO, 2004).

1.13 GLOSSARY

- **Metadata** – It is data about data. It is used to describe the content and store the information about a resource. It helps the users in locating the desired content.
- **Schema** – It is a list of elements which contains data points. These data points are defined. Thus, these data filed are used basically to capture the data points. These data points are used to record and store information relating to a resource which include as follows: an identifier, title, a creator name, or a publication date etc.
- **Standards–**It help in populating each of the data elements within a schema.
- **Extensibility** – In order to meet the specific needs of any application, the extension provision must be existed in metadata. Therefore, extensibility is essential principle of metadata.

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1.14 ANSWERS TO IN-TEXT QUESTIONS

i) Digital ii) 1995 iii) Ohio	iv) Modularity v) Data points

1.15 SELF-ASSESSMENT QUESTIONS

Note: Write your answers in the space given below.

i) What the different types of metadata exist?

---

ii) What is different between administrative metadata and descriptive metadata?

---

iii) Explain the DCMI elements?

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LESSON 2.5

LIBRARY SOFTWARE PACKAGES: AN OVERVIEW AND HOUSE KEEPING OPERATIONS

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1.1 Objectives/Learning outcome
1.2 Introduction
1.3 Selection of Software Packages
1.4 Type of Software Packages
1.5 Library software Packages
- 1.5.1 KOHA
- 1.5.2 NewGenLib
- 1.5.3 Libsys
- 1.5.4 Vitua
- 1.5.5 ABCD
- 1.5.6 E-Granthalaya

1.6 House Keeping Operations
1.7 Criteria for Evaluation of Library Software Packages
1.8 Summary
1.9 Glossary
1.10 Answers to In-text Questions
1.11 Self-Assessment Questions
1.12 References & Suggested Readings

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- After reading this chapter, you will be able to:
- describe the library software packages
- know the selection of library software packages
- availability of software packages at National and International Levels
- types of Library software packages
- about house- keeping operations
- criteria for evaluation of library software packages

To cater the need of the library users in the present scenario, libraries are moving towards the automated environment, selection of right software is one of them. software programs design to perform the operations of library activities are known as Library Softwares. Generally, the library automation software packages are based on the experiences and expertise of library professionals. The library software packages help in effective customer services, stock management and management of the library services offered to the patron. There are two types of library software packages i.e. open source and proprietary. Proprietary softwares packages do not allow the users to copy, view source code or customize it. They are also known as 'Turnkey or off –the shelf' once after the installation and import of data, the source code is restricted by the software package providing vendors whereas the open source software packages are usually available free of charge and these software packages allow users to read, view source code, redistribute, modify and use it by the users. Now the library automation software's available in the market and some other emerging at the rapid rate putting the librarians at a loss on which software to choose as both the software packages have almost similar functionalities. It has always been observed from the libraries across the world that library software packages not only improve the image of library but also provide effective customer services with existing staff.

Automation of any library helps in avoiding the repetitive task. Number of library software packages available at International and national levels. Selection of the good library software package is a challenging task for librarian/In-charge. Requirement of the library must be considered before choosing any library software packages. Some of the basic points should be kept in the mind before selection of any library software package such as:

(i) Ease in Use

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Before selection of any library software package, libraries should choose the software that support multiple languages, affordable, intuitive and user-friendly for both staff and users. This is much more essential that the library software package should have a parent-child relationship for patron records.

(ii) Cost of Software

This is one of the most important aspect for a library that the selection of Library software package should be done in a cost effective manner. Now a days, the libraries have to acquire library resources, software and infrastructure judiciously keeping in mind the shrinking budget of the library.

(iii) Use of Hardware

While selecting the library software package judicious selection of hardware must be done. Variety of software packages are available in Indian market but before selection of software, the compatibility, availability of hardware and cost effectiveness must be considered.

(iv) Data Storage Technique and Search Response Time

Information retrieval is a challenging task as users want accurate and timely information. How much time a computer will take in searching the document, depend on so many things such as size of the file, arrangement, operating system, hardware platform. Data storing technique also play a role in determining the time taken in searching the information. It has been felt that the speed of searching of the structure of invert file is quicker than the structure of simple file.

(v) Programming Language

All the programming languages have their own qualities. Programming language of any library software package is also important while selecting a software for library. A software has how many facilities, depends on the language in which the software is written.

(vi) Software support

It has been observed from the functioning of different library software packages that the good software remain always helpful in managing the entire library operation for maintaining books records to issue a book.

The computer alone cannot do anything without program and software. Hardware and software instructs the computer in a particular situation as what to do. Any type of computer

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program design to perform some kind of library activities is known as library software. These software can perform the task of acquisition, cataloguing, circulation, serial control and others. Further, the digital library software manages the digital resources of the library or any information center. There are variety of library software packages available and each of them having different functionality. Some of them are based on source code availability and others based on cost factor. Some of the examples of the library software packages have been listed below along with their developers and year of development. Table no. 1.3.1 provides the details of the software and their development year.

. Name of Software	Developed by	Year of Development
Sanjay	DESIDOC	1992
Minisis	IDRC	1970
Granthalaya	INSDOC	2003
Libsys	Infotech	1984
TULIP	Tata Unisis	1994
OASIS	Softlink Asia	1993
LIBRIES	Frontier Info Technology	1984
KOHA	Katipo Communication	2000
CDS/ISIS	UNESECO	1985
SOUL	INFLIBNET	2000
NewGenLib	Verus Solutions Pvt. Ltd.	2007
Virtua	VTLS	1998

Table. 3.1 Library software packages and their year of development

There are variety of software packages available for different need in the libraries such as Institutional Repository, Citation management softwares, Content management softwares, Audio video file editing softwares, Journal/ conference management softwares, E-learning management sofwares, software related to Audio-Video recording of talk, and Mobile apps etc. Examples of some of the well know library software packages such as Koha, NewGenLib, Libsys, Virtua and E-Granthalay have been used in the chapter. Here, an attempt have been made to discuss about some of the popular library software packages:

1.5.1 KOHA

The software package was developed by Katipo Communications for the Horowhenua Library Trust in New Zealand in 1999. The installation of the software started in the year 2000. Due to the wide popularity of the software, vendors have started providing commercial

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support. Paul Poulain and online communities added so many features such as support for multiple languages, cataloguing and search standard, MARC and Z39.50, Zebra Indexing. Later a feature Liblime was also added in its cart. Koha has been translated from its original English into French, Chinese, Arabic and several other languages. Below given figure presents the screenshot of the homepage of Koha ILMS

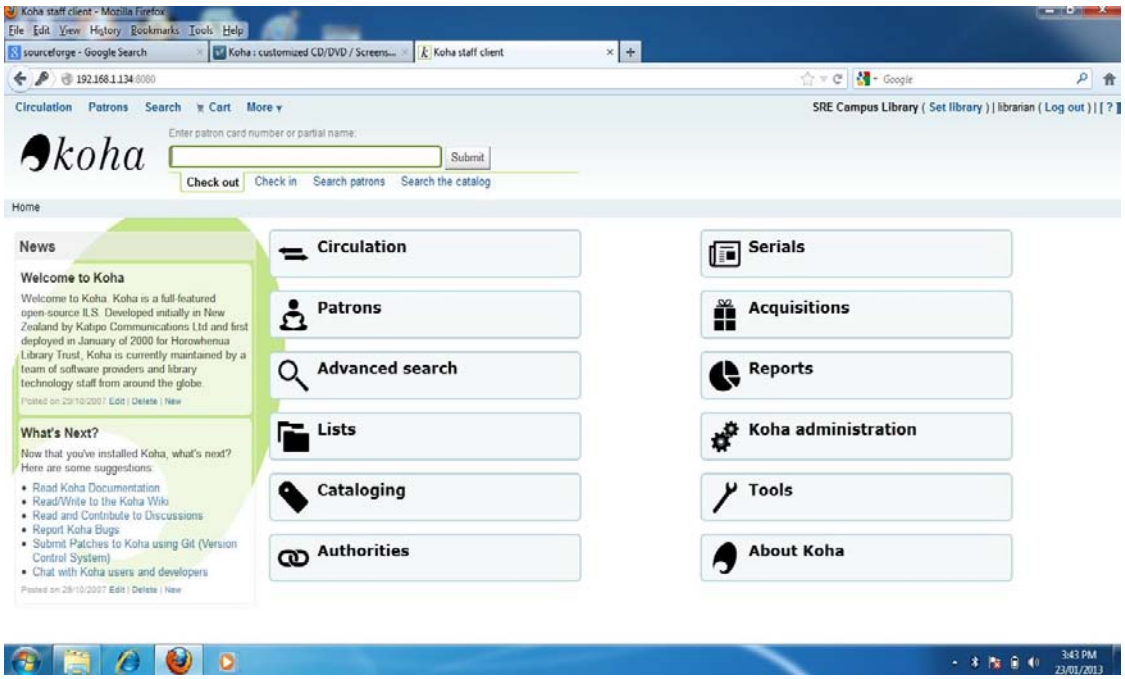

Fig. 1.1: Screenshot of Homepage of Koha ILMS (Source: Koha ILMS)

Koha shares parent-child relationship for patron records, it has easy to use circulation policies, strong patron management, a club and service feature (book clubs, community outreach programs). The software have the facility to enhanced matching policy rules for the 001 and 035 tags, allowing libraries to update older records with a newer version. Further, the OPAC, staff, administrative features and self-checkout interfaces are all based on standards-compliant World Wide Web technologies--XHTML, CSS and JavaScript--making LibLimeKoha a completely Web-based solution.

1.5.2 NEWGENLIB

This is one of the Indian based software developed by Verus Solutions Pvt Ltd. Domain expertise is provided by Kesavan Institute of Information and Knowledge Management (KIIKM), Hyderabadin the year 2007. The software was declared open source on 9th March 2008 and since then it has been gaining more and more popularity. It has more than 2000

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installations across the globe. The latest edition of NewGenLib is 3.0.R1 being used by the libraries. Below given figure presents the screenshot of homepage of NewGenLib ILMS

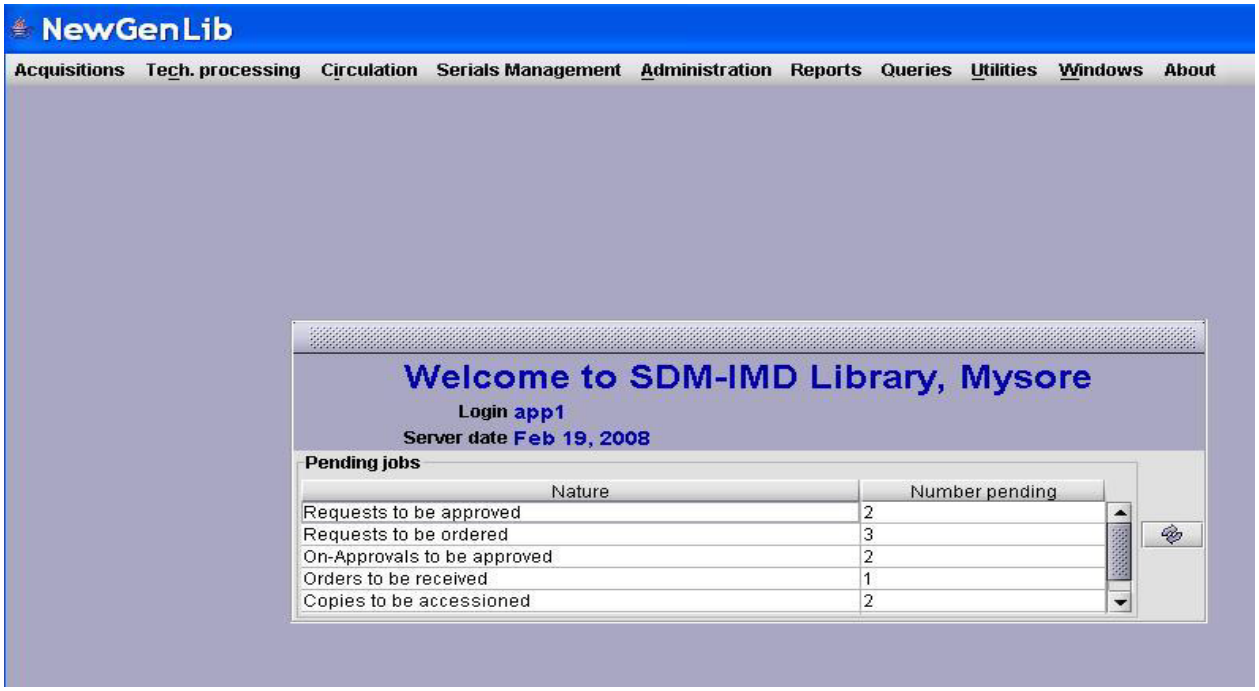

Fig.1.2: Screenshot of Homepage of NewGenLib ILMS (Source: NewGenLib ILMS)

The software has compatibility with MARC-21, MARC-XML, z39.50, SRU/W, OAI-PMH. It is very Scalable, manageable and efficient library software. The software supports federated searching also. The software package provide RFID integration and support many languages. This also provides Automated email/instant messaging integrated into different functions of the software. It further support the multi-user and multiple security levels and also allow digital attachments to metadata.

1.5.3 LIBSYS

This is one of the popular Delhi based library software package available for libraries. It has been providing services since 1984. Now a days it has been become very popular software package because of its feature, functionality and continues research and development taking place in it. The feature such as simple in using and much adoptive language have made it widely acceptable. Below given figure presents the screenshot of the homepage of Libsys ILMS.

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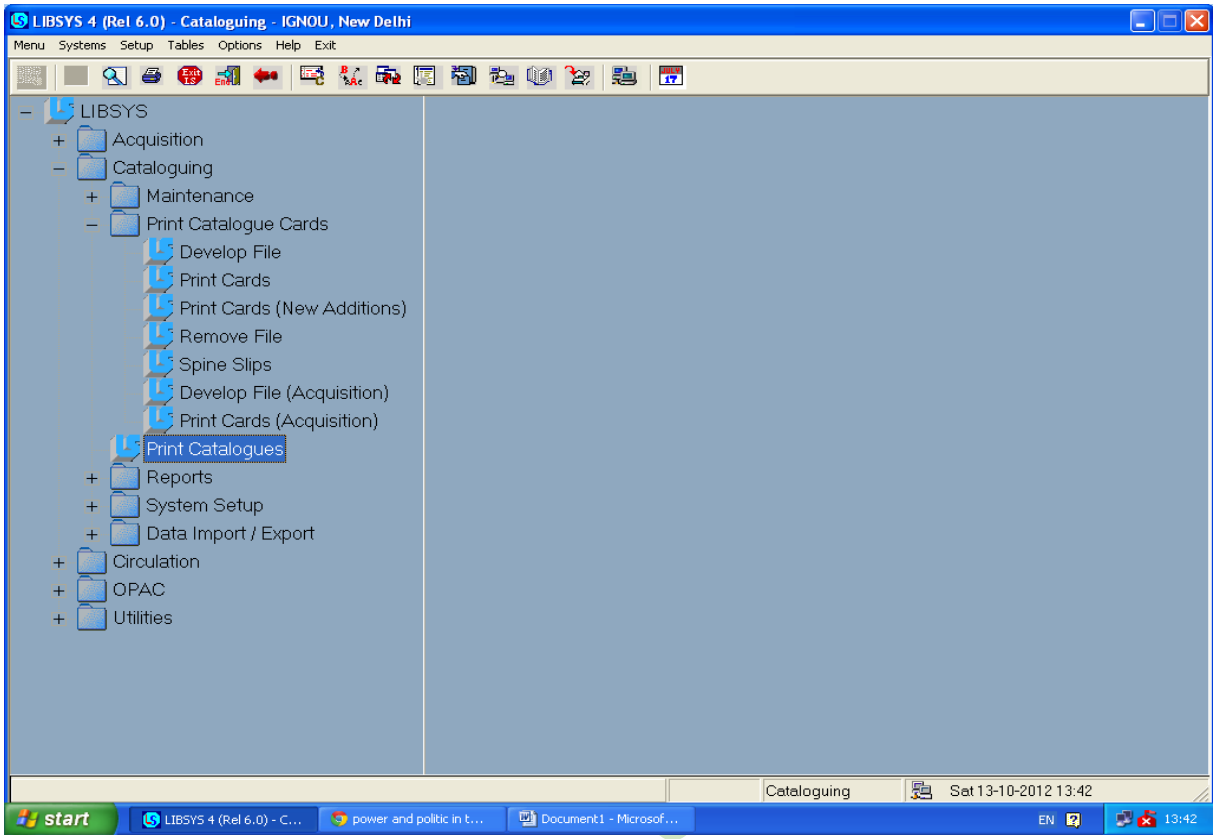

Fig. 1.3: Screenshot of Homepage of Libsys ILMS (Source: Libsys ILMS)

The library software package provides quality catalogue and bibliographic database. It also offers retrospective conversion and digitization services. The feature of retrospective conversion offers record upgrades, web enabled searching, normalization, custom database processing and hosting data for easy maintenance at low cost. The best thing about this library software package is that it support different standards such as Dublin Core, AARC-2, MARC-21 and Z39.50 protocol. LibSys has a powerful and user-friendly web OPAC along with a windows-based OPAC. LibSys handles Indian languages and scripts using ISM publisher and GIST of C-DAC. There is an addition of UNICODE support in LibSys that facilitates handling of both International and Indian languages. The software can handle digital contents along with various multimedia files and electronic resources implementation of a virtual library is a distinct possibility. It also provides the facility of Bar code printing, Thesaurus construction. Apart from that it also has the facility of Resource sharing.

1.5.4 VIRTUA

VTLS is the most popular library software package having more than nine hundred installations across the global. As providers of library solutions for more than 30 years,

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VTLS has a deep and broad knowledge of the current needs of libraries and information centers. It also supports the RDA (Resource description and access) implementation and FRBR (Functional requirement of bibliographic records) functionality. Below mentioned figure presents the screenshot of homepage of Virtua ILMS.

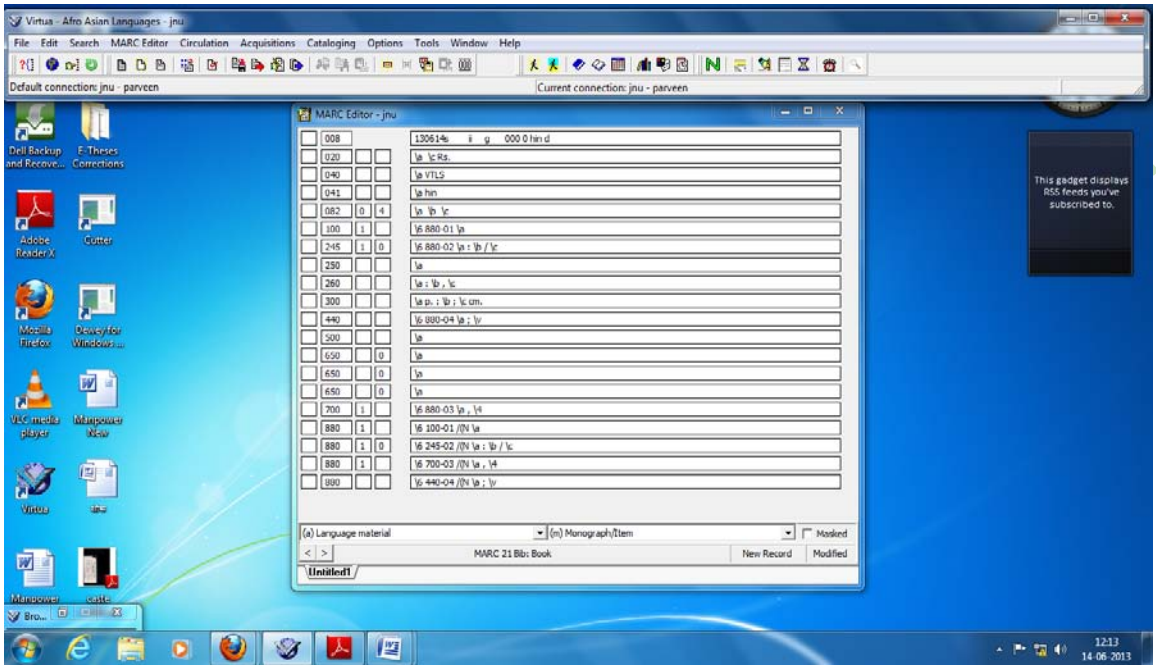

Fig. 1.4: Screenshot of Homepage of Virtua ILMS (Source: Virtua ILMS)

The software is based on six key technologies: relational database management systems, rapid development tools, three-tier client/server architecture, database warehousing, Unicode support and ATM network optimized applications. It further supports the standards and technologies such as MARC formats, Z39.50, UNICODE, Hebrew, linked authorities, RFID and e-mail notifications and recommendations, etc. It further provides access to external tools such as OCLC, RLIN etc.

1.5.5 ABCD

ABCD, acronym for Automatisación de BibliotécasyCentros de Documentación is an integrated package for library automation and a tool for documentation centers, is the culmination of several technologies developed by BIREME (OPS/PAHO, Brazil). These technologies support their online information services and have been developed over many years, involving many experts. The package contains an advanced database management (both creation/definition and data-entry/cataloging) module, an OPAC integrated into a 'library portal' page with meta-search functionality for either local or remote databases (iAH), a Serials Control module (SeCS), a module for Circulation and Statistics, a Thesaurus Manager and an Acquisition module. The software heavily relies on ISIS-database

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technology developed by UNESCO, and BIREME, ABCD's technology can be summarized as follows: fully web-based, ISIS-based, using PHP, ISIS(-Script), JavaScript and AJAX programming, multi-platform and multi-lingual.

The proposal for the development of ABCD is being promoted by BIREME during the last many years. The actual conception, design and development of the system started in 2007, when BIREME established an agreement with MSINFO of Venezuela, to have its Orbita Documental as the basis of the ABCD by adopting the technological platform of the Virtual Health Library and the FOSS development. In 2008 the development of ABCD received financial support from the Flemish Interuniversity Council University Development Co-operation section as ABCD has been selected as the solution for the project 'Development Of and Capacity Building in ISIS-Based Library Automation Systems' (DOCBIBLAS), for being offered to university library partners in the South. The aim of the DOCBIBLAS project, specifically in view of a need for sustainability, is to fully hand over ABCD to the ISIS users' community and both UNESCO and BIREME for continued technical development and promotion.

For country like India ABCD is very new and unfamiliar ILMS but because of the workshop, training programme and conferences taking place on ABCD is making the system hot and popular among the patron due to its strong web based feature.

Fig.1.5: Screenshot of Homepage of ABCD ILMS (Source: ABCD ILMS)

1.5.6 E- GRANTHALAYA

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e-Granthalaya is a library automation software from National Informatics Centre, Department of Electronics & Information Technology, Ministry of Communications and Information Technology, Government of India. It runs on SP.NET 4.0/AJAX/SilverLight Platform and uses MS SQL Server/PostGreSQL DBMS. e- Granthalaya was started as an in-house project at 'Karnataka State Centre of NIC, Bangalore' and first version of the software was designed for the Public Libraries in the State. Later, NIC HQs 'Library and Informatics Services Division' took over the designing of the software where library professionals were involved in the designing process and, thus, improved the software with enhanced user interface and simplify the work-flow of library functions so that it can suit to all kinds of libraries.

Using this software the libraries can automate in-house activities as well as user services. The software can be implemented either in stand-alone or in client-server mode where database and WebOPAC are installed on the server PC while the data entry program is installed on client PCs. The software provides LOCAL/LAN/WAN based data entry solutions for a cluster of libraries where a centralized database can be created with Union Catalog output. The software provides WebOPAC interface to publish the library catalog over Internet/Intranet. The previous version of E-granthalaya i.e. 3.0 runs on Windows platform Only, UNICODE Compliant, thus, supports data entry in local language. e-Granthalaya 3.0 uses MS SQL Server (any edition) as back-end solution where express edition of this SQL Server is provided FREE along with e-Granthalaya Software. Next higher version of the e-Granthalaya i.e. Ver.4.0 which was released during last quarter of 2014. e-Granthalaya Ver.4.0 is upgraded version and it provide a Web-based solution with enterprise mode where a centralized database is used for a cluster of libraries. e-Granthalaya 4.0 uses MS SQL Server as well as **PostgreSQL** as back-end database solutions and will also be available in NIC cloud computing environment with hosting facility to Government libraries.

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Computer and networking technologies are the foremost requirement of any modern library today. Users need accurate and timely information for the house keeping operations. House-keeping operations are those tasks that are carried out in the background for fulfilling the goals of the services for its users. House-keeping operations consists of the tasks such as cataloguing, classification, circulation of books, serial control etc. for carrying out house keeping operations effectively and efficiently, the computer and networking technologies are used for acquisition of books and other reading materials, their classification, cataloguing, circulation and serial control. Further, all sorts of jobs from the procurement of the reading materials to their organization can be easily done. It can serve as a remedy for all the existing problems being faced by the libraries and information centers. But, till now computers have been used successfully in the following areas of the library activities. The below mentioned graph depicts the functioning of house-keeping operations at various locations.

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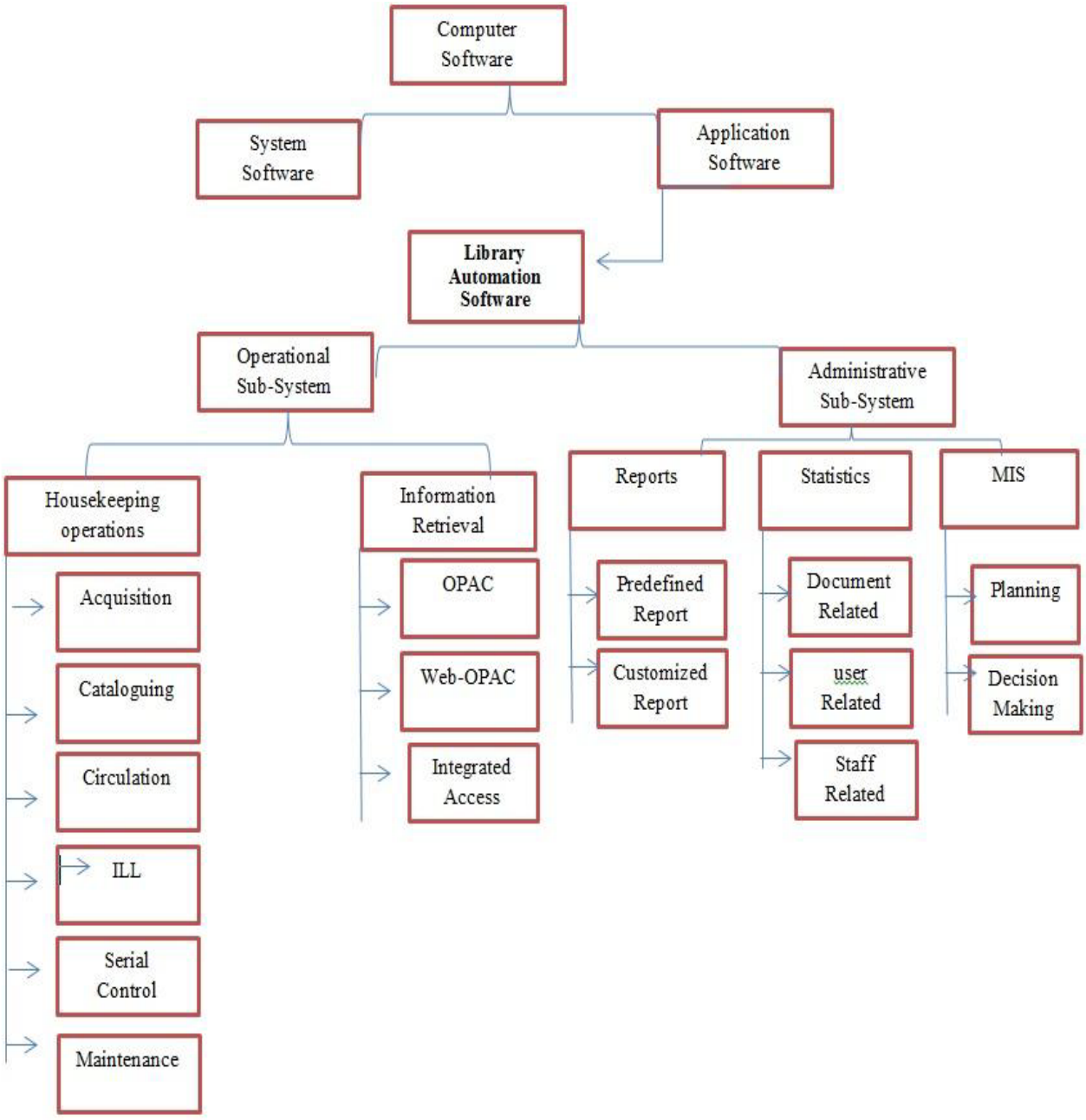
The below mentioned figure presents the picture of library software's and house keeping operations together.



Source: Mukhopadhyay, 2006

The mentioned figure gives the clear picture of house-keeping operations of any library and information system. It clearly reveals that the library software are of two types i.e. system and application software. The library software packages are the part of application software.

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It further reveals that the library software packages have two sub-systems i.e., Administrative and Operational Subsystems. Furthermore, the operational sub-system is divided into two parts House-keeping operations (Acquisition, cataloguing, circulation, ILL, Serial Control and maintenance) and information retrieval (OPAC, Web-OPAC, Integrated Access). Administrative sub-system consists of three sub-system such as Reports (Pre-defined reports, customized reports), Statistics (Document related, user and staff related) and MIS (Planning and decision making).

(i) Acquisition

The MARC bibliographic record service has opened up a new vista in both cataloguing and bibliographic database that can be used as a book selection tool. The basic procedure for acquisition is selection, procurement and accessioning. With the changing time the acquisition in majority of libraries are being done by importing the data from online databases, OCLC, British Library, offline databases, etc. The ordering and acquisition are the routine jobs in the library and for a single time ordering, it requires repetitive operation by different sections. These repetitive operations and the requisite checking can very well be done by the application of the computer system. Both offline and online acquisition can be performed by the use of the computer.

(ii) Classification

The classification is the most important aspect of any library operations. The document can be classified by using the Dewey Decimal Classification Scheme (DDC) and Colon Classification (CC) and other such schemes. Further, the classified document can be easily placed at its required location keeping in mind that the retrieval become easy. A computer-based classification system is being experimented at the documentation Research and training center, Bangalore. It is based on colon Classification System.

(iii) Cataloguing

The computerized cataloguing system operates with high speed for performing routine and repetitive jobs. Besides, computer can also be used in various other ways such as producing book plates, book pockets book cards spice labels, etc. It can also produce a variety of records, cards catalogues in the book form, Pasted catalogue, etc. as by products. When we look at the cataloguing procedures we find that the MARK project was started in November, 1965 by the library of Congreve USA. The latest development in the system includes the Co MARC (Co-Operative Machine-Readable Cataloguing). Computer Output microfilm (COM) was developed in the USA by Stromberg Carlson Company. The Online Computer Library Center (OCLC), previously known as the Ohio College Library Centre was stated in August 1970. All these have successfully used computer for cataloguing of documents. Majority of the libraries are copying the catalogue from OCLC or British library catalogue to save time and avoid duplication of work.

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(iv) Serial Control

Periodicals are continuing publication heaving reasonably permanent titles and appearing usually at regular intervals. Their contents usually vary from issue to issue. An article as a single bibliographic unit may be published in more than one issue and even in more than one volume. Obviously, the users may be interested in an issue of a serial as a bibliographic unit, or an article spread over a number of issues as a bibliographic unit. There is no doubt that periodicals comprises complex operations of library activities because of the very nature and characterizes of serial as library material. Further, the conflict between the physical unit and the bibliographic unit marks serial control a complex task.

In case of journal publication, the current issues, the retrospective or immediate back issues and bound volumes under every year of publication is an ongoing process. Usually the library should encounter the search problem because of the conflict between the title and the corporate body, the old titles and the changed littles, nature of irregularity in publications such as more than one issue in a single publication. These situations pose the problem of listing, acquitter accessioning, cataloguing and creation of records in the desired format.

(v) Circulation

The circulation activities are the life of the library services. The resources available in libraries are for use and are intended for the users, At various points, documents to be trapped for the users who have recorded their priority in using such documents not circulation is a flow of documents, but the flow should be controlled by library operations sold to serve the users in the best possible way with the available materials in the library. This is how a library would be able to provide best reading to their patrons.

Acquisition of any library resource and infrastructure requires fund, energy and time. The ability to evaluate the return on our investments gives us basis on which we choose alternatives. The process of evaluation reveals the worth of anything. Just like any other evaluation process library software package evaluation is also a herculean task. The process mainly involves the four basic tasks.

(i) Open-source library software package
(ii) In house developed software package
(iii) Whether the software will be commercial
(iv) Freeware

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It has been seen that generally the cost of proprietary software remains high, in case of In-house library software package would demand time and budget from the library and create issue in data exchange (Retro Conversion). Freeware library software packages demand extensive technical support. Whereas the open-source software does not have such issues with them if it has online community support.

(i) Preliminary Steps

In the preliminary step, it should also be kept in mind that the proper review on literature and documentation have been checked related to Library software package. This becomes very important to consult the person and institution regarding library software package before getting it installed in the library. Before installing the library software package, libraries should follow the reputation of the person and institution who have already installed the software in their libraries.

(ii) Reliability of Service providers or Vendors

It should be noted that the service provider is reliable and having rich experience in the service providing area. It should also be checked whether the service provider is providing on and off-site service. It should also be checked that do they have office in the country of giving services on and off-site. Are they offering training after the installation of the library software package. It should also be note that the software is getting updated regularly and providing user manual or not.

(iii) General feature of Library Software package

The library software package should have compatibility with different platform such as window 2000, window XP, window N.T. and should also support AACR-II, MARC-2 and LCHS. Further, it should also have capacity, flexibility and speed in different operations. The most important thing required is friendliness further, the software which are built on other platform should have mnemonic-based command. The library software package should have reliability and effectiveness to meet the specifications. It should also have the provision of addition of additional features as and when required.

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Software packages design to perform the activities related to library are know as library softwares. The renounced professor, Shailenderkumar in his study “Comparative features of integrated library management software” carried out in the year 2011 revealed that the library softwares are “based on the knowledge and experience of library professionals over many decades”. Now, variety of Open Source and Proprietary software available at National and International Levels. Software’s may it be open source or proprietary, selection of these must be done judiciously considering its cost, use of hardware, programming language, software support, data storage techniques and search response time. Before selection of any software package for library the evaluation of the software can be done on the basis of the reliability of service provider and the availability of the features in the software. Further, as far as house- keeping operations are concerned they are those tasks that are carried out in the background for fulfilling the goals of the services for its users. House-keeping operations

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consists of the tasks such as cataloguing, classification, circulation of books, serial control etc. for carrying out house keeping operations effectively and efficiently, the computer and networking technologies are used for acquisition of books and other reading materials, their classification, cataloguing, circulation and serial control. Further, all sorts of jobs from the procurement of the reading materials to their organization can be easily done.

Library Software : Software programs design to perform the operations of library activities are known as Library Softwares

OPAC : Online Public Access Catalogue is an interface between the users and the machine readable form of library resources. With the help of OPAC user can easily search in the library holdings

Open Source Software : Open Source software packages are usually available free of charge and these software packages allow users to read, view source code, redistribute, modify and use it by the users.

Proprietary softwares : Proprietary softwares do not allow the users to copy, view source code or customize it. They are also known as '*Turnkey or off – the shelf*' once after the installation the source code is restricted by the software package providing vendors

House keeping Operations: House-keeping operations are those tasks that are carried out in the background for fulfilling the goals of the services for its users. House-keeping operations consists of the tasks such as cataloguing, classification, circulation of books, serial control etc.

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1. Turnkey or off –the shelf 2. 2000 3. INSDOC	4. Developed In-house or by an 5. Koha

1. Define Open Source Software?
2. Define proprietary software?
3. What are the House Keeping Operations?
4. Point to be considered before selection of library software packages?

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LESSON 3.1

Database: Concepts and Components

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 What is Database?
  1.3.1 Definitions
  1.3.2 Application
1.4 Concepts
  1.4.1 Concept of a Database
  1.4.2 Problems of Database Development
  1.4.3 Types of Databases
1.5 Components of a Database
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

In this lesson, the students will be introduced to the concept and components of database. After reading this lesson, the students will be able to understand the meaning of database, and the types of databases. This lesson will also highlight theimportance of databasesin accessing required information for research and study purposes.

1.2 INTRODUCTION

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'Data' means the information prepared for and used on a computer program.Data are collected from a study involving observations, experimentations, interviews or surveys. Such 'data' is called 'raw data. Raw data needs organization and synthesis. The organized or synthesized data are called **'systematized data'** which need to be stored and made accessible to the users like scientists, technologists, a planner, industrialists, or even a common man. Similarly, the data may be different and kinds like technical data, scientific data, business data, industrial data, and socio-demographic data etc.

1.3 WHAT IS DATABASE?

1.3.1 Definitions

In simple words, database refers to any organized collection of data capable of being accessed by a computer. or

A database is a collection of data on a defined range of subjects together with all the information needed to access that data.

A Database is organized and designed to allow a large number of users to draw information from it for many different purposes in many different formats.

A database is a collection of related data stored and treated as a unit for information retrieval purposes.

According to Hitherto, the approach to data processing has been rather fragmented. The total data processing requirements for an organization have normally been split into a series of applications with separate file or files for each application. This practice has led to a proliferation of files, some with a similar type of data. This not only creates problems in updating and maintenance aspects but also leads to conflicting information being circulated due to delays in updating individual files. This situation further led to the development of an integrated approach to information processing. The database concept is a step in this direction. Therefore, it can be stated that a database is a collection of records or a file or collection of files that are brought together as a single file or entity to be commonly accessible by a given set of programs.

1.3.2 Application

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Under this approach, a file is not treated as a separate entity. Individual files are not set up for use by just one program. Instead, a systems or database designer works with the current or prospective users of a system to identify:

i. The information needs of those users, and
ii. the data that must be stored and processed to satify their needs.

Then, the data is organized so that it can be easily accessed by all the programs involved in providing that information as output. The database approach can be employed wherever data storage and manipulation are required. It is most useful when relationships between data are numerous and complex, and information requirements are subject to change.**Some common examples of databases are:**

1. A student database containing enrolment data for all the students currently attending the classes,

2. The 'Parts' database which a company establishes for inventory management purposes.

1.4 CONCEPTS

In simple language, we could say that a 'database is a lot of data; we cannot assume that the converse is true. The certain characteristics are essentially required for designing a database:

i. It is an organized, integrated collection of data.
ii. All relevant applications can refer to it with relative case and with no duplication of data.
iii. It is a model of the natural relationships of the data in the real-world environment.

The Major Characteristics of the Online Databases which are publically accessible are as follows:

i. They are available online and not just in Machine-readable format;
ii. They are accessible to public and
iii. They are accessible through a public telecommunications network.

The adoption of Database System helps the data to be organized suitably with the following advantages:

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- Encoding of data is possible.
- Relational among the data items and programs be made.
- Data repetition and consistency can be maintained.
- Sharing of data is made easy.
- Standards can be enforced to administer the database.
- Data can be structured as per the requirement of the organization/library.

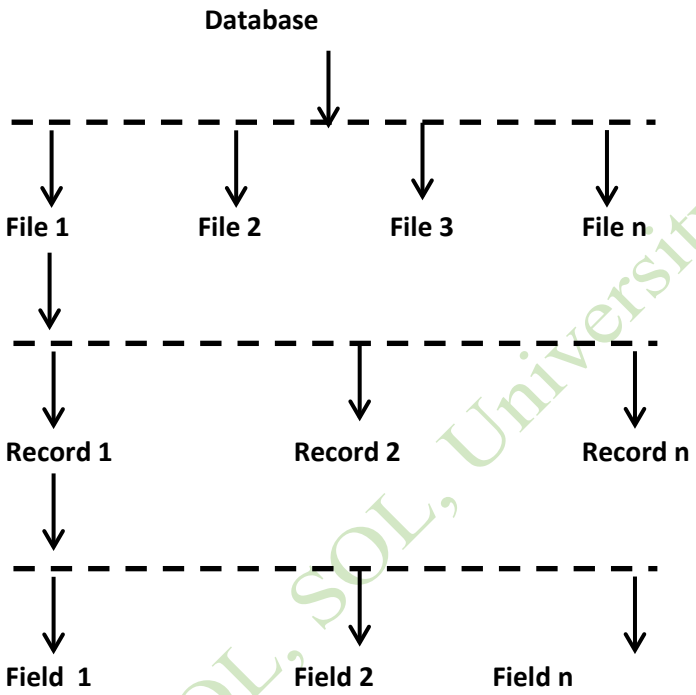

Fig. 1: Basic Hierarchy of Data Organization

1.4.1 Concept of a Database

To store and manage data in an efficient manner in the database, it is necessary to have the the understanding of the following key terms:

1. Database Schema: It is a design of the database. Alternatively, we can say that it is a skeleton of the database that is used to represent the structure, types of data will be stored in the rows and columns, constraints, and relationships between the tables.

2. Data Constraints: In a database, sometimes we put some restrictions on the table on what type of data can be stored in one or more columns of the table; it can be done by using constraints. Constraints are defined while we are creating a table.

3. Data dictionary or Metadata: Metadata is the data about the data. Or

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we can say that the database schema, along with different types of constraints on the data is stored by DBMS in the dictionary, is known as metadata.

4. Database instance: In a database, a database instance is used to define the complete database environment and its components. Or we can say that it is a set of memory structures and background processes used to access the database files.

5. Query: In a database, a query is used to access data from the database. Therefore, users must write queries to retrieve or manipulate data from the database.

6. Data manipulation: In a database, we can easily manipulate data using the three primary operations that is Insertion, Deletion, and Updation.

7. Data Engine: It is an underlying component used to create and manage various database queries.

1.4.2 Problems of Database Development

In India, the problems faced in the development of bibliographic databases are mostly common for all such databases, which are as follows:

i. **Technology and Compatibility:** The databases initially employed manual methods. Later, the activities adopted computer-based methods. Only a few people are skilled to deal with such changes. Such transformation of methods led to the starting of computerized activities with a huge legacy of manual data files as the physical transfer of which could not be easily accomplished.

ii. **Standardization:**TheInstitutions evolved their record formats without consulting their counterparts in this country or abroad. International Standards were not used; thus, all the databases may need convention. Although later, the Bureau of Indian Standards came up with a standard IS:11370-1985: Guidelines for Data Elements and Record Format for Computer Based Bibliographical Databases for Bibliographic Description of Different kinds of Documents. The standards, however require revision from time to time as and when required.

iii. **Vocabulary Control:**In most cases, the database development did not utilize Controlled Vocabulary. For e.g. on Food Sciences, CFTRI had not supplement the international thesaurus with locally used or locally recognized terms.

iv. **Software Standardization:**The software for database development and subsequent information retrieval needs to be standardized. For e.g. the, early starters like CFTRI have based their operation on higher-level languages running on an obsolete 16-bit machine and non-standard operating system. A few organizations, like the PID, have a package like MINISIS.

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v. **Software Marketing:**With the advancement in technology, there is a requirement to generate confidence among the information professionals that a developing country like India could also contribute to the database world on terms equal to those prevalent in the database market of the developed countries.

1.4.3 Types of Databases

The databases can be broadly categorized as below:

i. **Bibliographic Databases:**These databases contain a bibliographic citation to a document which may include an abstract;
ii. **Numeric Databases:**These databases contain numeric or statistical data;
iii. **Full-Text Databases:**These databases contain the full text of a publication;
iv. **Factual Databases:**These databases have directory-type data; and
v. **Research in Progress Databases:**These databases contains a description of research in progress.

IN-TEXT QUESTIONS

1. Database refers to any _____collection of data capable of being accessed by a computer.
2. In a database system, encoding of data is possible. True/False
3. Metadata is known as the data about the_____.
4. In a database, we can easily manipulate data using the three main operations that is _____, _____, and _____.
5. In a database, a query is used to access data from the database. True/False

1.5 COMPONENTS OF A DATABASE

The components of a database work harmoniously and contribute to the overall effective functioning of the Database Management Systems.The main components of any Database arediscussed as below:

i. **Hardware:** The hardware comprises of the physical devices or components of the computer system. Hence, the input, storage, processing, control and output devices are hardware. The hardware is the actual computer system used to keep and access the database. The hardware and software of a computer must work together for the computer to produce useful output. Nothing useful can be done with the computer hardware, and software cannot be utilized without supporting hardware.

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ii. **Software:** The database software is a set of one or more programs, which enables us to create a database, maintain it (add, delete and update its records), organize its data in desired fashion (for e.g. sort its records alphabetically name-wise), and to selectively retrieve useful information from it. Every computer has an operating system software, which takes care of the effective and efficient utilization of all the hardware and software components of the computer system. Most software can be divided into two major categories, i.e., system software and application software.

iii. **Data:** Database Management System collects, stores, processes, and accesses the data. The database holds both the actual or operational data and the metadata.While using a DBMS, the database is first constructed, created or defined. After that, the required data is stored, accessed, and updated to the created the database.

iv. **Query Language:**It enablesusers to define their requirements for extracting the desired information from the database through queries. Earlier, each database management system had its own query language. In this approach, queries developed for one DBMS could not be used with other DBMSs. Although, one query language called as 'SQL' emerged as an industry standard. It was originally developed by IBM and was based on an earlier query language called SEQUEL which is an acronym for "Structured English Query Language". Today, SQL is the standard query language used in many DBMSs. A non-programmer can easily learn a query language. It enables normal database users to access the database for desired information without the help of any programmer.

v. **Report Generator:** It enables a database user to design a report's layout in the desired format.

DBMS is a complex software package that interprets the user command for the computer to operate as required elements:

- **Data Definition Language (DDL):** Describes the content and format of data to be stored, defines the structure of the database, brings out relationships between records and indexing strategies, and forms the links between the logical and physical view of data.
- **Data Manipulation Language (DML):** provides a set of procedural commands for data processing, i.e., storing, manipulating and retrieving the data.
- **Database Manager:**This helps in the physical administration of data.e, dumping,logging,recovery,reorganization,design,redesign,store and retrieval of data.
- **Data Dictionary:** This helps the database administration,designer, systems analyst and even the end-user to coordinate and keep track of the data.
- **Query Language:**This helps to access data and display it on the terminal easily and quickly.

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- **Report Generator:**This helps to produce hardcopy reports,and saves time and money for both the user and the programming staff.

1.6 SUMMARY

Telecommunications and the proliferation of modems have made it easy for libraries and educational organizations to access information in electronic format. Thus, in this reference, a prevalent form of an electronic source is a database, which is a collection of information that is copyrightable. An individual downloads information by accessing the database, usually through a modem and a microcomputer, if from a remote site, and then transfers it to a hard disk drive or to any other peripheral device which facilitates the use of information easily (Kumar, 2004, pp. 296-97).

IN-TEXT QUESTIONS

6. Database Management System collects, stores, _____, and _____the data.
7. Report Generatorenables a database user to design a report's layout in the desired format.True/False
8. _____provides a set of procedural commands for the data processing.

1.7 GLOSSARY

Concept:an idea; a basic principle.

Manipulation:the action of manipulating something in a skillful manner.

Metadata:a set of data that describes and gives information about other data.

Query:a question, especially one expressing doubt or requesting information.

Schema:a diagrammatic presentation broadly a structured framework or plan or outline.

Vocabulary:the body of words which is used in a particular language.

1.8 ANSWERS TO IN-TEXT QUESTIONS

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1. Organized 2. True 3.Data 4. Insertion, Deletion, and Updation	5.True 6. Processes and Accesses 7.True 8.Data Manipulation Language (DML)

1.9 SELF-ASSESSMENT QUESTIONS

1. Define the term 'Database'. Briefly explain the types of Databases.
2. What are the important components of a database? Give a detailed description.
3. What are the problems faced during the development of a Database?

1.10 REFERENCES

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Lesson –3.2

DATABASE MANAGEMENT SYSTEM

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STRUCTURE

2.1 Learning Objectives
2.2 Introduction
2.3 Overview of Physical Storage Media
2.4 Magnetic Disk
2.4.1 Physical Characteristics of Disk
2.4.2 Performance Measures of Disks
2.4.3 Optimitization of Disk-Block Access
2.5 Raid
2.5.1 Improvement of Reliablity via Redundancy
2.5.2 Improvement in Performance via Parallelism
2.5.3 Hardware Issues
2.5.4Other Raid Application
2.6 Teritary Storage
2.6.1 Optical Disks
2.6.2 Magnetic Tapes
2.7 Storage Access
2.7.1 Buffer Manager
2.7.2 Buffer Replacement Policies
2.8 File Organization
2.8.1 Fixed-Length Records
2.8.2 Variable-Length Records
2.8.2.1Byte-String Representation
2.9 Organization of Records in files
2.9.1 Sequential file Organization
2.9.2 Clustering file Organization
2.10 Data –Dictionary Storage
2.11 Summary
2.12 Glossary
2.13 Answer to In-Text Question
2.14 Self Assignment Question
2.15 References
2.16 Suggested Readings

2.1 LEARNING OBJECTIVES

Central University of Jammu

After undergoing this module, you should be able to understand:

- Magnetic Disk , Physical Characteristics of disks, and Performance of Disks.
- RAID and its applications.
- Teritary Storage, Optical Disk, and Magnetic Tapes.
- Storage Access, Buffer Manager and Replacement Policies.
- File Organization and its types.
- Data Dictionary Storage.

2.2 INTRODUCTION

In this module, we have discussed numerous ways to put the data models and programming languages that were introduced in earlier chapters into practise. The features of the underlying storage media, including disc and tape systems, are where we begin. Then, a number of data structures are defined to provide quick data access. We take into account a number of various structural options, each best suited for a particular type of data access. The ultimate data structure decision must be based on the system's anticipated use as well as the physical properties of the particular machine.

2.3 Overview of Physical Storage Media

Most computer systems can store data in a variety of ways. These storage media are divided into different categories based on how quickly data can be accessed, how much it costs to purchase the medium per unit of data, and how reliable the medium is. These are some of the media that are commonly available:

- **Cache**. The fastest and most expensive type of storage is the cache. The hardware of the computer system controls how much of the limited cache memory is used. The management of cache storage in the database system won't be a problem of ours.

- **Main memory**. Main memory is the storage system utilised for data that can be used for operations. Even while main memory has a large amount of data available, it is typically too tiny (or too expensive) to store the complete database. In the event of a power outage or computer system crash, the data in main memory is typically lost.
- **Flash memory** Flash memory, also known as electrically erasable programmable read-only memory (EEPROM), differs from main memory in that data remain accessible in the event of a power outage. Flash memory reading data requires fewer than 100 nanoseconds. Flash memory is limited to 10,000–1,000,000 erase cycles. We have to wipe an entire bank of memory at once in order to overwrite memory that has already been written.

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- **Magnetic-disk storage** Power outages and system breakdowns do not affect data storage. Data loss due to disc storage device failures is possible, but they are uncommon. Currently, magnetic drives can be anything between a few gigabytes and 80 gigabytes in capacity.

- **Optical storage**Optical discs are magnetic-optical storage systems that read data that has been magnetically encoded using optical methods. A disc contains data that is optically stored, and a laser reads that data. Compact discs (CDs) and digital video discs are the two most widely used optical storage media (DVD).
  JukeboxSystems have a few drives and a large number of discs that can be automatically (by a robot arm) placed into one of the drives as necessary.

- **Tape storage**The main purposes of tape storage are data backup and archiving. Magnetic tape is far less expensive than discs, but because the tape must be accessed sequentially from the beginning, access to the data is substantially slower. Tape storage is sometimes known as sequential-access storage because of this. Disk storage, on the other hand, is referred to as direct-access storage since data may be read from any point on the disc.

According to their cost and speed, the various storage medium can be arranged in a hierarchy (Figure 1). Although more expensive, higher levels are quicker. The cost per bit drops while the access time grows as we advance down the hierarchy. This trade-off is logical since there would be no benefit to using the slower, more expensive memory if one storage system were faster and less expensive than another, all other factors being equal.

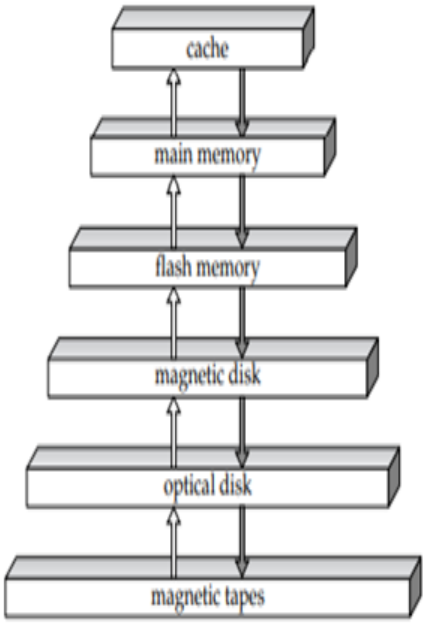

Figure 1: Storage-Devices hierarchy(Source : Silberschatz−Korth−Sudarshan,Database System Concepts, Fourth Edition)

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2.4 Magnetic Disks

The majority of secondary storage for contemporary computer systems is provided by magnetic discs. Disk capacities have been increasing by more than 50% annually, but large applications' storage needs have also been rising quickly—in some situations, even more quickly than disc capabilities. Numerous discs could be required for a sizable database.

2.4.1 Physical Characteristics of Disks

Disks are physically quite basic (Figure 2). Every disc platter is spherical and flat. Information is stored on its two surfaces, which are covered in a magnetic substance. Platters are formed of hard metal or glass and have magnetic recording material applied to them, typically on both sides. To distinguish them from floppy discs, which are constructed of flexible material, we refer to such magnetic discs as hard discs. A read/write head is positioned just above the platter's surface. The tracks and sectors that make up the disc surface are logically separated. The smallest piece of data that may be read from or written to the disc is a sector.

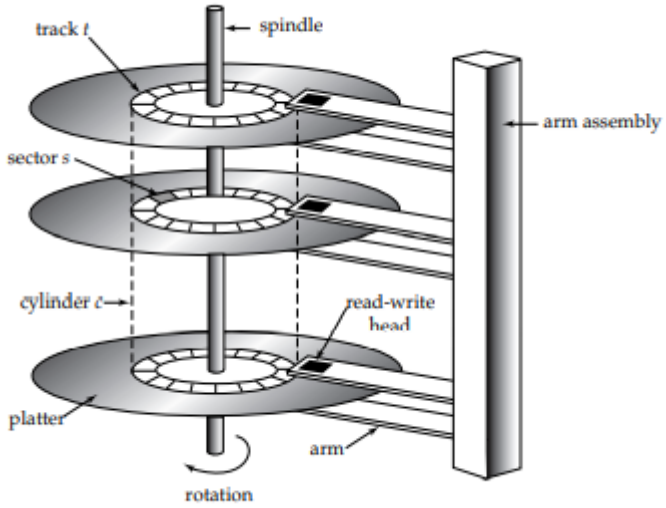

Figure 2: Moving-Head Disk Mechanism (Source :Silberschatz−Korth−Sudarshan ,DatabaseSystem Concepts, Fourth Edition)

A read-write head is located on each side of a disk's platter, and it moves across the platter to access various tracks. The read-write heads of all the tracks on a disc, which normally has numerous platters, are placed on a single unit known as a disc arm and move in unison. Head-disk assemblies refer to the combination of disc platters mounted on a spindle and heads mounted on a disc arm. Since all of the platters' heads move in unison, while one platter's head is on the ith track, all of the other platters' heads are also on the corresponding platters' corresponding ith tracks. Therefore, the ith cylinder is the collection of all the platters' ith tracks.

Each sector that is written has a checksum attached by disc controllers; the checksum is calculated from the data written to the sector. It is possible to conceptually map a damaged sector to a different physical location if the damage occurs during the initial formatting of the disc or during an attempt to write the sector.

2.4.2 Performance Measures of Disks

The main measures of the qualities of a disk are capacity, access time, data-transfer rate, and reliability.

Access time is the interval between the time a read or write request is made and the start of data transfer. The arm must shift to the proper track and wait for the sector to pass below it as the disc rotates in order to access (read or write) data on a specific sector of a disc. The seek time, which increases as the arm must move farther, is the amount of time required to relocate the arm. Depending on how distant the track is from the starting arm position, search times typically range from 2 to 30 milliseconds. Since the head needs to travel a shorter distance, smaller discs typically have reduced seek times.

One-third of the worst-case seek time is represented by the **average seek time.** The rate at which data can be read from or written to the disc is known as the data-transfer rate. Depending on the disc model, current average seek times range between 4 and 10 milliseconds. According to current disc technologies, maximum transfer speeds can range from 25 to 40 megabytes per second.

2.4.3 Optimization of Disk-Block Access

The virtual memory manager included in most operating systems and the file system both produce requests for disc I/O. Each request includes a reference to the disc address, which is specified as a block number. A block is a collection of sectors that are contiguous and come from a single platter track.Here, we discuss several other techniques.

- **Scheduling** By requesting the blocks from a cylinder in a sequence that reduces disk-arm movement, we might be able to shorten the processing time. Disk-arm scheduling methods make an effort to arrange track accesses in a way that maximises the number of accesses that can be handled.

- **File organization**. We can arrange blocks on disc in a way that closely resembles the way we anticipate data to be accessed in order to decrease block-access time. The blocks of a file should ideally be kept in order on nearby cylinders if we are storing it on a collection of cylinders.

- **Nonvolatile write buffers**NV-RAM, or nonvolatile random-access memory, can significantly speed up disc writes. Nonvolatile RAM's contents are not lost after a power outage. Only when the nonvolatile RAM buffer is full does the database system experience a delay when it requests a block write.

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- **Log disk** When the disc is idle or when the nonvolatile RAM buffer is full, the controller writes the data to the destination location on the disc. Using a log disc, which is a disc dedicated to writing a sequential log, is another method to decrease write latencies.

2.5 RAID

A system with many discs has the potential to increase the speed at which data may be read or written. Multiple independent readings or writes can be carried out simultaneously using parallelism. Because redundant data can be stored on many discs, this configuration has the potential to increase data storage dependability.

To increase performance and reliability, a number of disk-organization strategies known as redundant arrays of independent discs (RAID) have been proposed.

2.5.1 Improvement of Reliability via Redundancy

If we just keep one copy of the data, each disc failure will cause a large loss of data. Duplicating each disc is the most straightforward (but most expensive) method of adding redundancy. Mirroring or shadowing is the name of this method. Therefore, a logical disc is made up of two physical discs, and each write is performed on both discs.
Given that they happen much more frequently than natural disasters, power outages are a particular cause for concern. If there isn't a data transfer to disc happening when a power failure happens, it's not a problem. Although the discs are mirroring, if a write is in progress to the same block on both drives and the power goes off before both blocks are fully written, the two blocks may still be inconsistent.

2.5.2 Improvement in Performance via Parallelism

Let's now think about the advantage of parallel disc access. Due to the ability to send read requests to either disc when using disc mirroring, the rate at which read requests may be handled is doubled (as long as both discs in a pair are functional, as is almost always the case). The number of reads per unit of time has doubled, yet the transfer rate for each read is the same as in a single-disk system.

By striping data across various discs while using multiple discs, we can increase the transfer rate just as much (or more). Data striping, also known as bit-level striping, is the process of distributing each byte's bits over several drives.

Block-level striping Blocks are assigned logical numbers and an array of n discs is treated as a single huge disc. When reading a huge file, it pulls n blocks at once from n drives concurrently, resulting in a high data transfer rate.

The most popular type of data striping is block level striping. It is also possible to stripe at higher levels, such as bytes or sectors of a block. In a disc system, parallelism aims to accomplish two key things:

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1. Load-balance several little accesses (block accesses), which will boost their throughput.

2. To decrease the response time of large accesses, parallelize large accesses

2.5.3 Hardware Issues

Software alone can implement software RAID, requiring no changes to the hardware. The development of specialised hardware to handle RAID has many advantages. In order to continue operating even in the event of a power outage, good RAID systems contain numerous redundant power supply and battery backups.

2.5.4 Other RAID Applications

The principles of RAID have been applied to other types of storage, such as tape arrays and even data transmission through wireless networks. The RAID architecture can recover data even if one of the tapes in an array of cassettes is damaged when used with arrays of tapes. When used for data broadcast, a block of data is divided into manageable units and broadcast alongside a parity unit so that, in the event that one of the units is not received for any reason, the other units can be used to rebuild the missing unit.

2.6 Tertiary Storage

Some of the data in a big database system could have to live on secondary storage. Magnetic tapes and optical discs are the two tertiary storage devices used the most frequently.

2.6.1 Optical Disks

Compact discs are being replaced by DVDs in applications that demand enormous volumes of data. Data can be stored on discs in the DVD-5 format up to 4.7 gigabytes (in one recording layer). 8.5 gigabytes can be stored on DVD-9, and 9.4 gigabytes can be stored on DVD-10.

Jukeboxes are machines that store a lot of optical discs and automatically load them as needed. A mechanical arm loads a disc onto a drive when it is accessed from a rack. Such a system has a potentially enormous total storage capacity of several terabytes.

2.6.2 Magnetic Tapes

Tapes are mostly used for backup and offline archiving of rarely accessed data. Large amounts of data, such video or image data, are also used for them. Tape devices are highly dependable, and competent tape drive systems check the newly written data to verify that it was successfully recorded.

Large data volumes, up to many terabytes, are stored on tape jukeboxes (1012 bytes). Imaging systems that collect data via remote sensing satellites and sizable video libraries for television broadcasters are two examples of applications that require such huge data storage.

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2.7 Storage Access

A database is translated into a variety of different files that the underlying operating system maintains. These files have tape backups and are permanently stored on drives. Blocks, which serve as both the units of storage allocation and data transport, are fixed-length storage units that are used to partition each file.

The database system wants to reduce the number of block transfers between the disc and memory as much as possible. Keeping as many blocks in main memory as you can is one technique to minimise the amount of disc accesses. The objective is to increase the likelihood that a block will already be in main memory when it is accessed, eliminating the need for a disc access.

2.7.1 Buffer Manager

The buffer manager provides the address of the block in main memory to the requester after reading the requested block from the disc. It makes room in the buffer by removing other blocks and allocating space for the block. Additionally, the buffer manager must employ methods more advanced than conventional virtual memory management systems in order to effectively service the database system.

- **Buffer replacement strategy**Before a new block may be read in while the buffer is full, a block must be removed from the buffer. A least recently used (LRU) strategy is utilised by the majority of operating systems. This indicates that the most recently accessed block is copied back to disc.
- **Pinned blocks**Restricting the number of times a block may be written back to disc is important for the database system to be able to recover from crashes. The majority of recovery systems, for instance, mandate that a block not be written to disc while an update on the block is being performed. A block is said to as pinned if it cannot be written back to disc.

- **Forced output of blocks**Even if the buffer space it takes up is not required in some cases, the block must still be written back to disc. The forced output of a block is the name given to this writing. Therefore, data in buffers is lost in a crash, although data on discs typically survives a crash.

2.7.2 Buffer-Replacement Policies

A replacement approach for blocks in the buffer aims to reduce disc accesses. It is impossible to know in advance which blocks will be referenced in general-purpose programmes. Operating systems therefore forecast future references based on the historical pattern of block references. Typically, it is assumed that blocks that have recently been referenced will likely be cited once more. The least recently referred block is thus replaced if a block needs to be changed. The least recently used (LRU) block-replacement technique is the name of this method.

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In operating systems, LRU is an appropriate replacement strategy. Database systems might have knowledge of the near future as opposed to operating systems, which must look to the past to make predictions about the future. There are various steps involved in a user request to the database system. The database system can frequently foresee which steps need to be taken. Once the last tuple has been processed, the buffer manager should be told to release the space used by a borrowing block. We also have the toss-immediate strategy and the MRU strategy.

2.8 File Organization

As seen in figure 3, a file is logically arranged as a series of records. Blocks on the disc are mapped to these records.. Files are provided as a basic construct in operating systems, so we shall

record 0	A-102	Perryridge	400
record 1	A-305	Round Hill	350
record 2	A-215	Mianus	700
record 3	A-101	Downtown	500
record 4	A-222	Redwood	700
record 5	A-201	Perryridge	900
record 6	A-217	Brighton	750
record 7	A-110	Downtown	600
record 8	A-218	Perryridge	700

Figure 3: File Containing Account records(Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

assume the existence of an underlying file system. We need to consider ways of representing logical data models in terms of files.

Record sizes vary, despite the fact that blocks have a constant size set by the operating system and the physical characteristics of the disc. Tuples comprising separate relations in a relational database typically come in various sizes.

Using many files and storing records of a single fixed length in each file is one method of mapping the database to files.

2.8.1 Fixed-Length Records

As an example, let us consider a file of account records for our bank database. Each record of this file is defined as:

type deposit = **record**
account-number : char(10);
branch-name : char (22);

balance : real;
end
Our account record is 40 bytes lengthy if we suppose that each character takes up one byte and that a real takes up eight bytes. Using the first 40 bytes for the first record, the following 40 bytes for the second record, and so on is a straightforward strategy (Figure 4). However, there are two issues with this straightforward strategy:

1. Removing a record from this structure is challenging. The record that is to be deleted must be replaced by another file record, or we must have a means to indicate deleted records so that they can be disregarded.

record 0	A-102	Perryridge	400
record 1	A-305	Round Hill	350
record 3	A-101	Downtown	500
record 4	A-222	Redwood	700
record 5	A-201	Perryridge	900
record 6	A-217	Brighton	750
record 7	A-110	Downtown	600
record 8	A-218	Perryridge	700

Figure 4: File of Figure 3, with record 2 deleted and all records moved (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

2. 2. After deleting a record, we could shift the record that came after it into the empty space, and so on, until all records after the deleted record have been moved ahead. It could be simpler to simply relocate the file's final record into the location where the deleted record had stood. Moving records into the space made available by a deleted record is not ideal because it necessitates more block accesses. The address of the first record whose contents are removed is all we now need to store there.We use this

record 0	A-102	Perryridge	400
record 1	A-305	Round Hill	350
record 8	A-218	Perryridge	700
record 3	A-101	Downtown	500
record 4	A-222	Redwood	700
record 5	A-201	Perryridge	900
record 6	A-217	Brighton	750
record 7	A-110	Downtown	600

Figure 5: File of Figure 4 , with record 2 deleted and all records moved (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

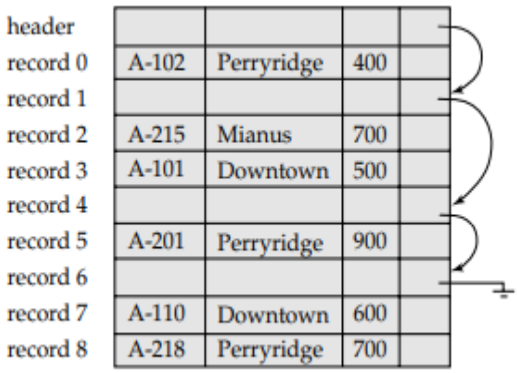

Figure 6: File of Figure 5 with free list after deletion of records 1,4 and 6 (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

first record to store the address of the second available record, and so on. Intuitively, we can think of these stored addresses as pointers, since they point to the location of a record. The deleted records thus form a linked list, which is often referred to as a free list. Figure 2.8 shows the file of Figure 2.5 , with the free list, after records 1, 4, and 6 have been deleted.

We use the record that the header points to when a new record is inserted. The new record is added to the end of the file if there is no more room. This match becomes invalid if we permit records with various lengths in a file. It's possible that an added record won't fit in the empty spot left by a removed record.

2.8.2 Variable-Length Records

Variable-length records arise in database systems in several ways:

- Storage of multiple record types in a file
- Record types that allow variable lengths for one or more fields
- Record types that allow repeating fields

We will investigate an alternative way of representing the account information included in the file shown in Figure 6 because there are various methods for constructing variable-length records. According to this illustration, each member of the system has a unique file that contains the names of all the branches and the account details for each branch.The format of the record is

```
type account-list = record
                        branch-name : char (22);
                        account-info : array [1 .. ∞] of
                                            record;
                                        account-number : char(10);
                                            balance : real;
                                        end
end
```

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Account-info is described as an array with any number of entries. In other words, even while every actual record will have a particular number of elements in its array, the type definition does not set a restriction on how many there can be in an array. Up to the extent of the disc storage, of course, there is no restriction on the size of a record.

2.8.2.1 Byte-String Representation:

The addition of a unique end-of-record () symbol to the end of each record is a straightforward technique for implementing variable-length records. Then, we can save each record as a series of related bytes. Figure 7 illustrates such an arrangement for the file of fixed-length records from Figure 5 to be represented as variable-length records. Instead of employing end-of-record symbols, an alternative byte-string encoding places the record length at the start of each record.The byte-string representation as described in Figure 7 has some disadvantages:

Generally speaking, there is no room for records to get any longer. A variable-length record must be moved if it grows longer. If pointers to the record are kept elsewhere in the database, movement is expensive.

Therefore, it is uncommon to implement variable-length records using the fundamental byte-string representation defined here. For arranging records within a single block, a modified variant of the byte-string representation known as the slotted-page structure is frequently employed.

0	Perryridge	A-102	400	A-201	900	A-218	700	⊥
1	Round Hill	A-305	350	⊥				
2	Mianus	A-215	700	⊥				
3	Downtown	A-101	500	A-110	600	⊥		
4	Redwood	A-222	700	⊥				
5	Brighton	A-217	750	⊥				

Figure 7: Byte String Representation of Variable- lenght records(Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

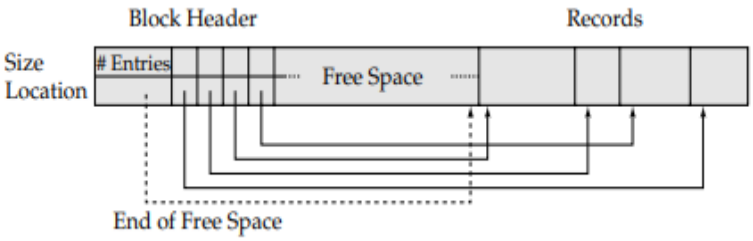

Figure 8: Slotted Frame Structure(Source :Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

Figure 8 shows the slotted-page structure. Each block has a header at the start that includes the following details:

1. The amount of header record entries

2. The block's final open space

3. An array with each entry containing the position and size of a single record.

As long as there is room in the block, identical strategies can be used to enlarge or shrink records. If a record is added, room is set aside for it at the end of the available space, and the header is updated with information about its size and position.

There are two ways of doing this:

1. Reserved space. We can utilise fixed-length records of that length if there is a maximum record length that is never exceeded. A unique null, or end-of-record, symbol is used to fill any empty space (for records that are shorter than the maximum space allowed).

2. List representation. Lists of fixed-length records that have been chained together by pointers can be used to represent variable-length records.

0	Perryridge	A-102	400	A-201	900	A-218	700
1	Round Hill	A-305	350	⊥	⊥	⊥	⊥
2	Mianus	A-215	700	⊥	⊥	⊥	⊥
3	Downtown	A-101	500	A-110	600	⊥	⊥
4	Redwood	A-222	700	⊥	⊥	⊥	⊥
5	Brighton	A-217	750	⊥	⊥	⊥	⊥

Figure 9: Using the reversed-Space method (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

The reserved-space method is useful when most records have a length close to the maximum. We use the symbol to represent this situation in Figure 9. To represent the file by the linked list method, we add a poin icon to the end of the file.

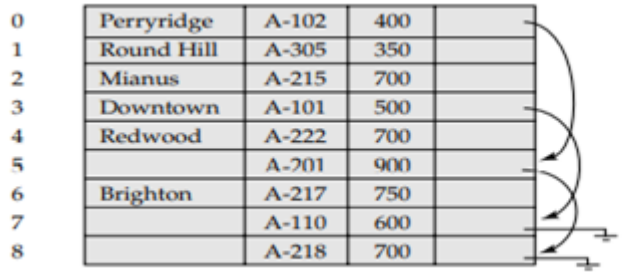

Figure 10: File using Linked lists(Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

The first record in a chain is called the Anchor block, and all subsequent records are found in the Overflow block. Despite not all records in the file having an identical length, all records inside a block have the same

length.

IN-TEXT QUESTIONS

1. Devices that store a huge number of optical disks are called?
2. Tertiary storage is also known as .....
3. Files are logically partitioned into storage units of fixwd-length known as?
4. An organized logical sequence of records is called?
5. The linked list created from the deleted records of file is referred to as?
6. Allocation of certain bytes are made at the beginning of the file known as?

2.9 Organization of Records in Files

So far, we have looked at the representation of records in a file structure. A collection of records is an example of a relation. The next issue is how to build up a file with a certain set of records. Several options on how to arrange documents in files include:

- **Heap file organization.**Any record can be inserted into the file anywhere there is room for it. There is no records ordering. For each relational ock of the file where the record should be placed, there is often a single file.

- **Sequential file organization.**According to the value of a "search key" for each record, records are kept in a sequential order. This organisation is described in Section 2.7.1.

- **Hashing file organization**. Each record's attribute is used to calculate a hash function. The hash function's output indicates which block of the file the record should go in.

2.9.1 Sequential File Organization

Sequential files are intended for quick processing of records that have been sorted according to a search-key. Any attribute or group of characteristics can be used as a search key; the primary key or even a superkey is not required. We chain together records via pointers to enable quick retrieval of records from a file.

A chronological file of account information from our banking example is shown in Figure 11. In that instance, the branchname is used as the search key, and the records are stored in search-key order.

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Records may be read in sorted order thanks to the sequential file organisation; this is advantageous for both display and some query processing methods.

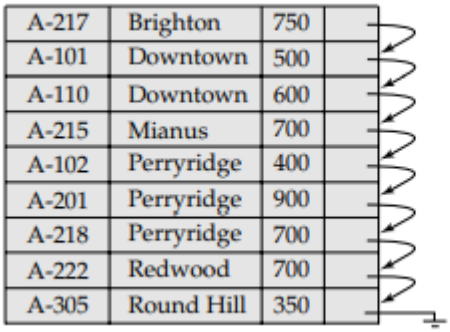

Figure 11: Sequential file for account records(Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

It is difficult, however, to maintain physical sequential order as records are inserted and deleted, since it is costly to move many records as a result of a single

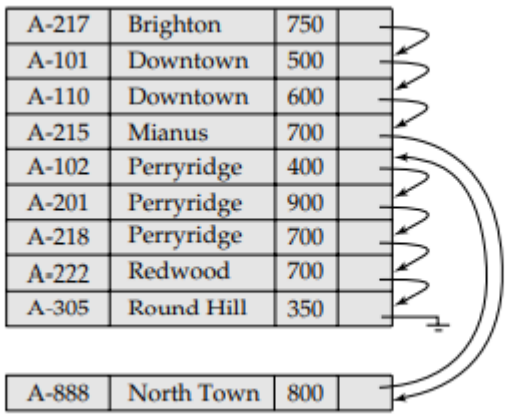

Figure 12: Sequential file after an insertion (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

insertion or deletion. We can manage deletion by using pointer chains, as we saw previously. For insertion, we apply the following rules:

1. Find the file's record that, in search-key order, comes before the one that needs to be put.

2. Insert the new record into the block where this record is located, if there is a free record (that is, space left after a deletion). If not, add the fresh record to an overflow block. In either scenario, change the pointers so that the records are chained together according to the search key.

After the record was inserted, Figure 12 depicts the file from Figure 11. (North Town, A-888, 800). Despite forcing sequential file-processing applications to treat records in a different order than their physical order, the structure in Figure 12 enables quick insertion of new records.

2.9.2 Clustering File Organization

In order to fully utilise the operating system's file system, many relational database systems store each relation in a separate file. For low-cost database implementations for embedded systems or portable devices, this straightforward relational database implementation is ideally suited.

A clustering file structure is one that groups together in each block related records from two or more relations. As a result, we can read data that would fulfil the join requirement in a single block read. Clustering has improved how one join is processed (depositor customer), however it slows down how other sorts of queries are processed.For example,

select *

from customer

The OSI model is built around three concepts:

1. Services.
2. Interfaces
3. Protocols

Each layer is intended to offer services to the upper layers lie above it.

2.10 Data-Dictionary Storage

So far, we have considered only the representation of the relations themselves. A relational-database system needs to maintain data about the relations, such as the

Hayes	Main	Brooklyn
Hayes	A-102	
Hayes	A-220	
Hayes	A-503	
Turner	Putnam	Stamford
Turner	A-305	

Figure 13: Clustering File Structure (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

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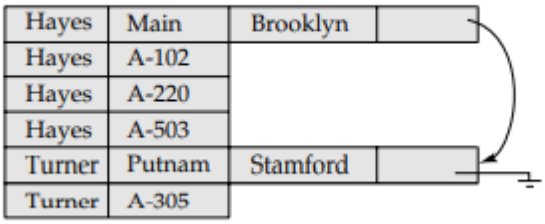

Figure 14: Clustering File Structure with Pointer chains. (Source : Silberschatz−Korth−Sudarshan ,Database System Concepts, Fourth Edition)

schema of the relations. This information is called the data dictionary, or system catalog. Among the types of information that the system must store are these:

- Names of the relations
- Names of the attributes of each relation
- Domains and lengths of attributes
- Names of views defined on the database, and definitions of those views
- Integrity constraints (for example, key constraints)

In addition, many systems keep the following data on users of the system:

- Names of authorized users
- Accounting information about users
- Passwords or other information used to authenticate users

Further, the database may store statistical and descriptive data about the relations, such as:

- Number of tuples in each relation
- Method of storage for each relation (for example, clustered or nonclustered)

The data dictionary may also note the storage organization (sequential, hash or heap) of relations, and the location where each relation is stored:

- If relations are stored in operating system files, the dictionary would note the names of the file (or files) containing each relation.
- If the database stores all relations in a single file, the dictionary may note the blocks containing records of each relation in a data structure such as a linked list.

we shall see a need to store information about each index on each of the relations:

- Name of the index
- Name of the relation being indexed
- Attributes on which the index is defined
- Type of index formed

All this information constitutes, in effect, a miniature database. The exact choice of how to represent system data by relations must be made by the system designers. One possible representation, with primary keys underlined, is

Relation-metadata (relation-name, number-of-attributes, storage-organization, location)
Attribute-metadata (attribute-name, relation-name, domain-type, position, length)
User-metadata (user-name, encrypted-password, group)
Index-metadata (index-name, relation-name, index-type, index-attributes)
View-metadata (view-name, definition)

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In this representation, it is expected that the relation Index-metadata has a list of one or more attributes. One such attribute list can be represented by a character string like "branch-name, branch-city." To facilitate quick access, the data dictionary is frequently stored in a non-normalizedformat.

IN-TEXT QUESTIONS

7. Which level of RAID refers to disk mirroring with block striping?
8. A unit of storage that can store one or more records in a hash file organization is denoted as
9. The file organization which allows us to read records that would satisfy the join condition by using one block read is .....
10. Each tablespace in an Oracle database consists of one or more files called?

2.2 SUMMARY

Most computer systems can store data in a variety of ways. They are divided into groups based on how quickly they can access data, how much it costs to purchase the memory per unit of data, and how reliable they are. Cache, main memory, flash memory, magnetic discs, optical discs, and magnetic tapes are a few of the media that are accessible.

The chance of physical failure of the storage device and whether data is lost as a result of a power outage or system breakdown influence the reliability of storage media. A file can be logically organised as a series of records that are mapped onto disc blocks. Using many files and storing records of a single fixed length in each file is one method of mapping the database to files. As an alternative, files can be set up to support records of various duration. Variable-length records can be implemented using a variety of methods, such as the slotted-page method, the pointer method, and the reserved-space method.

2.12 GLOSSARY

File: File containing record.

Record: A record is all of the data or information about one person or one thing.

Field: One piece of data or information about a person or thing.

2.13 ANSWERS TO IN-TEXT QUESTIONS

1.Optical Disc drive	6.File header
2. Offline Storage	7. RAID level 1
3.Blocks	8. Buckets
4. File	9.Clustering file Organization

5.Free List	10.Data files

2.14 SELF-ASSESSMENT QUESTIONS

1. How does the remapping of bad sectors by disk controllers affect data-retrieval rates?

2. List the physical storage media available on the computers you use routinely. Give the speed with which data can be accessed on each medium

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LESSON 3.3

Database Management System: Basic Functions and Potential Uses

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.2.1 Objectives of DBMS
1.3 What is Database Management System?
1.3.1 Definitions
1.3.2 Main Components of a DBMS
1.3.3 Steps involved in DBMS Development
1.4 Basic Functions of DBMS
1.5 Potential Uses of DBMS
1.6 Summary
1.7 Glossary
1.8 Answers to In-text Questions
1.9 Self-Assessment Questions
1.10 References
1.11 Suggested Readings

1.1 LEARNING OBJECTIVES

In this lesson, the students will be introduced to the concept and importance of Database Management System (DBMS). After reading this lesson, the students will be able to understand the basic functions, components and uses of DBMS, respectively. This lesson will also highlight the main objectives and steps used in the development of DBMS.

1.2 INTRODUCTION

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DBMS is the specific information system which helps the managers in management and decision-making. DBMS provides information in the form of special data elements stored in tables.

1.2.1 Objectives of DBMS

i. To provide retrieval flexibility. It should be relatively easy to link data from different files.

ii. To reduce data duplication and eliminate multiple copies of a master file.

iii. To ensure a high level of data independence. DBMS should convert the stored data into a form that could be used in whatever language the programmer desires to use.

In brief, we can say that the Primary objectives of the DBMS are:

- To avoid unnecessary duplication of data.
- To ensure data integrity and consistency.
- To enable rapid updating.
- To facilitate use by more than one user at a time.
- To provide data security.
- To make the data independent of application programs.
- To facilitate maintenance of standards.

1.3 What is DBMS?

DATA

Data is a collection of facts that are unorganized but able to be organized into useful information. Some examples are a collection of sales orders, employee time sheets, and class attendance cards. Data can be manipulated to produce output, such as bills, employee salary slips, and student attendance reports. This output, which can be used to help people in making decisions is called information. Thus, the information is data arranged in an order and form that is useful to the people who receive it.

MANAGEMENT

Management is the art of directing and getting the action in work to be performed. Management of any work plays a vital role in implementing that particular task. Without managing the various activities to be performed, it seems like a ship without its captain. Thus, for the effectiveness of a task, it is crucial.

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DATABASE MANAGEMENT

Thus, Database management is the art of managing data systematically so that it can be implemented easily and also make data easily accessible.

The whole process in a DBMS involves the following three steps:

1. Storage and Retrieval of Data

2. Updating and Deletion of Data

3. Protection of data from unintentional or deliberate damage or misuse or transfer etc.

DBMS allows users to organize, process and retrieve selected data from a database, without the need to know about the underlying database structure.

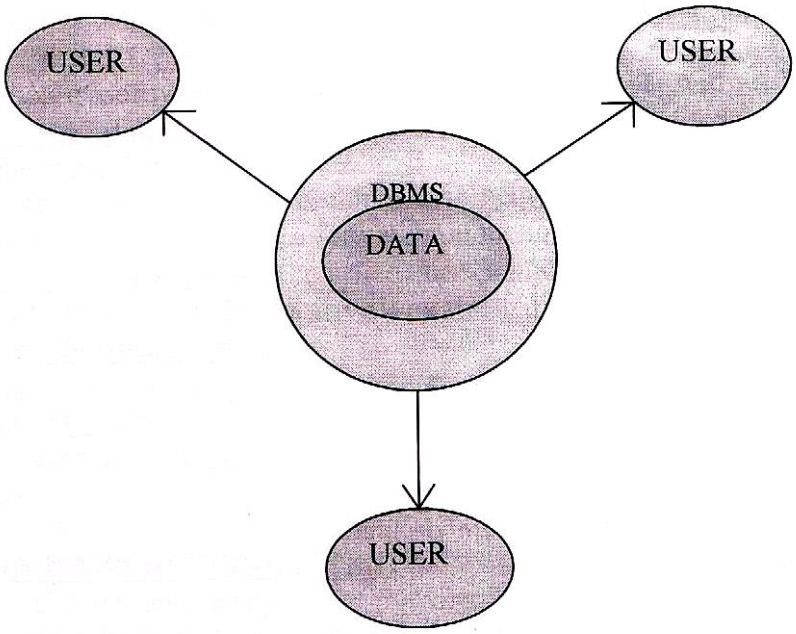

Fig. 1: Role of DBMS

1.3.1 Definitions

In simple words, we can say that DBMS is a collection of software that is used to store, delete, modify and retrieve data that is stored in a database. DBMS acts as an interface between the user and the data.

A database management system (DBMS) is computer software designed for the purpose of managing databases. Typical examples of DBMSs include Oracle, DB2, Microsoft Access, Microsoft SQL Server, PostgreSQL, MySQL, FileMaker and Sybase Adaptive Server

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Enterprise. DBMSs are typically used by Database administrators in the creation of Database systems.

1.3.2 Main Components of a DBMS

The four major components of a DBMS include the following:

1. **Data Definition Language (DDL):**DDL is used to define thestructure of a database. The database structure definition (also commonly known as *database schema*) typically includes the following:

   i. Defining all data elements to be included in the database.
   ii. Defining the organization of the data elements (fields) into records, tables, etc.
   iii. Defining a name, field length, and field type for each data element. A field name refers to the corresponding data element while accessing it. The field length is used to define the maximum size of the data element.
   iv. It is defining controls for fields that can have only selective values. For e.g., in an employee database, the gender field can have controls to accept only the values M or F. Such controls ensure the correctness of entered data to some extent.
   v. Defining access controls to the various tables, records, and fields for different categories of users to protect the privacy of sensitive data items from unauthorized user access.
   vi. Defining the logical relationship among the various data elements of the database.

   It is possible to generate a complete description of a database from its schema. This description, in turn, can be used by systems analysts in defining new applications on the database.

2. **Data Manipulation Language (DML):**Once the structure of a database (i.e., database schema) has been defined, the database is ready for the entry and manipulation of data. The DML includes the commands which enable the users to enter and manipulate the data. DML stipulates the user to specify how to get and what data. The commands of DML that deal with retrieving data from the system are regarded as query language.

3. **Query Language:**For handling complex queries, all database systems support a query language. The query language enables users to define their requirements for extracting the desired information from the database in the form of queries.

4. **Report Generator:**A report is the presentation of information extracted from a database. The report generator enables the users of a database to design the layout of a report in the desired format. For e.g. the user can specify the proper spacing between the data items to be presented in a report, also he may include suitable report

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titles and sub-titles, column headings, page numbers, separation lines and other elements, which make a report mor readable and presentable. The report generator can also be instructed to perform arithmetic operations (such as calculating subtotals and totals) on the data found in numeric fields to make a report more meaningful and valuable. A user can define the layout of the report and then store it for later use. This facility is often used for generating periodic reports.

1.3.3 Steps involved in DBMS Development

STEP 1: Collect and analyze the requirements. Identify the different entities, attributes and relationships, modules and other such elements required.

STEP 2: Normalize the relations into 3NF (Normal Forms) and higher.

STEP 3: Draw ER diagrams to properly identify, structure and represent the entities, attributes and relations.

STEP 4: Draw Data Flow diagrams (DFDs) to represent the data flows into, inside and from the system.

STEP 5: Decide the table structure to handle the different tasks and data storage.

STEP 6: Critically evaluate and modify the design.

STEP 7: Implementation of the design using proper database software (commercial or own).

STEP 8: Testing of individual modules and then integration testing of all modules.

STEP 9: Decide upon user permissions and system security.

STEP 10: Preparation of user manuals and training modules.

STEP 11: Final release.

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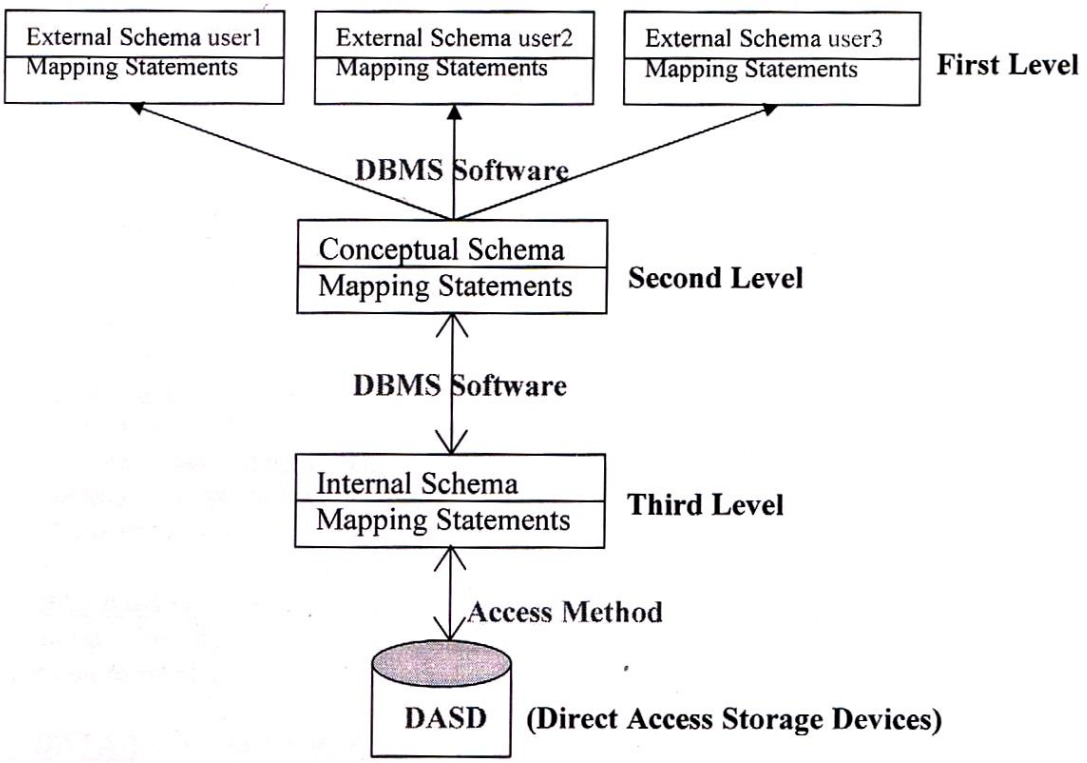

Fig. 2: Architecture of aDBMS

1.4 BASIC FUNCTIONS OF DBMS

All DBMS provide commands to view, modify, delete or add the records of an already established database. The user can specify the record to be displayed by specifying its key field value. The database systems usually also provides the flexibility to the user to move between records for viewing different records. Many database systems provide a facility to set up a filter, which allows the user to browse through and view only those records, which meet some criterion. Filter provides a quick and convenient way to narrow down the number of records the user has to work with.

IMPORTANT FUNCTIONS OF A DBMS ARE AS FOLLOWS:

1. QUERY PROCESSING: Query operation is the most commonly used function in a DBMS. It should be possible for users to query the database and obtain answers to their queries. There are several aspects to query processing. Firstly, a good query language is needed, such as SQL. Secondly, techniques for query processing like numerous algorithms have been proposed for query processing in general. Users pose a query using a language. The construct of a language has to be transferred into the construct understood by the database system. This process is called Query Transformation.

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The user interface manager accepts queries, passes the queries and gives to the query transformer. The query transformer and query optimizer communicate with each other to produce an execution strategy. The database is accessed through the storage manager.

2. TRANSACTION MANAGEMENT: Transactions must satisfy the ACID (Atomicity, Consistency, Isolation, and Durability) properties. Major aspects of transaction management are serializability, concurrency control and recovery.

i. **Concurrency Control:** techniques ensure that the database is consistent when multiple transactions update the database. These techniques are locking, time stamping and validation.
ii. **Recovery:** If a transaction aborts due to some failure, then the database is brought into a consistent state, which is called Transaction Recovery. One solution to handle transaction failure is to maintain log files.

3. STORAGE MANAGEMENT: The storage manager is responsible for accessing the database. Creating and maintaining appropriate index files is very important in DBMS. Proper access methods and index strategies are required for retrieving data easily and directly.

4. METADATA MANAGEMENT: Metadata describes the data in the database. Metadata also includes information on access methods, index strategies, security and integrity constraints. Policies and Procedures are also a part of Metadata. Metadata management manages the metadata for more complex systems such as digital libraries and Internet database systems.

5. DATABASE INTEGRITY: Concurrency control and recovery techniques maintain the integrity of the database. Integrity mechanisms also include techniques for determining the quality of data. For e.g. what is the accuracy of the data?

6. DATABASE SECURITY: The major issues in the database security are authentication, identification and enforcing appropriate access controls. For e.g. what are the mechanisms for identifying and authenticating the users?

7. FAULT TOLERANCE: This is a very important function of a DBMS as various faults may occur in a database, which could be hardware faults or software faults. Transaction management ensures that the database can be brought back to a consistent state in the presence of faults. The solutions may be maintaining appropriate Log Files and Check-pointing. In check pointing various checkpoints are placed during database processing. At each checkpoint it is ensured that the database is in a consistent state.

8.LANGUAGE INTERFACE: the data is manipulated by using manipulation commands. It facilitates as an environment where the users need not worry about the physical implementation while working with it.

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9. DATA CATALOGUE (also called a data dictionary): It is a system database that describes data, relationships, constraints and the schema in the database i.e. a metadata.

IN-TEXT QUESTIONS

1. DBMS is a collection of _____that is used to store, delete, modify and retrieve data that is stored in a database.
2. DBMS acts as an interface between the user and the data. True/False
3. The _____enables users to define their requirements for extracting the desired information from the database in the form of queries.
4. Creating and maintaining appropriate _____is very important in DBMS.
5. The major issues in the database security are_____, identification and enforcing appropriate access controls

1.5 POTENTIAL USES OF DBMS

There are several advantages and benefits of DBMS in today's electronic and digital environment which includes the following:

1. **Better Data Sharing:**Implementing a DBMS allows onsite and remote users to access and share the data easily by following the correct authorization protocols. It helps the users improve access to the data enabling them to share the organizational data efficiently and accurately.
   The improved data processes provide a smart solution to database queries, including the ad-hoc and impromptu ones. It results in accurate and fast data access, facilitating more informed and timely decision-making.

2. **Better Security:**Data security is animportant element of a database. A Data management solution allows only the authorized users to access the database. The authentication is managed by using a Login ID and password facility. The controlled user access preventsunauthorized users from accessing resources in a database, which can potentially violate the integrity constraints.

3. **Data Integration:** a single interface can manage databases with physical and logical relationships instead of storing data in isolated database systems.

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4. **Informed Decision-Making:** Data-driven decision-making facilitates a business person with a competitive advantage if it is authentic and reliable for them to use. The DBMS helps the organizations to ensure the data accuracy and quality which may be trusted for analysis and decision-making using a DBMS.

5. **Increase in Efficiency and Productivity:**Deploying a DBMS helpsin increased data accessibility and streamline the information. It acts as a catalyst to boost up end-user productivity, which may lead to improved efficiency and good results for an organization.

6. **Effective Data Integration:**A DBMS provides an integrated picture of the various activities and operations of any organization. The unified data allows companies to evaluate the controls and performance effectively and quickly.

1.6 SUMMARY

Database systems are typically installed and coordinated by an individual called the database administrator. A database administrator has the overall authority to establish and control data definitions and standards. He/she is responsible for determining the relationships among the data elements and for designing the database security system to guard against unauthorized use.A DBMS frees the users of a database from the need to worry about the organization and location of the data. In the database-oriented approach of organizing data, a set of programs is provided to facilitate the users in organizing, creating, deleting, updating and manipulating in a database. All these programs together form a Database Management System (DBMS).

IN-TEXT QUESTIONS

6. Data security is animportant element of a database. True/False
7. The _____enables the users of a database to design the layout of a report in the desired format.
8. A DBMS provides an _____about the various activities and operations of any organization.

1.7 GLOSSARY

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Attribute:a quality or feature regarded as a characteristic or inherent part of someone or something.

Database:a structured set of data held in a computer, especially one that is accessible in various ways.

Fault:an unattractive or unsatisfactory feature, especially in a piece of work or in a person's character.

Interface:a point where two systems, subjects, organizations, etc., meet and interact.

Integration:the act or process of uniting different things.

Query Language:a language for the specification of procedures for the retrieval (and sometimes also modification) of information from a database.

Report Generator:A report generator is a computer program whose purpose is to take data from a source such as a database, XML stream or a spreadsheet, and use it to produce a document in a format that satisfies a particular human readership.

Security:the state of being free from danger or threat.

Tolerance:the ability or willingness to tolerate the existence of opinions or behavior that one dislikes or disagrees with.

1.8 ANSWERS TO IN-TEXT QUESTIONS

1. Software 2. True 3.Query language 4. Index files	5.Authentication 6. True 7.Report Generator 8.Integrated picture

1.9 SELF-ASSESSMENT QUESTIONS

1. What is Database Management System? Explain in detail.
2. What are the MajorComponents of a DBMS?
3. What are the basic functions and potential uses of a DBMS in today's electronic environment?

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LESSON 4.1

Introduction to Web Interface: WWWISIS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
2 CDS/ISIS
2.1 Chronological evolution
2.2 Versions of CDS/ISIS
3 WWWISIS
Web Servers
Common Gateway Interface (CGI).
Apache Server
3.1 Installing WWWISIS
3.2 Testing WWWISIS
4. Summary
5 Glossary
6 Answers to in-text questions
7 Self-Assessment questions
8 References

1.1 LEARNING OBJECTIVES

This unit will introduce you to web version of CDS/ISIS, a DBMS package that is particularly suited for the building of bibliographic databases. The utility of this database can be extended to build some other databases too and to publish the catalogue online via www. The lesson will also provide an information on new features considerably to increase user-friendliness system and connecting to the WWW.

After completing this unit, you will be able to:

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- discuss or describe the general features and capabilities of CDS-ISIS for web WWWISIS;
- discuss or describe historical precedents for WWWISIS;
- and you may be able to perform a comparative analysis of the features of WWWISIS versions and their applications in the design and development of various types of information storage and retrieval systems.

1.2 INTRODUCTION

The worldwide interconnectedness of computers has become a reality with the development of the Internet. Internet has developed to offer a variety of user-friendly tools for information publishing and access, including Gopher, WAIS, WWW, and others. In addition, to integrating all other access mechanisms, the WWW offers a very practical method for publishing and gaining access to databases, multimedia and hypertext linked content kept on computers located all over the world. With the development of WWW technology, the majority of informational activities started moving online. A user can access information once it has been published on the Web from anywhere in the globe. A common user interface for accessing information/databases is a web browser like Netscape or Internet Explorer. A user will not have to spend as much time learning the search syntax of various information systems thanks to this. Libraries are utilizing these advancements to make their materials available on the Web.

In India, a particularly well known popular bibliographic information management tool is called CDS/ISIS. There are now numerous technologies, server client mechanism is available for opening the CDS/ISIS database to the Internet/Web. First among these is the WAIS ISIS Server. The WWWISIS Server, the IQUERY Server, and two more. In this, lesson you will learn connecting CDS/ISIS with the WWW. A close working relationship between developers and users was necessary given the unique circumstances surrounding the conception and development of CDS/ISIS. Similar requirements for data management systems are shared by many CDS/ISIS users, primarily in the library sector.These requirements played a significant role in the development of DOS and Windows ISIS software as well as Web apps for data management.

Micro-CDSin the more than 20 years after its initial DOS inception, ISIS has developed into one of the key tools for the computerization of library catalogues and building information systems at thousands of institutions all over the world.Many international, governmental, and non-governmental organisations as well as thousands of databases in the ISIS format are currently in use, especially in non-profit organisations in developing countries.a sizable, active community of knowledgeable librarians and developers who are familiar with the system and its basic elements, such as the ISIS formatting language, Field Definition Table, Field Select Table, etc., and who can design and implement simple applications in the libraries and information centres dispersed throughout the world fairly easily.

About a dacade ago, there were some new demands that mostly concerned the tools for creating complex applications. Over the previous ten years, numerous solutions have been

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offered. BIREME, the company responsible for the development of ISIS-DLL, was one of them. The BIREME tools made it possible to create tools for creating sophisticated web-based systems. Two development lines began in roughly the same amount of time:

- One at BIREME produced WXIS,
- and the other at ICIE, in response to an FAO-WAICENT request, occurred at the initial stage of developing tools for AGRIS centres and produced WWW-ISIS.

How to use the free program WWWISIS to make an existing CDS/ISIS database accessible through the Web. The Latin American & Caribbean Centre on Health Sciences Information, or BIREME, is the organization that created, updated, and disseminated this program. In a client/server WWW environment, WWWISIS serves CDS/ISIS databases. It provides support for tasks such as searching, formatting, and data entry over CDS/ISIS databases. There are several operating systems that support WWWISIS. It was tested on various platforms, including an i686 running Red Hat Linux release 5.2 (Appolo) Kernel 2. 0. 36 and Windows 95, Windows NT, and Linux.The library's OPAC, which has more than 80,000 entries, and Current Contents issues (bibliographic data), which have more than 25,000 records, were used for the testing.The file structure of CDS/ISIS 3.07 is entirely compatible with WWWISIS.However, there is no assurance of this compatibility with a machine running UNIX or a derivative of it.Therefore, it is secure to recreate the master and inverted files on UNIX using the BIREME programmes.

2 CDS/ISIS

The CDS/ISIS system (Computerized Information Service / Integrated Scientific Information System), which was created at the ILO in the early 1960s. Although commonly referred to as CDS/ISIS or just ISIS, it was given the official name CDS/ISIS Mini-Micro Version. It is now maintained and developed by UNESCO, has a Windows version called WINISIS.

The initial CDS/ISIS microcomputer version was introduced in 1985, and since then it has been distributed to more than 20,000 institutions worldwide. The initial release of Windows was made available for testing in May 1995, while the initial release of WINISIS was version 1.31, which was introduced in November 1998. It is a slightly improved version of the system documentation for version 1.0 that was released in November 1997.

The information retrieval program CDS/ISIS for Windows was created by UNESCO (the United Nations Educational, Scientific and Cultural Organization) and is compatible with Microsoft Windows. Version 1.4 (release 19), which dates from January 2001, was sent to distributors on CD-ROM in March 2001.

The original DOS version of MINISIS, which was created in Ottawa, Canada, by the International Development Research Centre, was always known throughout Latin America as Micro-ISIS; the Windows version is known as Micro-ISIS or WINISIS.

2.1 Chronological evolution

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The historical evolution of CDS-ISIS for DOS and for Windows is briefly covered in this course (WINISIS). Over the previous 20 years, there have been numerous software upgrades and feature additions, versions which are also highlighted.

ISIS, which was created by the UN International Labour Organization (ILO) for IBM mainframe computers in the early 1960s, served as the inspiration for CDS/ISIS (Computerized Documentation Service/Integrated Scientific Information Systems).The ILO library uses ISIS for cataloguing and documentation.The International Development Research Centre (IDRC), a global institution that supports socioeconomic development initiatives in underdeveloped nations, was subsequently granted the software.The Information Science Division of IDRC created application versions of ISIS named MINISIS for the HP3000 mini-computer series in partnership with Hewlett Packard (HP).Institutions and organisations in poor nations that received funding from IDRC for development projects were also given access to the software.successive MINISIS version (A to G) have been produced improvised manuals and increased facilities for documentation of bibliographic and similar types of materials.ISIS was given to UNESCO by IDRC, who then started working on the program's development.The indexing, retrieval, and printing capabilities of ISIS for IBM mainframe computers have been updated in a number of iterations.

By the 1980s, with relatively less expensive microcomputers on the market, international organisations like UNESCO and IDRC, which provide assistance to developing countries in the fields of information science and communication, decided it would be practical to support computer applications for information storage and retrieval using mini, micro-computers in institutions in those countries.Developmental aid organisations, such as IDRC, supported the purchase and usage of DBASE, INMAGIC, FOXPRO, etc. on microcomputers for database work.UNESCO felt the necessity to provide ISIS-like software for microcomputer-based bibliographical work.

Early 1980s saw the creation of the Mini-microcomputer version of ISIS, or CDSISIS, and in December 1985, a training session on the programme was arranged at the Paris offices of UNESCO for participants from underdeveloped nations. Version 1.0 for DOS was then made available for public use.Since then, other developing nations have hosted national and regional workshops and brief training programmes on the use of CDS/ISIS in addition to the training sessions at the UNESCO Headquarters in Paris.

The programme was initially given away by UNESCO for free to non-profit organisations, particularly those in underdeveloped nations.National centres have been identified in a number of nations for the distribution of the software and the planning of workshops and training sessions.These tasks were carried out in India by the National Information System (NIS) for the Department of Scientific and Industrial Research (DSIR), Government of India, New Delhi.In several nations, CDS-ISIS User Groups have recently been established.These groups now communicate with one another via listservs.These training sessions, user group gatherings, and interactions have not only made it possible for the software to be used more widely but have also made it possible to get feedback on how well it functions in real-world settings.UNESCO published various software versions (Ver. 2.3, 3.0+ in particular) that had

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issues fixed and new features and capabilities introduced in response to comments and suggestions.The 1989-released Ver. 3.0 and its revisions can be set up for networking and multi-user, multi-tasking features.

IN-TEXT QUESTIONS

1. CDS/ISIS is developed by _____.
   a) DSIR b) NIS c) UNESCO d) CSIR
2. Is CDS/ISIS can be downloaded through internet ?Yes / No
3. In which year UNESCO released the first version of CDS/ISIS in India?
   a) 1995 b) 1985 c) 1960 d) 1980
4. Latest version of CDS/ISIS is entirely compatible with WWWISIS? Yes / No

2.2 Versions of CDS/ISIS

WWWISIS, JavaISIS, GENISIS are some other versions of CDS-ISIS which enable placing and accessing CDS-ISIS database on the web.

CDS/ISIS FOR DOS

The first version of the package actually consisted of five applications that ran independently but interacted with the same database. The remaining programs matched the other choices on the main menu of subsequent DOS versions, such as Sorting and Printing, Data Base Definition, Masterfile Services, and System Utility Services. One software, which integrates in data entering and information retrieval. Version 2.0 was released in 1988 and it was also a combination of the many applications into one, but allowed the Pascal programming for the expansion of the core package's functionality. Version 2.3, brought enhancements in the indexing process' indexing became fast and less space consumption. Version 2.3 came with the feature of restoring the backup in new installation. The application can be configured to start up in any database or in any language for which a menu is available. Additionally, it enables the DOS version to load and run a Pascal program before the main application itself.

CDS/ISIS for WINDOWS

It seemed inevitable that customers of CDS/ISIS would ask for a Windows version ever since most new microcomputers came with a new operating system called Microsoft Windows in 1989. In 1995, UNESCO created and released WINSIS, a window version of CDS/ISIS. ISIS for Windows, unlike the DOS version, is written in a variety of languages, principally C and C++. WINSIS was introduced with the support feature of Multi-language friendly, user friendly, menu driving and many other window based desktop environment features

WWWISIS

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An executable programme created in C by BIREME and using the CISIS functions library serves as an interface between an application written in IsisScript, the native language of the web server, and the CGI (Common Gateway Interface) application, enabling the management of data in ISIS model databases. The mention of BIREME compels us to mention that there is a version of CDS/ISIS that enables client/server mode CDS/ISIS database searches, with the 'server' being a web server and the 'client' being a desktop machine running any web browser. The client's user needs some technical know-how, an internet connection, and little expertise to search the database. CDS/ISIS and Hypertext Markup Language are combined to generate the print formatting language used by WWWISIS (HTML).

JavaISIS

Another client/server approach is JavaISIS, which enables access to a CDS/ISIS database on any internet-connected device—even one that is not a web server. It requires BIREME and WWWISIS server on the same computer.

OTHER VERSIONS

Versions of CDS/ISIS for the UNIX and VMS operating systems have been created by UNESCO.Although VMS is no longer in use, the UNIX version is.

3 WWWISIS

In the beginning, the WWW-ISIS was mostly caused by the ISIS-DLL functionality limitations of the BIREME.ISIS databases, in example, could only be installed on the Windows platform and were not UNICODE compliant.With the help of the Institute of Computer Science (Warsaw University of Technology) and the FAO, these drawbacks were eliminated, and a new version of WWW-ISIS was created that is compatible with both Windows and Linux environments and compliant with UNICODE.

The present WWW-architecture ISIS's is divided into two distinct categories of functions:

- The ISIS-specific activities, such as reading a section of an inverted file, formatting a record, updating a record or inverted file, etc., are performed by the functions that enable access to the ISIS databases via ISIS-mechanisms. DLL's
- a collection of operations that carry out WWW-ISIS functionality apart from ISIS, such as creating a search screen or offering a worksheet for the data entry screen. These operations can be the ones that receive data from an ISIS database using the first grouping order.

The new WWW-ISIS software which:

- Stores ISIS records in a relational database, with one column designated specifically for storing "ISIS records." With this strategy, we get relational database storage stability, quick access to the specified record (via MFN), and the idea of an amorphous flexible ISIS record structure is maintained (XML).

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- Uses a novel ISIS inverted file, a powerful indexing technique, for text retrieval. The most effective Open Source text search engine in this situation is Lucene. It also complies with UNICODE;
- has a component that may parse ISIS formatting language within the parameters of the present WWW-ISIS in addition to the REF and lookup functions;

With BIREME ISIS, it is possible to build a CDS/ISIS system that is entirely web-based, replete with web-based functionality for data entry, editing, indexing, and retrieval, as well as to instantly build and update databases based on user input received via the internet. WWWISIS functions as a server through WWW CGI. The name of the input database, a Boolean search, and a definition of the output format are what actually drive the operation. The database architecture of CDS/ISIS and WWWISIS is identical (DOS and Windows). Databases are created with WlNlSlS 1.4 and then made searchable with WWWISIS. With the aid of an IS0 file, data can be exported from one version of DOS/Windows and imported into Unix. As long as the cipar option in IsisScript instructs wxis where to find the database and the directory has appropriate permissions configured for the database- related tasks, databases can be loaded or stored in any directory on the server (eg. read or write).

Salient features of WWWISIS are:

- The parameters that control WWWISIS activities can be generated dynamically. Database name (db), search expression (bool), and display format specification are required arguments (pft).
- Records from an ISIS database can be dynamically converted to HTML pages, which means that ISIS display formatting language can be used to fetch and send back partial master files or the results of a search to the web client.
- WWWISlS can be accessed directly or using a CGI script's command line.
- Searching, formatting, and field update languages for CDS/ISIS are included.
- WWWISIS receives the search criteria submitted in form fields through CGI, formats them, and then sends them to the client.
- To enable CDS/ISIS searching, formatting, and field updating functions, WWWISIS employs the CISIS interface library created by BIREME.

The CGI-environment virtual record is the initial ISIS master file record that is created when WWWISIS first launches.Data delivered by the WWW server to the CGI process is stored in this record by WWWISIS.

The following tasks can be accomplished with WWW-ISIS:

- Browse,
- search using a form,
- search across several ISIS databases,
- utilise the ISIS query language,
- save past queries,
- use thesaurus-based search,
- and dataentry with complete validation and access to authoritative databases.

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Browse

The browse function intendeds for people who have little or no experience using databases or the Internet. This function makes it simple to locate a certain record since it displays a piece of the database that has been sorted according to the specified criteria. The beginning point for browsing can be chosen.The following choices are accessible on the BROWSE screen:

- Choosing a sorting criterion,
- using the paging button,
- and entering a "Start from" value

Search

This intends with the users with some familiarity with the Internet and databases can utilise the search tool. Below we will sketch basic features of the search system.

- There has been a multi-criteria search put into place. This indicates that the user can view a variety of fields. One can use the common ISIS operators inside of each field. Boolean operators can be used to connect the fields (AND, OR, NOT).
- Each field has dictionary support to make the search process user-friendly. As a result, the end user can always consult the fields' vocabulary. The dictionaries can be provided either dynamically from the inverted file or in the form of a combo box. In this instance, a page with terms for selection is shown.
- The query form field automatically compiles all of the selected terms.
- Advanced users can inspect and amend the automatically generated query in ISIS Query Language by using the ISIS Query Language tool.
- A single query can be executed across several conceptually compatible databases, and from the user's perspective, all the databases can be viewed as logically being one database for the purposes of browsing, sorting, and displaying the results. Users can specify which independent databases should be viewed as conceptually one database by using checkboxes, which can be provided.
- The user can choose the display and sorting formats for the answer presentation.
- The output is sorted and shown on successive pages.

The search interface can be completely customised.

1. One may offer a variety of separate user interfaces in various languages and levels of difficulty;
2. one can define the display and sort formats;
3. the searching screens are managed by search definition tables (one per language).
4. Without extensive HTML expertise, all necessary search definitions can be completed with ease.

Thesaurus supported search

For seasoned users, this feature might be helpful as it offers information on logic of the classification of the documents. A thesaurus can be used to search through the relationships

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between search terms so they can be used correctly. Because the navigation process is automated, it is possible to mark particular terms as ones that are of interest to us. The end-user can amend his or her query again, add additional criteria, and submit it after collecting all the indicated descriptors into a descriptor field. This kind of searching offers very high precision and relevancy, in our experience. The system's main features are as follows:

- It is very simple to implement different navigation strategies (alphabetic, KWOC, systematic);
- It supports an infinite number of thesauri, allowing for the thesaurus to be used to search an infinite number of databases and record types;
- If a thesaurus has links to other thesauri or concordance tables, it is simple to apply a one-thesaurus standard to the databases while using different thesauri.
- Multilingual thesauri can also be used to conduct searches in languages other than the ones used to index a particular database.
- It means that one can conduct a search using, for instance, French variations of the descriptors in a database that is indexed with English descriptors.

IN-TEXT QUESTIONS

5. ISIS fully supports Boolean operators in advanced search feature. (Yes/No)
6. _____ number is use to quick access to the specified record
   a) MST b) PFT c) MFN d) FST
7. ISIS fully supports thesaurus search. (Yes/No)
8. Multilingual feature was also suported by CDS/ISIS. (Yes/No) .

Data entry

The system enables the implementation of a complete data entry feature. CCF format is supported by CDS/ISIS. ISIS formats may be used during the data entering process for a variety of checks:

- Global and field validation;
- delete validation;
- automatic worksheet selection when selecting a record for update;
- ownership validation, which may be checked before running update and/or delete record;
- copy of default values;
- and copy of linked record values to the current record are all examples of validations.

The following characteristics of the system:

- Access to the modification features requires ID and password authorization.

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- For each entity class, a number of predefined worksheets that can be single-page or multi-page can be defined.
- For some fields, dynamically generated lookup tables from ISIS authority databases may be provided.
- The primary database or another "authority" database, such as a thesaurus, corporate author name database, publisher database, etc., may be used to retrieve the authority tables.
- You can mark the values you need and pick them up to put in the field.
- The length of the data elements in the lookup table is unlimited; a data entry element can be allocated to a subfield; static combo boxes, check boxes, and radio buttons for picking a value from a limited collection of data values.
- The worksheets allow for the development of repeated groups for repeatable ISIS fields with subfields.
- The system creates one field occurrence from each repeated group automatically (giving the required subfield codes); the worksheets are easily configurable by a script.

Platform support

The interface has been developed as a CGI programme that the HTTP server process will launch. Both Microsoft and Linux platforms support running it. Either SQLite or PostgreSQL can be used to hold the ISIS database. Any modern browser, including Netscape Navigator and Internet Explorer, can be used to access the client side of the interface.

Platform MS: The system is compatible with servers running Windows XP and later for the Microsoft family of operating systems.

Platform: UNIX Any LINUX system should support this software.

Web Based User Interface

Through a Web browser, a user can interact with data or software running on a remote server using a Web user interface or Web app. The user interacts with the content on a web browser, which functions as a client, after downloading it from the web server. The content can be stored on a distant server thanks to the distributed nature, and since Web browsers are so common, it is easy to access the content. Webmail, online shopping, document sharing, social media, and instant messaging are the most popular Web apps. These kinds of interfaces have created a great amount of data in the present.

Databases Access on Web

The World Wide Web (WWW), a client-server distributed hypermedia system, was initially developed at the European Laboratory for Particle Physics (CERN) in Switzerland with the intention of promoting researcher information sharing.The process of enabling Web access to databases involves interaction between the web server, web browser, CGI scripts/programs, and HTML forms.The usage of HTML forms on the client side and CGI applications on the

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server side is the primary technique for gathering search queries and/or data entry and submitting it to the database.

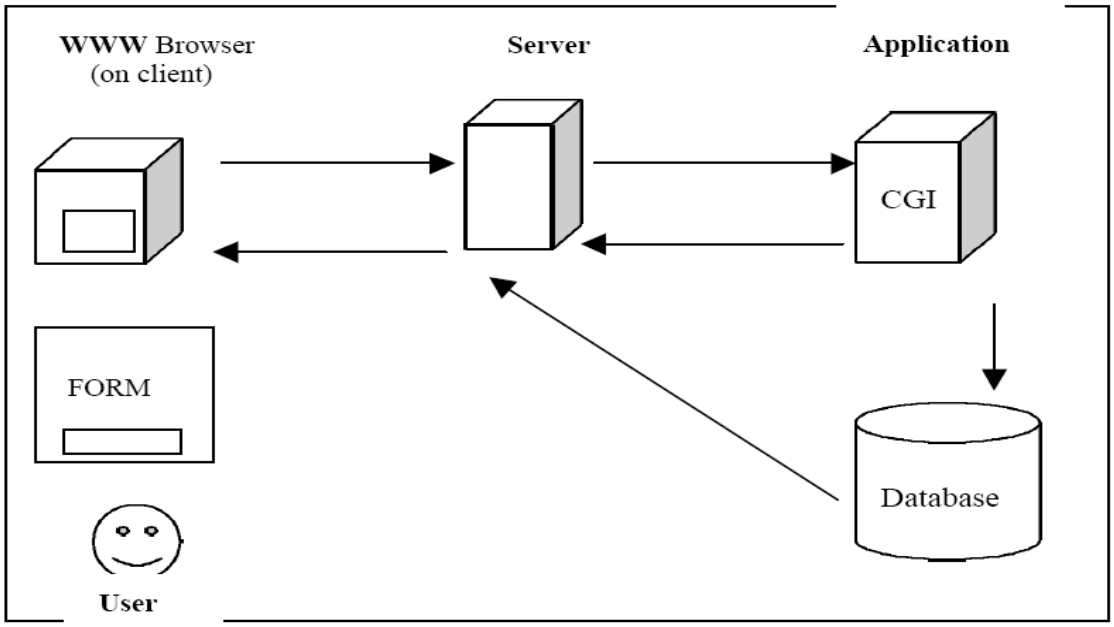

Fig 1: client-server interaction.

Web Servers

An Intranet or Internet user can access Web services and websites using a web server, which is a computer system.An HTTP (Hypertext Transmission Protocol) daemon application should be running on the Web server to track and respond to client requests.A daemon is a waiting process for client requests that runs in the background.It goes back to the waiting area to await other requests after handling the customer request.Usually, a web server is the only thing linked to the Internet or an intranet.Web servers are one of the many OS platforms for which there is software.The best way to access the World Wide Web is through Web browsers, GUI-based client programmes like Netscape, Internet Explorer, or Mosaic.The GUI-based browsers can read text files, but they can also parse picture and audio data. Each web server on the vast network has a unique address that other computers connected to the internet can use to locate that specific web server.WWWISIS is compatible with a variety of web server platforms, including Omni HTTPd, Apache, and others.

Common Gateway Interface (CGI).

WWWISIS was developed and put into use as a CGI interface between the ISIS database and web servers. CGI is a key technology for the creation and management of interactive HTTP

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Web pages. The data acquired from the browser is then processed by the application programme. CGI is not a programming language in and of itself; rather, it is a simple protocol that can be used to interact between web forms and the server-side software. On web servers, CGI scripts and programmes are kept in a special directory commonly known as cgi-bin. A CGI programme is ideally created in any language, including C, C++, Fortran, PERL, TCL Any Unix, shell Visual Basic, Apple script, and others, that can accept standard input, write to standard output, and read environment variables. Static WWWISIS web pages are stored on the server in subdirectories or the root directory. Typically, wwwroot is used to refer to the root directory. Before being sent to the client, text pages, images, audio files, and other sorts of data must all be saved in wwwroot. Given that it controls the website's structure, the root directory must be specified when setting the web server software. Another directory, often called cgi-bin, is also recognised by the web server (for CGI binary files). This directory contains programme files that may be accessed and run on the server by including their URL. To put it simply, CGI scripts collect browser requests and send data in HTML format back to the browser.

IN-TEXT QUESTIONS

9. Which format is used by CDS/ISIS?
   a) MARC 21 b) AACRII c) CCF d) UNIMARC
10. _____is a key technology for the creation and management of interactive HTTP Web pages.
    a) CGI b) XML c) GUI d) Database
11. Netscape, Internet Explorer, Firefox are the example of Web Browser. (Yes/No)

HTML Forms

It is necessary to create the interface that provides functionality for the data entry system once all of the worksheets have been designed and tested. Among other things, the menu should have options for logging in, adding new entries, choosing records for updates, etc. The retrieval mechanisms that were used to create public access to the database may typically be used to access the records as well. The interface created for public use, however, cannot be used directly for modifying databases. Particularly, the access methods could be different from those planned for the public interface. We provide search by basic bibliographic attributes, for instance, while creating the public interface to a library database (Author, title, descriptors, conference data, etc.), Employees who enter data may want further access to records by MFN, ISBN, accession number, call number, etc. Similar to that, HTML has forms that let users input data. HTML forms are nothing more than scripts created in a reasonably basic programming language from computer programme codes. The only item that starts procedures like dynamically creating web pages in response to user input are files. An HTML document may have a client-side script attached to it or embedded within it. Different display formats will also be used. We may offer functions for exporting certain

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records on the public interface (as ISO2709 or XML), whereas on the data entry side we need function buttons for calling LOGIN, UPDATE, COPY, DELETE.

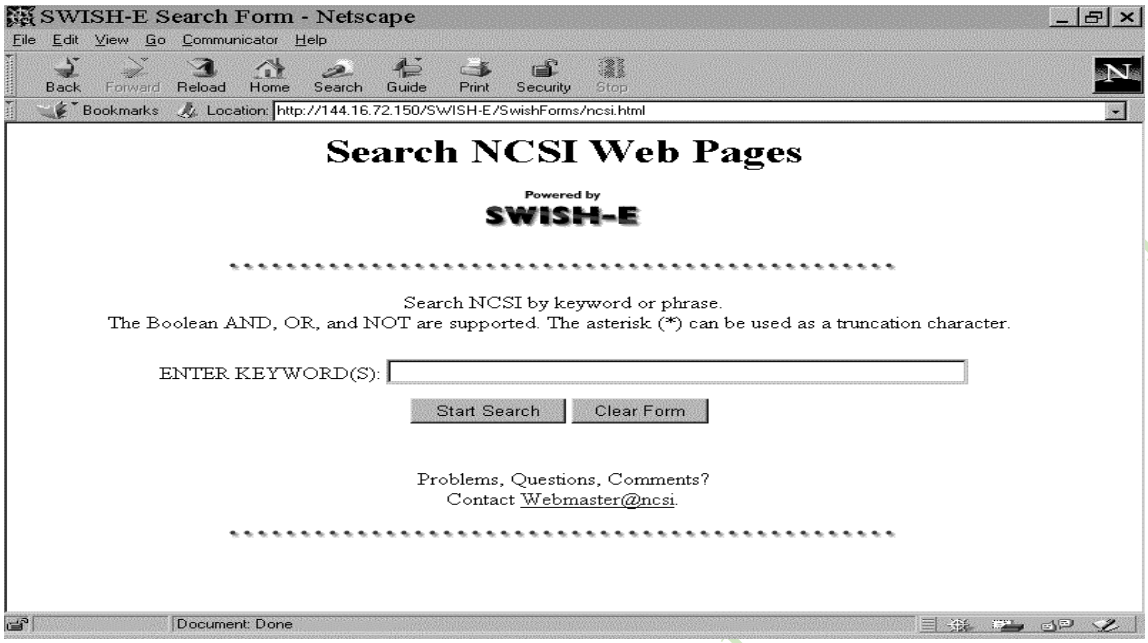

Fig. 2 HTML Form

Web Browser and Web Server

An interface between a user and a web server is provided by a web browser. Web browsers work by connecting to web servers online, requesting specific documents, and structuring the responses for local system viewing. HTML-tagged text files are used to create the Web pages on a Web server. The Web browsers that receive these documents commonly finish them with "html," which they then understand. When you click the Open button on your browser and type any URL (for instance, http://www.ncsi.iisc.ernet.in/), the browser creates a GET request, connects to the server at the specified URL, and waits for a response. After responding, the server terminates the connection. The server responds and then cuts off the connection.

Web Interface to CDS/ISIS Database

Web access to CDS/ISIS databases is made easier with the help of the technologies listed below

One of the most well-known pieces of software that serves CDS/ISIS databases in a WWW environment is WWWISIS. It is a free resource that was created by BIREME and PAHO. WWWISIS supports the search, formatting, and field updating languages of CDS/ISIS. WWWISIS is available for a variety of operating systems, including Windows 95, Linux, Sun Solaris, and others. To enable web access to their CDS/ISIS databases, a number of websites are using WWWISIS.

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- Alejandro Ferreira Guido of Uruguay created the commercial software IQUERY, which may be used with Linux, SCO, or DOS. The system, which was created with the ISIS 3.0 version's guidelines in mind, was intended to serve as an interactive search engine for Mini/Micro CDS/ISIS databases. The program has three separate operating modes: interactive command shell, CGI for use with web servers, and interpreter using commands from a file.
- WAISISIS freeware server application.
- Websis, a CGI application that uses a Web interface to search CDS/ISIS databases over the Internet. Websis was created by the Infocentre and made available without charge.
- CDS/commercial ISIS's Delphi-ISIS Windows-95/NT front end.
- Two Java applications—a Java Client and a Java Server—make up the new JAVAISIS (v 2.0). It is compatible with Linux, any other Unix system, Windows 95/98 and NT, and Linux. http://space.tin.it/computer/gaenea/

Web access to the CDS/ISIS

In order to make the CDS/ISIS database accessible over the Web:

- A Web server programme ought to be set up and functioning in the background.
- A HTML form has to be made.
- The form should make it easy to choose a database and accept search terms (s).
- WWWISIS should have been copied to the Web server's cgi-bin subdirectory and should have executable permission for all users (on a Linux installation).
- Shell scripts and batch files must be created, copied, and given executable permission to all users (on a Linux system).

Apache Server

The most popular, reliable and robust web server on the Internet is apache. The Apache Software Foundation created the open source Apache web server. The versions of the software are available for many operating systems. The "Program Files" directory on the C drive contains the apache installation. The program will be set up in the directory c:\program\files\apache1\apache. The HTML files we produce should be accessible once the software has been installed. Running the HTTP daemon is necessary to start the Apache server.

The following procedure helps to do that:

1) Login as Root user
2) Run “setup” command
3) In the “setup” choose the ‘system services’
4) Select "httpd" under "System Services" and click "Mark." By using the space bar to mark, a "*" that denotes the start of the http daemon at boot time will

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appear. The machine boots up automatically the following time, and the web server is turned on.

5) Quit setup

To test your web server-Open a browser (you can use Netscape Navigator on Linux) and type something resembling (but different from) the following.The following URLs are provided to ensure that the web server can access the files we create.

1) "httpd://localhost"
2) Or: httpd://192.168.1.117"
3) Or: httpd://127.0.0.1"

The first option from the list above must be utilised; however, if you know your IP address in alphabetical order, you can use it as a backup.If neither the first nor second option is feasible, the third alternative can be used.If all goes according to plan, one should see the Apache Server's welcome page, which in RedHat Linux 7.0 is simply the following file (previous versions of RedHat Linux had this file under /home/www) /var/www/index.html. This file should be replaced by your home page.

3.1 Installing WWWISIS

For various operating systems, including Windows 95, Linux, Solaris, etc., WWWISIS is freely downloadable. Use the WWWISIS or WWWI32 command at the command prompt to verify that the correct version of WWWISIS was downloaded (WWI32.EXE for PC-Windows). If the right version is downloaded, the command should be executed, and the screen should show the output from the next page. If the command does not return the output shown below, the downloaded version of WWWISIS or WWWI32 is in error. Make sure the FTP transfer mode is set to "binary mode" while downloading WWWISIS or WWWI32. If the transfer mode is not set to, binary while downloading the file, then even the correct version of WWWISIS or WWWI32 will not work.

Linux System

Fter getting the WWWISIS and its related programs.

The programs include:

- wwwisis: the main program to run the web interface
- loadiso.sh: the shell script to generate master and cross reference file form the ISO
- format file of the given data base.
- fullinv.sh: the shell script to generate inverted files
- ifload.exe used by the fullinv.sh file
- mx.exee used by loadiso.sh and fullinv.sh

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All the above programs may be kept in /var/www/cgi-bin directory, the only essential one is 'wwwisis'.

Steps to generate database files:

Use CDS/ISIS to export data to be captured in a file called 'MST.ISO' and issue the following commands.

cp MST.ISO /var/www/cgi-bin/mst.iso
cp CDS.FST /var/www/cgi-bin/cds.fst
cp CDS.STW /var/www/cgi-bin/cds.stw
cp CDS.PFT /var/www/cgi-bin/cds.pft
cd /var/www/cgi-bin
./loadiso mst cds (this generates cds.mst and cds.xrf from mst.iso)
./fullinv.sh cds (this should generate the inverted files, but it does not)

Note: It should be noted that RedHat Linux 7.0's sort tool has a flaw because it attempts to sort words rather than characters.The production of the inverted file is stopped as a result of this problem. To use the sort application, copy it to your RedHat Linux 6.0 installation. Also take note that although Unix CDS/ISIS employs all-capital file names, the file names are typically written in tiny letters.

To test whether loadiso.sh has generated the master and cross-reference files, give the following command wwwisis db=cds from=1 to=5 pft=@cds.pft

The above command should display first 5 records. This should work even without the generation of inverted index files.

To test that the inverted files are properly generated, give the following command

wwwisis db=cds bool="plant" pft=@cds.pft

The above command should display the records having the key word 'plant'.

Windows NT System

In a Windows NT environment with Internet Information Server (IIS) 4, there is no support for batch (.bat) file unlike in Windows 95. Therefore, to call WWWI32.EXE directly from a HTML form element specification, `in' parameter is used as illustrated below:

<form method=post action="/cgi-bin/wwwi32.exe/[in=cds.in]/">

The contents of `cds.in' file:

ctttype=text/html

cgi=@cds.cgi

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The `ctttype' parameter, which specifies the content type of the text, that WWWISIS outputs, is mandatory. Without this parameter, the `http' server will be encountered. The contents of `cds.cgi' file will be the same as the one illustrated under Windows '95 environment. Thus, the usage of `in' parameter under Windows NT environment and the usage of batch file (.bat) under Windows 95 environment is the only difference between the two OS environments as far as WWWISIS is concerned. The rest of the procedures are same under both the OS environments. In addition, the access rights should be given to the directory where the database files are stored under Windows NT environment.

3.2 Testing WWWISIS

To test that the 'WWWISIS' program is working, run the following commands at shell prompt

wwwisis hello

wwwisis menu=1

However, to test the CGI (Common Gateway Interface) to web server Run Netsape Navigator

Enter the URL as: http://127.0.0.1/cgi-bin/wwwisis [hello].

NOTE: you can use server IP address in numeric or alphabetical form instead of 127.0.0.1

The above procedure should result in displaying a web page with 'hello'. You can also try with '[menu=1]' to see that menu '1' is displayed. If everything works well, we are ready to develop CGI programs.

Basic Concepts

Between the web server and the browser, the Common Gateway Interface (CGI) acts as a bridge (in our case Apache web server).CGI scripts can be used to send requests from the browser to the server.There are numerous CGI scripting languages, including the Unix shell and others like Perl and Tcl.These CGI scripts not only route browser requests to the web server, but also retrieve data from the server and send it in HTML format to the browser.The "cgi-bin" directory is often where these CGI scripts are kept.

Briefly, the CGI programs

1. Should collect request from the browser
2. And send data back to the browser in HTML format

The most common method of collecting data from the browser is to use the HTML tag

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'FORM'. The FORM tag contains another element called 'ACTION' where we can specify the action (i.e. the programme) to be invoked. A brief syntax of the 'ACTION'

tag is given below

<html>

<body>

…

…

<FORM ACTION=http://127.0.0.1/cgi-bin/search.sh METHOD="POST">

…

…

</body>

</html>

NOTE: For a complete explanation of HTML tags, one should refer any book on HTML.

Steps in Setting Up WWWISIS Interface

1. Create an HTML file which serves as the first interface. If we call this file as 'index.html', it should be placed in '/var/www/html/index.html'. (Refer Appendix –1)
2. Create a programme which is invoked from the above file. If we call this programme as 'search.sh', it should be used with 'ACTION' of 'FORM' tag in the index.html file and should be in the '/var/www/cgi-bin' directory. (Refer Appendix – 2)
3. Create 'search.cgi' file to present the various options for the 'wwwisis' command used in 'search.sh' file. The 'search.cgi' in turn refers to various other files. This file also should be in the /var/www/cgi-bin directory. (Refer Appendix – 3)
4. Copy 'cds.fst' file to /var/www/cgi-bin' (Refer Appendix – 3)
5. Create cds.txt file (Refer Appendix – 3)
6. Create head.pft file (Refer Appendix – 3)
7. Create cds.pft file (Refer Appendix – 3)
8. Create tail.pft file (Refer Appendix – 3)

All the above files should be in /var/www/cgi-bin, except the 'index.html' file. Now open the browser like Netscape Navigator and the URL as http://127.0.0.1

NOTE: you cannot simply open the same file by entering the URL as /var/www/html/index.html as this cannot establish connection to the web server. This approach can only be used to view the disk files in html format. Please also note that

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127.0.0.1 can be used only if you want to access from the same machine where the web server is installed. However, to access the web page from some other machine, you should give the IP address of the machine having the web server, either in alphabetical or numeric form such as 'http://www.localhost.com' or 'http://127.0.0.1/library'. If everything is alright the following first page should be displayed.

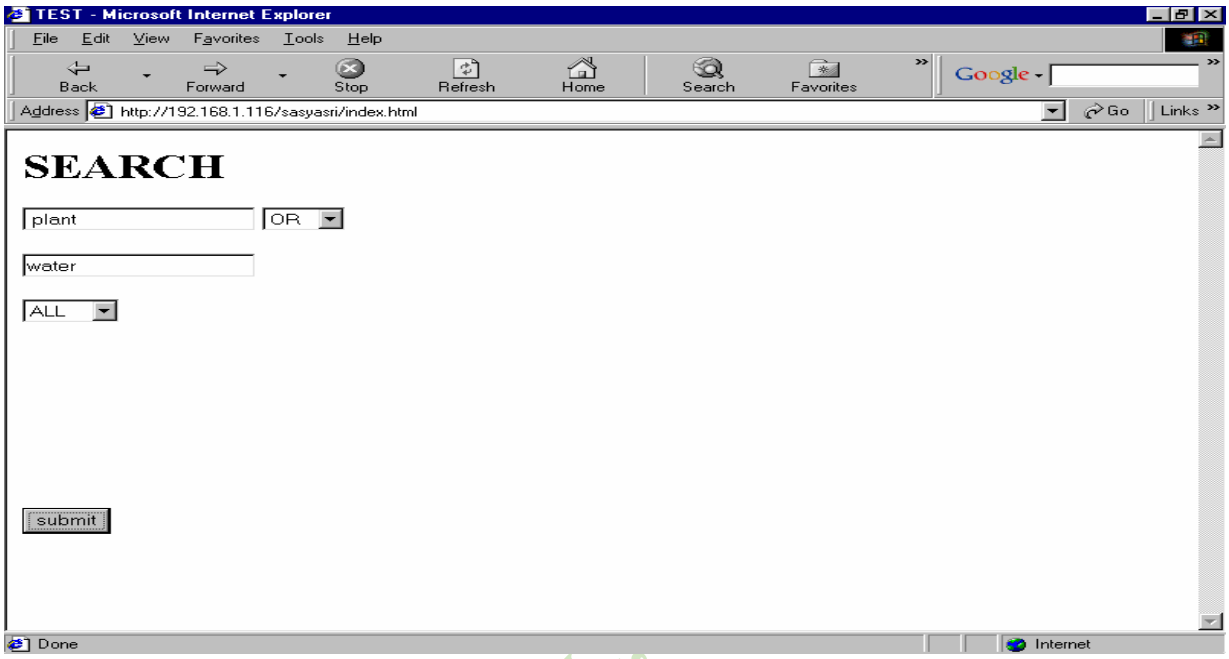

Fig. 3. Search Interface

Enter the keyword or keywords in the box above. The second entry on the previous page only shows the Boolean operator "OR," however by bringing down the menu, one can also see "AND" and "NOT." The fourth entry just shows the word "ALL," but if you drag down the menu, you can see words like "TITLE" and "AUTHOR." This will restrict the search to the AUTHOR or TITLE fields, respectively. All of the indexed fields are automatically searched by the system. The system displays the following web page with all the bells and whistles after the user enters the search criteria and clicks "submit." The photos in the output below are not important and are simply included for demonstrative purposes.

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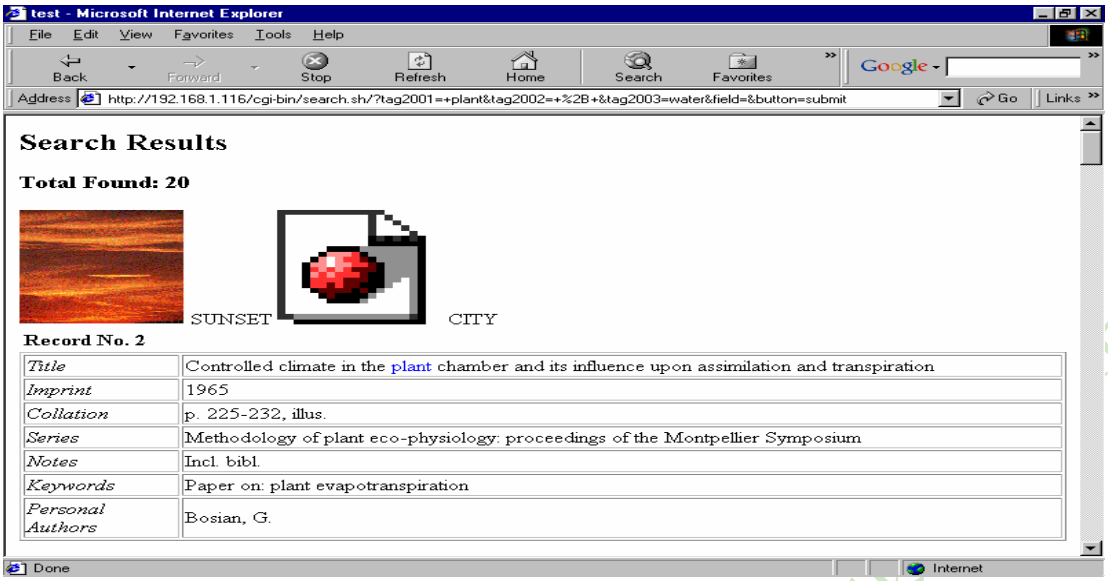

Fig 4**Search Results**

IN-TEXT QUESTIONS

12. WAISISIS commercial server application. (Yes/No)
13. WWWISIS is freely downloadable.(Yes/No)

4 SUMMARY

This Lesson briefly discussed the historical development of CDS/ISIS for DOS and for WINDOWS (WINISIS), beginning with ISIS for IBM mainframe computers in the early 1960s at the UN International Labour Office. The successive upgrading of the software and addition of several features over the past fifteen years were mentioned. The web version is WWWISIS and with the help of its feature, it is made possible to publish the database records on internet. The supportive applications and softwares were also discussed in this lesson to make you aware about their support to make the WWISIS to go online. It is now a powerful information storage and retrieval software for use on microcomputer in standalone or networked mode. There are some 50,000 installations in the world, mostly in developing countries. In India, it became very popular and it was promoted in completion of numerus projects

5 GLOSSARY

CCF	Common Communication Format
CDS/ISIS	Computerized Information Service / Integrated Scientific Information System
CGI	Common Gateway Interface

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DBMS	Database Management System
DOS	Disk Operating System
DSIR	Department of Scientific and Industrial Research
FST	Field Selection Table
GUI	Graphical User Interface
HP	Hewlett Packard
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IDRC	International Development Research Centre
ILO	International Labour Organization
IP	Internet Protocol
ISBN	International Standard Book Number
KWOC	Keyword Out of Context
MFN	Master File Number
OS	Operating System
PFT	Field Definition Table
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNICODE	unique, unified, universal encoding
URL	Uniform Resource Locator
WWW	Worldwide Web
XML	eXtensible Markup Language

6 ANSWERS TO IN-TEXT QUESTIONS

1. UNESCO	8. Yes
2. Yes	9. CCF
3. 1985	10. CGI
4. Yes	11. Yes
5. Yes	12. No
6. MFN	13. Yes
7. Yes	

7 SELF-ASSESSMENT QUESTIONS

1. Desribe in brief about the WWWISIS.
2. Describe Apache Server.
3. Describe CGI.
4. Write a note on Web Server..
5. Describe the version of CDS/ISIS

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LESSON 4.2

Introduction to Web Servers: Apache Server and Internet Information Server

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
2 Types of Web Server
2.1 Apache WebServer
2.2 Internet Information Services
3 Summary
4 Glossary
5 Answers to in-text questions
6 Self-assessment questions
7 References

1.1 LEARNING OBJECTIVES

Let's now explore Web Server.The computer that stores online material is known as a web server.In general, web servers are used to host websites, but there are other types of web servers as well, including those for gaming, storage, FTP, email, and so forth.A machine known as a Web server houses each and every Website.This server has an ongoing internet connection.A unique address made up of four digits between 0 and 255 separated by periods is assigned to each Web server connected to the Internet. For example, 68.178.157.132 or 68.122.35.127. It will make it possible for us to understand the order of Apache and IIS Webserver installations.These webservers can interface further with other database software to make their data accessible to other users.

1.2 INTRODUCTION

It is a piece of software that runs on the client side and functions as an intermediary between the server and the client to serve websites on the internet. In other words, a hardware or software that aids in delivering the content, which can be accessed via the Internet, is referred to as a web server. The content is stored on the hardware, and is made available online by the

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software. Web servers are actually meant large computers which can be used to store a lot of data and provide access to many people simultaneously. The ability to view content like web pages or other data from any location that is linked to the internet is made possible by a web server. The webpages that are requested by users are stored, processed, and delivered by web servers. The material is stored on the hardware, while the software makes it available online. Web servers are most frequently used to host websites, but they can also be used to store data or run business applications. Additionally, there are various methods for requesting content from a web server. The Hypertext Transfer Protocol (HTTP) is the most popular request type, but there are numerous others like the Internet Message Access Protocol (IMAP) and the File Transfer Protocol (FTP). For large software, an organization may have its own web servers, which are kept up by its own IT team, or the duty may be delegated to an IT firm. A third party web server service can be purchased for simple online applications, such as a small business's marketing website. We use Apache Webserver and IIS as examples of web servers.

How Web Servers Work

Basically, A user types www.google.com into a web browser like Internet Explorer, Firefox, Chrome, etc. on a computer that is connected to the internet. The web server accepts the request and fulfils it by showing the google.com web page.

Web server respond to the client request in either of the following two ways:

1. Sending the file to the client associated with the requested URL.
2. Generating response by invoking a script and communicating with database

The page appears on your screen no matter where in the world that URL is located, which is interesting, at the simplest level conceivable. Your browser established a connection with a web server, sent a request for a page, and then got it. The Background Here are the fundamental actions that took place behind the scenes to load a Web page on your computer screen, if you wish to learn more about them. The browser broke the URL into three parts:

1. The protocol ("http")

2. The server name ("www.google.com")

3. The file name ("web-server.htm")

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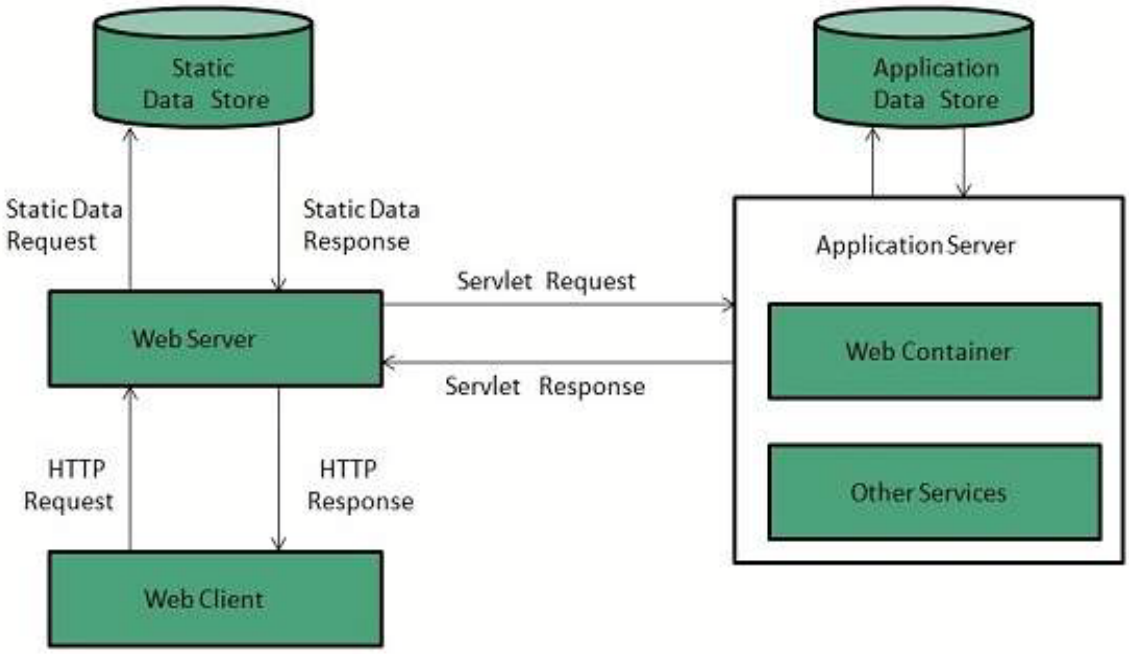

Fig 1.1: WebServer Function

Key Points

When a client serves a requests for a web page, the web server looks for it and, if it is located, transmits it to the client along with an HTTP response.

- The web server will send an HTTP response if the requested web page cannot be located. Error 404 Not located.
- The web server will get in touch with the application server and data store if the client has requested more resources in order to build the HTTP response.

Architecture

Web Server Architecture follows the following two approaches:

- Concurrent Approach
- Single-Process-Event-Driven Approach.

Concurrent Approach

The web server may process several client requests simultaneously thanks to the concurrent technique. It can be done using the following techniques:

- Multi-process
- Multi-threaded
- Hybrid method.

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Multi-processing

- In this scenario, a single process (the parent process) starts a number of child processes that are each single-threaded and distributes incoming requests to these child processes. Each child process is in charge of dealing with a single request.
- The parent process is in charge of keeping an eye on the load and choosing whether to kill or fork processes.

Multi-threaded

- It generates numerous single-threaded processes as opposed to Multi-process.

Hybrid

- It combines the first two methods. This method creates numerous processes, each of which starts a number of threads. One connection is handled by each thread. Less strain is placed on system resources when numerous threads are used in a single process.

2 Types of Web Server

Following table describes the leading web servers available today:

S.N.	Web Server Description
1	**Apache HTTP Server** The Apache Software Foundation created the most widely used web server in the world. Almost every operating system, including Linux, UNIX, Windows, FreeBSD, Mac OS X, and more, can run the free source Apache web server. The Apache Web Server is used by about 60% of the web server machines.
2.	**Internet Information Services (IIS)** Microsoft's high performance Web Server is called Internet Information Server (IIS). Operating systems Windows NT/2000 and 2003 are used by this web server (and may be on upcoming new Windows version also). Because IIS is intimately linked with the operating system, it is extremely simple to administer. IIS is included with Windows NT/2000 and 2003.
3.	**Lighttpd** The FreeBSD operating system includes the free web server lighttpd, which is pronounced lighty. This free and open-source web server is quick, safe, and uses a lot less CPU power. Additionally, the operating systems Windows, Mac OS X, Linux, and Solaris support Lighttpd.
4.	**Sun Java System Web Server** This Sun Microsystems web server is appropriate for medium-sized and large-sized websites. Despite being free, the server is not open source. But it works with UNIX, Linux, and Windows operating systems. JSP, Java Servlets, PHP, Perl, Python, Ruby on Rails, ASP, ColdFusion, and other Web 2.0-related languages and technologies are supported by the Sun Java System web server.
5.	**Jigsaw Server**

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	The World Wide Web Consortium is the source of Jigsaw (W3C's Server). It is open source, free, and compatible with a number of operating systems, including Linux, UNIX, Windows, Mac OS X, and Free BSD. Jigsaw is a Java software that can execute both PHP and CGI scripts.

2.1 Apache WebServer

Apache WebServer

Many websites are powered by this open source, free software.Serving website owners and website content is its primary duty.It is a dependable and highly dated web server.The Apache webserver is software that operates on a server rather than a physical machine.When users access the websites, it establishes a connection between the server and the browsers to transfer files back and forth.The Apache software can be altered.These enable server administrators to enable/disable new functionalities because of its module-based structure.Security modules, cache, URL rewriting, password authentication, and other modules are among Apache's many available modules.

The most widely used Web server in the world is generally acknowledged to be Apache (HTTP server).The Apache Web server was initially created for Unix servers, but it has been adapted to Windows and other network operating systems (NOS).The phrase "patchy," which the Apache developers used to describe early versions of their software, is where the name "Apache" originates.Its official name is Apache HTTP Server, and the Apache Software Foundation is responsible for its upkeep.CGI, SSL, and virtual domains are just a few of the functionality offered by the Apache Web server.Plug-in modules are also supported by Apache for extensibility.Apache is dependable, cost-free, and comparatively simple to set up.

IN-TEXT QUESTIONS

1. Apache Server was initially created for _____
   1. Anriod 2. Unix 3. IOS 4. Windows
2. Which among the following is not Server
   1. Anriod 2. Apache 3. Lighttpd4. Internet Information Services (IIS)
3. Generally, the most widely used Web server in the world is _____
   1. Jigsaw Server2. Apache 3. Lighttpd 4. Internet Information Services (IIS)

htaccess, IPV6, FTP, HTTP/2, perl/Lua, WebDav, load balancing, URL rewriting, and session monitoring are some of the features of Apache that are often used.Without separating the server hardware and the apache software for each website, an Apache webserver can host numerous websites on the same system.Virtual Host, or VHost, is the name of this idea.

There are two types of Apache Virtual Host:

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1. Name-Based Virtual – Host
2. Address-based virtual – Host

Multiple virtual sites can be hosted on a name-based virtual host using a single IP address.Requests for desired websites are received by specifying the IP address on the apache server.We must configure more IP addresses on the server to support IP or address-based virtual hosting.Ten virtual hosts can be formed if the server has ten IP addresses.For the aim of offering virtual hosting, web hosting firms frequently employ the Apache webserver.The same machine that runs the Apache server distinguishes between several hosts.

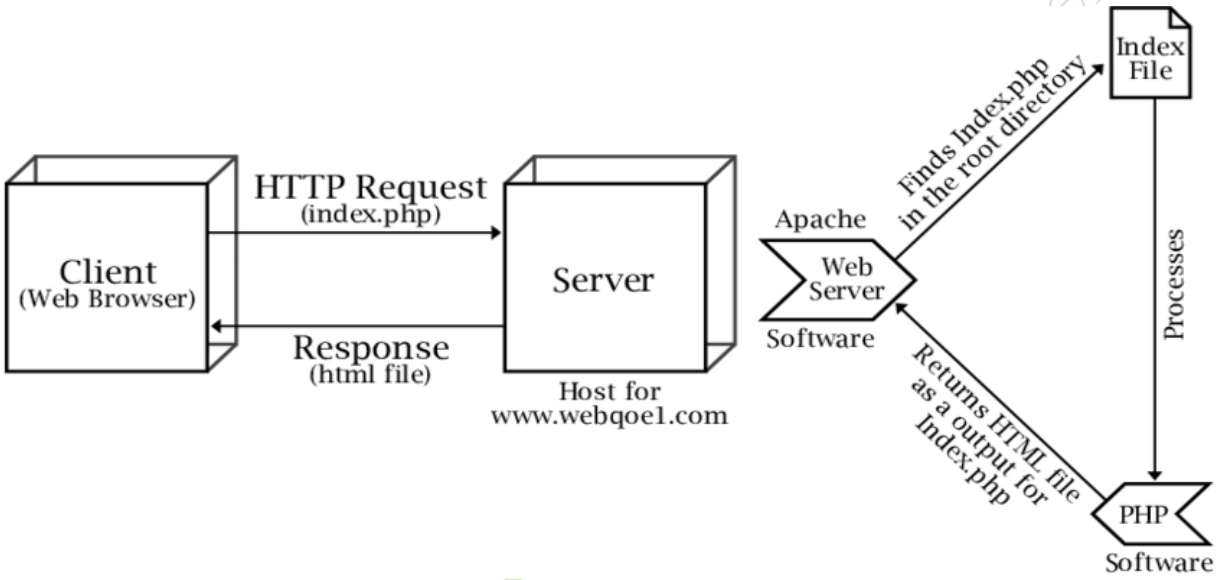

Fig. 2 Apache Server Function

Features of Apache Web Server

1. Handling of static files
2. Loadable dynamic modules
3. Auto-indexing
4. .htaccess
5. Compatible with IPv6
6. Supports HTTP/2
7. FTP connections
8. Gzip compression and decompression
9. Bandwidth throttling
10. Perl, PHP, Lua scripts
11. Load balancing
12. Session tracking
13. URL rewriting

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Geolocations are also based on IP address, A wide range of features are supported by Apache, many of which are added as built modules that enhance the core capability. These include things like Authentication protocols and server-side programming language support. Perl, Python, Tcl, and PHP are supported by several interfaces for popular languages. Mod_access, mod_auth, mod_digest, and its replacement, mod_auth_digest, are all well-known authentication modules. A few examples of additional functionality include support for SSL and TLS (mod ssl), a proxy module (mod proxy), a URL rewriter (sometimes referred to as a rewrite engine, implemented under mod rewrite), customised log files (mod log config), and filtering support (mod include and mod ext filter).

Mod_gzip, an external extension module for Apache, is a popular compression technique used to reduce the size (weight) of web pages delivered over HTTP. ModSecurity is an open source intrusion detection and prevention engine for online/web applications. Apache logs can be examined using free tools like AWStats/W3Perl or Visitors in a web browser.

One Apache installation can serve a variety of real websites with the help of virtual hosting. For example, One system running one installation of Apache, might handle the simultaneous serving of test47.test-server.test.com, www.test.com, www.example.com, etc. DBMS-based authentication databases, configurable error messages, and content negotiation are all characteristics of Apache. Several graphical user interfaces also support it (GUIs).

Performance of Apache Server

Although being the "fastest" web server is not Apache's primary design objective, it does perform on par with other "high-performance" web servers. In order to better meet the needs of each unique infrastructure, Apache offers a number of Multi Processing Modules(MPMs) that enable PHP to execute in a process-based, hybrid (process and thread), or event-hybrid mode. This suggests that choosing the right MPM and the right configuration are crucial.

Where performance trade-offs are necessary, Apache is designed to boost throughput and decrease latency rather than just handle more requests, guaranteeing consistent and reliable processing of requests within tolerable time-frames.

The Apache version that combines the usage of many processes and multiple threads per process is the multi-threaded version, which the Apache Foundation regards as offering great performance.

Because threads have less overhead than processes, this design operates more quickly than the prior multi-process based topology, but it falls short of the event-based architecture offered by other servers, especially when other servers process events using many worker threads.

The overhead that one thread per connection generates is an easy way to explain this disparity (as opposed to a couple of worker threads per CPU, each processing many connection events). It costs CPUs money to switch between threads since each thread has to maintain its own stack and environment.

Installation

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Depending on your operating system and how much control you desire over the installation process, Apache can be installed in a number of different methods. On the apache website, you can get the most recent Binaries if you're setting up the server on a Windows computer. If you have selected Linux as your operating system than you have got more choices. The Apache website offers both OS-specific binaries and the source code for download and compilation. On many Linux and UNIX systems, the package manager can also be used to install the Web server.

Configuring

After installation, two key configuration files must be edited.These files can be opened in any text editor because they are plain text files.The files are case-insensitive and have one directive per line.The server disregards lines that begin with the character # because they are regarded as comments.

The httpd.conf file is the main configuration file.This file can typically be found in /etc/httpd/httpd.conf for Linux/Unix users.However, the file is located at /etc/apache2/apache2.conf on Linux distributions based on Debian.The default directory for HTTPD.conf in the Windows operating system is C:ProgramFilesApache GroupApache2conf.

Information about the system, including the server root directory, the listening port, the maximum number of clients that can connect at once, and the number of server instances the software can start at once, is stored in the httpd.conf file.One server can now serve a variety of clients simultaneously thanks to the ability of Apache to be configured for virtual hosting.The httpd.conf file also contains the virtual host instructions.

The basic configuration can be modified at the directory level using the.htaccess file.The configuration modifications are only effective for the directory it lives in and any subdirectories, hence this file must be produced on a per-directory basis.You can set cgi handling, redirection, require authentication before enabling site access, and much more using the.htaccess file.The Apache Documentation has a complete list of directives.

Starting

On all operating systems, the Apache Web server is available as a service.A software programme that operates in the background without user input is known as a service.This makes it possible for external users to access the Web pages whenever the physical server is turned on, whether or not a user is signed in.

In Windows, you launch the service from the Control Panel's "Services" menu.Every service that is offered to users will be included.The "Apache" service will be selected, and you will click "Start" next to it.You only need to click "Stop" to end the service.

For Linux/Unix users, there are multiple ways to start a service.You must launch a terminal window, which is accessible from the main "Applications" or "Start" menu under "System Tools" or "Utilities."The root user is required to launch the service.Either use the "su" command to change to root, or prepend the instructions with "sudo."

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The service can be started by typing /etc/init.d/apache2 start.The service can be stopped by typing /etc/init.d/apache2 stop.When the service has begun, you can check your setup by entering "http://localhost" in the address bar of a web browser. Software Complexity Contributing Factors

Program Length - A browser's source code may have up to 75000 lines.The executable file for a browser typically weighs between 5 and 7 megabytes.The task of correcting every error in such a sizable application is exceedingly difficult.

Software Interfaces - Because browsers must exchange data with other applications, their code bases are larger than they otherwise would be, increasing the risk of bugs.

Market forces - To keep a competitive edge, products need to be released swiftly to the market.It can be difficult to completely examine every component of them before use.Large software systems release new versions so regularly because older versions have flaws fixed in them.

Team Development - Complex systems like browsers are frequently created by large teams of programmers.Very few people are capable of completing this activity by themselves.A single programmer's inconsistent programming practises or even simple negligence can produce issues that are very challenging to locate and fix.

2.2 Internet Information Services

IIS stands for Internet Information Services, which is compatible and run on the Windows Operating Systems and Microsoft's.Net framework. Mono can be used to run IIS on Linux and Mac computers, although this is regarded as unreliable. Without webservers, the internet would not function. Web servers host web applications. This makes it possible to process messages that come in over specific TCP ports. IIS has integrations with.Net and the ASP programming language, among other Microsoft products. One thread handling or creating a new thread for each request are the two basic methods used to handle web requests. IIS's thread-per-request model involves selecting a thread from a thread pool to handle each request. IIS has many functionalities. Static webpages and ASP.Net web applications are hosted by IIS. It can be expanded to host web applications created on other platforms and used as an FTP server. Basic, ASP.Net, and Windows authentication are only a few of the built-in authentication methods. The application pool is one of IIS's most important features. Remote management is a useful function. Power Shell can be used to manage IIS using the CLI. IIS uses a number of standard languages and protocols to function. Different elements, including as text, button placements, picture interactions, and hyperlinks, are created via HTML. A variety of tools, such as WebDAV, which may build and publish web content, are available to developers for the creation of IIS websites.

Over the years, IIS has continuously advanced and gained market dominance over Apache because to strong feature, performance, and security enhancements. Microsoft's web server product, IIS (Internet Information Services), comes in second to market leader Apache. IIS Express is a stripped-down version that may be installed as a standalone freeware server

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starting with Windows XP SP3. It is a closed software application. One area that has made substantial progress is security, which has come a long way since IIS 6.0's infamous Code Red worm vulnerability. However, not everything has been perfect. For instance, IIS traditionally has inadequate support for PFS (Perfect Forward secrecy), a critical cryptographic property that guarantees a long-term key won't be compromised if a single component session key is broken or leaked.However, it's possible that the IIS-Apache security comparison is unfair to IIS. Since the majority of malware targets Windows and Linux (Apache's preferred operating system), the IIS vulnerability may also be largely attributed to its operating system parent.

Web Servers provide Portals

A business and its users can benefit from far more capability offered by modern web servers.Web servers are widely used as gateways for large, highly dynamic web-based applications that integrate middleware for business and back-end applications in order to construct enterprise-class systems.As an illustration, Amazon Web Services provides users with a web-based gateway for managing public cloud services.Through streaming media providers, such as Spotify, Wynk, Netflix, Amazon Prime, and other OTT applications, real-time streaming content is made available.

How Does IIS Server Work?

IIS functions as a web server with a dedicated Process Engine that manages all client-server communications. In essence, a client sends a request to the server, which is handled by IIS, and the client receives a response.

The two primary layers of IIS's processing architecture are as follows:

- Kernel Mode:- Executed code has complete access to all associated hardware and is free to execute any command. Kernel Mode is typically used for reliable applications. Crashing in kernel mode has disastrous effects on the entire system. The location of HTTP.SYS is in kernel mode.
- User Mode:- This mode only allows you to execute instructions that don't entail making hardware or reference memory requests. This enables much quicker recovery and gives an additional layer of defence against errors. The APIs are given the responsibility of interacting with the hardware and reference memory when running code in user mode. User Mode contains the Web Admin Service, Virtual Directory, and Application Pool.

It is the responsibility of Kernel Mode to receive requests from clients and route them via HTTP.SYS to an application pool. This happens when a user types in or clicks on the site URL to visit a page. By capturing these requests, HTTP.SYS makes a queue for each application pool.

The launch of Http indicates that processing has started.Runtime.ProcessRequest. A pool of HttpApplication objects is created by the HttpRuntime process and then transmitted over HTTP.

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Until the HTTP handler on the ASP.NET page handles the request, HTTP Modules are kept active. After the request has passed through the HTTP route, the page loads. The Worker Process and the Application Pool are two important concepts in the world of IIS, as you can see.

The container is the Application Pool. In addition to separating various applications from one another, it houses the worker process. No matter if they are housed on a single server or a group of servers, this is true. A single application pool can contain multiple websites. To put it another way, an application pool is a set of URLs that have been served by worker processes. Application separation makes management easier and ensures that if one application pool has a problem, the others are not impacted.

IIS works with ASP.NET Core

The most recent version of Active Server Page (ASP), a server-side script engine that creates interactive webpages, is the ASP.NET Core framework. The ASP.NET Core application receives a request from the web and delivers it to the IIS server, where it is processed before being returned to the IIS server and the client who made the original request. Blog platforms and content management systems are a couple of examples of apps created with ASP.NET Core (CMS). WebDav, which can build and publish web content, is one of the tools that developers can use to create IIS websites. Integrated development tools like Microsoft Visual Studio are another option for developers.

IN-TEXT QUESTIONS

4. Apache is _____ software
   1. Free 2. Commerical 3. Open Source 4. Gift software
5. Which among the following is not a OTT Application
   1. Prime Video 2. Netflix 3. Winsis 4. Spotify
6. A webserver is a specific type of backend server used for “internet” traffic
   1. Cloud 2. Internet 3. Data 4. Apache

Versions of IIS

Along with Microsoft Windows, IIS has developed. IIS's first version debuted alongside Windows NT. IIS 1.0 debuted alongside Windows NT 3.51, and IIS 4.0 followed with Windows NT 4.0. IIS 5.0 came with Windows 2000. IIS 6.0 was introduced with Windows Server 2003 by Microsoft. With Windows Server 2008, IIS 7.0 got introduced, a significant makeover (IIS 7.5 is in Windows Server 2008 R2). IIS 8.0. was introduced with Windows Server 2012 (Windows Server 2012 R2 uses IIS 8.5). Additionally, Windows Server 2016 and Windows 10 introduced IIS 10. Microsoft has improved existing functionality and added new features to IIS with each release. For example, IIS 3.0 introduced ASP for dynamic

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scripting; IIS 6.0 improved security and stability and included support for IPv6; and IIS 8.0 introduced multicore scaling on non-uniform memory access hardware, centralised SSL certificate support, and Server Name Indication.

Features in IIS 10

IIS 10 provides a wide range of new features and functionalities.The HTTP/2 protocol, which uses resources more efficiently and has a lower latency than HTTP 1.1, is now supported by IIS 10.The Nano Server, a minimal server deployment type compatible with Windows Server 2016, can run ASP.NET Core, Apache Tomcat, and PHP applications using IIS 10.Because IIS 10 can run in a virtual machine and container, developers and administrators have more flexibility in their deployment choices and can support a wider range of web applications.

Features of IIS Server

The IIS server is quite popular and widely used. It has a lot of essential features and is a good tool for a lot of IT admins. IIS is typically used to host ASP.NET status websites and web applications, but it may also be used as an FTP server, host WCF services, and host on other platforms (such as PHP) if extended.

The following are some of IIS's most important features:

- Application Pools: The IIS server system's application pools are an essential element. A single application pool may have a single IIS worker process operating or several. These worker processes are in responsible of maintaining the functionality of the application instances.
- Authentication: The IIS server offers Windows auth, Basic, and ASP.NET authentication options. Windows auth makes it possible to log into web applications using your domain account, which is especially helpful if you utilise Windows Active Directory.
- Security: IIS provides security features including SFTP and HTTPS binding, TLS certificate management tools, and request filtering so that traffic may be efficiently whitelisted and blacklisted. A number of FTP security features can be used, as well as rules for authorisation and permission, request logging, and other things.

In general, IIS is a flexible and highly adaptable web server.It is capable of much more than merely hosting ASP.NET apps with certain enhancements.By expanding it, you may create a successful, adaptable, and reliable IIS server.

IIS Express for testing

For web developers to test websites, Microsoft offers IIS Express, a standalone version of IIS.IIS Express provides all of the essential features of the complete IIS web server while allowing numerous operations to be carried out without administrative rights.

Security

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Organizations must take security precautions to shield the web server from security lapses in order to guarantee a website is secure.Businesses can protect IIS by using built-in features.Among the techniques for securing Windows IIS are:

- Ensure that all security patches are installed on the Windows operating system.
- To lessen the chance of an attack, disable any IIS features that are not being used.
- Install firewalls to guarantee that the server only receives legitimate packets.
- Manage which domains and IP addresses are permitted to access the web server.
- Apply rules for individual requests using URL authorisation, such as handling certain URLs. A business can use URL authorisation to restrict who is allowed to access the requested pages.
- Logging can be used to see who is accessing the web server.
- Set the error page so that it only shows pertinent details about a problem.
- Make sure that excessive information, such as usernames and passwords, is not displayed on error pages. the IP address of the server or any information that hackers could use to exploit the web server.

Steps to install and configure IIS

On a server running Microsoft Windows Server 2012 R2, Microsoft Windows Server 2016, or Microsoft Windows Server 2019, the procedure for installing IIS is as follows. The steps to install IIS using Server Manager are as follows:

- By pressing [Windows], choose Server Manager.
- Click Manage > Add Roles and Features in the Server Manager dashboard.
- Choose the installation type.
- Click Next after selecting the role-based or feature-based installation option.
- Click Next after selecting the server where IIS will be deployed.
- Turn on the IIS Web Server role.
- To add the IIS Management Console, click Add Features.
- The SelectFeatures window will appear after selecting Next.
- The Web Server Role (IIS) window will popup once you click Next.
- The Select Role Services window will appear when you click Next.
- Choose the necessary role services and press Next.
- To install the chosen roles, role services, and features, click Install.
- To complete the installation, click Close.

The instructions to install IIS using PowerShell are as follows:

- Type PowerShell into the search bar and then select Windows PowerShell. Enter the following command in Windows PowerShell:
- Web Server Install-Windows Feature Include Management Tools
- Click [ENTER].

The steps to configure IIS using Server Manager are as follows:

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- Return to the Server Manager and click the Tools menu option for Internet Information Services (IIS) Manager.
- Select Website Add
- At the very least, specify the route and site name. Select OK.
- The initial website is available for use.
- IIS is preconfigured to act as the default website when it is installed.
- To alter the website's fundamental settings, however:
- Sign in as an administrator to the computer running the web server.
- Select Settings from the Start menu, then click Control Panel.
- Click Internet Services Manager twice after clicking Administrative Tools.
- In the left pane, click the website you want to manage, then select Properties from the context menu.
- On the website tab, click.
- Fill out the Description box with a description of the website.
- Enter the website's Internet Protocol (IP) address or use the default choice of All (Unassigned).
- As necessary, change the Transmission Control Protocol port.
- Select the tab labelled Home Directory.
- To access a folder on the local machine, select A directory on this machine and then click Browse to find the desired folder.
- Click A share located on another computer, type the network path, or click Browse to choose the shared folder, and then click Open to use the shared folder that has been shared from another machine on the network.
- To give readers access to the folder, click Read (required).
- To accept the website's attributes, click OK.

Follow these steps to create a new website in IIS:

- Sign in as the administrator on the web server PC.
- Select Control Panel by clicking Start, then Settings.
- Click Internet Services Manager twice after clicking Administrative Tools.
- Click Action, then New, before selecting website.
- Click Next after the Website Creation Wizard has launched.
- Write a website description.
- (Only used internally to identify the website in Internet Services Manager, this description.)
- Decide on the website's IP address.
- The website will be available on all interfaces and configured IP addresses if All (unassigned) is chosen.
- Enter the TCP port number for the site's publication.
- Enter the Host Header name here (the real name that is used to access this site).
- Select Next.

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- Either type the folder's path into the box provided or click Browse to choose the folder, then click Next to continue.
- Click Next after choosing the website's access restrictions.
- Press Finish.

IN-TEXT QUESTIONS

7. IIS 10 is the _____ of Internet Information Services
   1. Part 2. Edition 3. Version 4. Generation
8. Web servers host _____ applications
   1. Data 2. Web 3. Server 4. Potocol

3 SUMMARY

This Lesson briefly discussed the development and the importance of Web servers in the era of internet. Brief about the types of webservers and their importance in making the databases to go online for the indefinite numbers of users. Webservers helps number of softwares to publish their data via www. The successive installation of webservers softwares. Brief discussion of the features of Apache and IIS webservers. Description of configuring the Apache and IIS. IIS Server can seem overly complex at times, but once you understand the fundamentals, such as how to configure your website, you'll be well on your way to mastering the learning curve. The key is to stick with it, because learning how to utilize the world's second-largest Windows web server is well worth the initial learning curve.

4 GLOSSARY

CGI	Common Gateway Interface.
CLI	Command Line Interface
CMS	Content Management Systems
FTP	File Transfer Protocol
GUIs	Graphical User Interface
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
IIS	Internet Information Services
IMAP	Internet Message Access Protocol
IP	Internet Protcol
IT	Information Technology
MPM	Multi Processing Modules

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PFS	Perfect Forward secrecy
SFTP	Secure File Transfer Protocol
SSL	Secure Sockets Layer
TLS	Transport Layer Security
URL	Universal Resource Locator

5 ANSWERS TO IN-TEXT QUESTIONS

1. Unix	5. Winsis
2. Andriod	6. Internet
3. Apache Server	7. Version
4. Free	8. Web

6 SELF-ASSESSMENT QUESTIONS

1. Describe the functioning of WebServers.
2. Describe the details of IIS server
3. Describe the details of Apache server
4. Describe the details of Sun Java System Web Server

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LESSON 4.3

Web Interface Software: GENISIS

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STRUCTURE

1 Learning Objectives
1.1 Introduction
2 GENISISWeb
2.1 History of GENISISWeb
2.2 Installation of GENISISWeb
2.3 Steps and Proccedure of GENISISWeb Application
2.4 The Setting up/Installation of Apache Web Server
2.5 The Setting up/Installation of GenISIS Web
2.6 Configuration of GENISIS
2.7 Designing the display formats
2.8 Web query form
3 SUMMARY
4 Glossary
5 Answers to in-text questions
6 Self-assessment questions
7 References

1 LEARNING OBJECTIVES

As you have already learnt about WINISIS. This lesson will be introducing you to another important web interface packagei.e. GENISIS. Although it has the potential to create various sorts of databases, WINISIS is particularly well suited for creating bibliographic databases for the libraries, documentation centre and information centres.

After finishing this Unit you able to:

- To create a Webopac using Genisisweb and Winisis database to create digital archives library
- Transfer the WINISIS's digital document archives to GenisisWeb.

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- To make GenIsisWeb's digital document retrieval process easier.
- Discuss general features and capabilities of Winisis and Genisisweb versions; and
- Compare the features of its Winisis and Genisisweb versions, as well as how they are used in the creation of various information storage and retrieval systems..

1.1 INTRODUCTION

A rapidly increasing amount of information is being produced nowadays and is being digitally archived in libraries and information centres.This is required to be properly archived and kept in the libraries and information centres.Building up a library of searchable digital documents is the process of digital document archiving.It can be regarded as digital libraries because they publish their digital collections in an orderly fashion on CDROM or the intranet for wider circulation and use.The issue of managing the abundance of digital records available is solved by digital archiving.

The previous practice of sharing bibliographical information on materials has been replaced by digital archiving.With the click of a mouse, patrons can retrieve a specific document they required, thanks to digital archiving, which also offers the entire text of the documents and is backed by robust search and navigation capabilities.In an effort to concentrate on knowledge management, dissemination, and ensuing information empowerment, digital document archiving has been developed.WinIsis, GenIsisWeb, and the Apache web server are the software programmes utilised for digital archiving in this study. These all the programmes can run on low-end Windows or Linux environment computers.

2 GENISISWeb

While using GenIsisWeb, It uses WinIsis as its back-end software.It is free programme for Windows environment that allows for the development of text databases.It can be used to create searchable digital archives of full text documents in the formats of Word, Excel, PowerPoint, HTML, PDF, audio, and Video.By adding a command line in its print format to display a hyperlink in the database display screen, it is possible to convert a database built using WinIsis into a digital archive.The record may be connected via the hyperlink to the relevant digital document in the collection.The link will open the associated document when clicked, instantly.In order to better serve users, there is a major movement nowadays to digitise internal library sources.Therefore, it is necessary to produce and maintain digital documents for long-term archiving, structuring, and simple search/retrieval.

2.1 History of GENISISWeb

WINISIS and CDS/ISIS databases can be visually produced using the Open Source authoring tool GENISIS (for Win32), which can also be used to create a user-friendly front end for the

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databases.It is necessary to enter the file name just (and not the complete path) in the field that includes the link to the document when building the WINISIS database.

Since 1985, UNESCO has been creating CDS/ISIS, a sophisticated non-numerical information storage and retrieval programme, in response to the demand from numerous institutions, particularly in developing nations, for the ability to streamline their information processing operations using contemporary (and reasonably priced) technologies.

Genisis is now freely accessible on the UNESCO FTP site and was initially created for UNESCO by the defunct IBISCUS Association (France).Microsoft Visual Basic is used in the software's development.Additionally, the source code is publicly accessible.On the CDS/ISIS webpage of UNESCO, a new version of GENISIS, the writing programme used to visually create search interfaces for CDS/ISIS databases, is now available.

2.2 Installation of GENISISWeb

Following are the two versions of the application.

- GenisisWeb, for online publishing, and
- GenisisCD, for creating CDRom interfaces for CDS/ISIS databases

The updated CDS/ISIS print format wizard in GenisisWeb now supports CSS (Cascading Style Sheets), making it simpler to connect records to one another.GenisisCD utilises HTML pages in addition to its own.

An installation software, autorun, HTML help, fully adjustable interface logos, and more executeable files may all be found on a fully featured CD that is created using a search engine.GenisisCD will create the CD, which you may subsequently burn using your preferred CD writer programme.English and French are the interface languages available.

Your machine already has the WINISIS programme installed.The GenIsisWeb application, whose creation is detailed below, will use the database built by WINISIS as its back end.

Genisis essentially carries out the following actions:

- Web query form with field selection and index access;
- Display of query results;
- Display of information for a specific record;
- Application test;

A local web server, such as Apache, is necessary for testing the created application using GenisisWeb.

Finally, GENISIS can export the created application to a real internet/intranet server (Windows, Unix, Linux) or build the structure of the CDRom for the copy, depending on which version is being used. GENISIS has the foundation on the Web CDS/ISIS interface WWWISIS by BIREME.

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2.3 Steps and Proccedure of GENISISWeb Application

The following are the procedures for developing the GenIsisWeb application:-

- After downloading it from the UNESCO website, install it.
- Switch it to the English language version Install GenIsisWeb software and;
- Install Apache or IIS web server;
- Configure WINSIS (The Field Definition Table, The Data Entry Worksheet, The Display Format, and The Field Selection Table);
- Create a database and enter the data in WINISIS by exporting the records or manually entering;
- The HTDOCS folder of Apache will typically automatically copy the WWWISIS folder from the GenIsisWeb installation. If not, then do it;
- In GenIsisWeb, BIREME's contents (not its folder) will typically be copied to CGI-BIN. If not, then do it;
- Develop a homepage-like webpage for the GenIsisWeb front end application.
- The front end can be visited using an HTTP address.

IN-TEXT QUESTIONS

1) what software programmes is not utilised for digital archiving ?
   1) WinIsis 2) GenIsisWeb 3) CDS/ISIS 4) Apache web server

2) GENISIS is not supported with _____
   1) Andriod 2) Windows 3) Unix 4) Linux

3) Field Definition Table (FDT) is use to define_____
   1) Fields 2) Print formats 3) Data Entry 4) Author Field

2.4 The Setting up/Installation of Apache Web Server

It is necessary to install the web server Apache or IIS before proceeding with the installation of GENISIS.Since Apache is a free and open-source programme, getting the programme and its source code is simple.Install Apache web server software on your PC in order to use GenIsisWeb to build a handy front end.The most widely used free programme for turning a computer into a server is called Apache.After installing the Apache software, every computer in the network, including the client computer, will function as a server and be able to access the application.

GenISIS Web can be installed following the installation of Apache.

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2.5 The Setting up/Installation of GenISIS Web

Since these files are not automatically copied, move the "wwwisis" and "bireme" directories from GenISIS to the corresponding folders in Apache.The Apache web server needs to be running before GenISIS can be started.Then, by launching any web browser, you may check to see if Apache is functioning properly.When you open Internet Explorer or Netscape and type "localhost" into the address bar, a screen should appear confirming that everything is functioning as it should.

2.6 Configuration of GENISIS

GenISIS needs to be configured when you launch it for the first time.You can change the language when you first open the screen.By choosing English from the drop-down option under the language tab, the default language can be chosen.Clicking the box on the right-hand side will require you to choose the cgi-bin.You must choose cgi-bin in the Apache folder if you're using Apache, and Scripts in the Inetpub folder if you're using Internet Information System (IIS).After that, you must choose the document root by clicking on the box in the right-hand corner.The WWWROOT directory in the Inetpub will serve as the document root if you are using IIS.The document root for Apache users is HTDOCS in the Apache folder.The configuring procedure will then be finished.After that, click "VALIDER," and a pop-up window containing the OK message will appear.You can test the software as suggested in this message.when you've finished configuring.

Further, You will see a dropdown menu after selecting the tab labelled "APPLICATION."When you choose New, a dialogue box allowing you to choose an existing WinISIS database will appear.Press "OPEN" after choosing the database.After that, you will see a notice asking you to give a name for your application when you choose the database and click the OPEN button.Any name, such as MYWEB, can be entered here. Then, hit the OK button.

Three forms will now be shown up in a window:

- Query form: enables you to create a query with access to Indexes and field selection.
- The format "listing" enables you to create a brief display format from which users can choose a link to a detailed display.
- The "details" format option enables you to create a detailed display format.

Create the query form. You must add fields to the query form to design it.A popup labelled "ITEMS ON THE QUERY FORM" will open when you click the "ADD" button at the bottom of the query form.The items you see in the left panel are those that have been indexed in your database, or that are included in the FST, and one field includes all fields.You have the ability to choose the operators and gain access to the index on the left panel below.After choosing a field, you have three options for how the link to the index will be displayed.You can choose any options you want to have on the right side.Without using the dollar symbol,

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you can choose "AUTOMATIC TRUNCATION" here. You return to the Query Form after selecting these options and pressing the "OK" button.

One field can only be chosen at a time.You must click on ADD and choose another field if you wish to pick more than one.The right side of this window has three tabs, as seen below.You can format these pages by clicking on any of these.Here, you can choose how many results to show after a search.The colours for the background are also selectable.It is advised to experiment with these settings to observe how your search display and query form are affected.To find out what happens and how to create your question form and display windows, click this button as well.Once the query form is complete, you can test it.On the menu bar, select APPLICATION, and then select SAVE from the dropdown menu.Click "OK"Once more, use the menu bar to select APPLICATION, and then from the dropdown menu, select CREATE APPLICATION.Your web browser will launch when you select Yes.

IN-TEXT QUESTIONS

4. What is the purpose of using GENISISWeb?
5. Whether GENISISWeb application software is free or paid?
6. What are the pre-requisite for the installation of GENISISWeb?
7. Where the testing output of GENISISWeb can be seen:
   a) Webpage b) Client
   c) Server d) Mobile
8. Which is the backed software of GENISISWeb?

A query form will appear there.Connect to IndexNote that three different forms of index linking are applied.You can now open the Index by clicking on the link to Index, then choose some search phrases from the Index.

When you return to the search form, the terms you choose will already be there.Click the SEARCH button now.The search results will be returned to you.Keep in mind that you have not yet created the display formats.The format that you see is the default.

2.7 Designing the display formats

The short display must, first be created so that users can choose which records to see in more detail.In the Format listing window, click.You will then receive the default form.When you click the ADD button at the bottom, a form that looks like a WinISIS worksheet will appear.Click here to access this drop-down menu, which will allow you to choose the

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field.Having chosen the fieldYou will receive assistance if you click on this.Than to include a link, click here.

One field should be linked to the detailed display so that visitors can view the detailed display of each record by clicking on it. You can choose two or three fields to be presented in the short display.After entering a field, a brief display is made.select the OK button.Note: You must add each field individually here as well.After choosing two or three fields for your brief display.You can save, create, view, and perform searches using the web interface as described above under, with this, you may choose from a variety of ways to link the record's number to the comprehensive presentation.

2.8 Web query form

Short display on the web Detailed display on the web

If you design this and are connected to an intranet, you can enable database searches for other users by supplying your IP address.The database and web interface can also be exported to a server on a different computer bycreating a web server export.To export the application to a web server, click the application.A conversation box will appear after that.You must choose the export path in accordance with the directions provided in this.You can export to a Windows server or a UNIX server.You will then see another dialogue box with detailed instructions on how to copy the files to the server after clicking OK (Path for Windows server).Before closing this page, print it out, then use these directions to copy the files to the server.Here, a GENISIS-built web interface is now available online at the IP address or url you provided to the server.

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ACTIVITY

This unit is based upon the theory and pratical part, this unit focus upon the students to make them learn about the usage of GENISISweb application, how to publish the digtaldocument archives globally. Therefore, the learners must install the WINISIS application, Apache Webserver application andGENISISweb application on their computers. It is required to do the configuration of the applications post installation. Beside, the configuration the integration is also required like transferring the files from WINISS to GenisisWeb. Once the integration is done it will automatically fetch the data and will broadcast via html page is the testing part.

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3 SUMMARY

This Lesson briefly discussed the Genisis software which help in making the database publish online. It is based on windows platform. It history begins and was designed y the UNESCO to make the libraries and data centre enable to make the data online via web. The web version Genisis web and CD database version, It is made possible to publish the database records on internet with the help of Apache or IIS or some other server.

4 GLOSSARY

UNESCO	The United Nations Educational, Scientific and Cultural Organization
CD	Compact Disk
IIS	Internet Information Services
IP address	Internet Protocol address
PC	Personal Computer
HTTP	Hypertext Transfer Protocol
HTML	The HyperText Markup Language
FTP	File Transfer Protocol
PDF	PortableDocumentFormat

5 ANSWERS TO IN-TEXT QUESTIONS

1. CDS/ISIS
2. Andriod
3. Fields
4. To create the WebOpac
5. Free
6. Computer with minimum configurations
7. Web Page
8. WINISIS

6 SELF-ASSESSMENT QUESTIONS

1. Write the steps of the installation ogGENISISWeb.
2. Write the steps of designing display format.
3. Describe the importance of GenisisWeb.
4. What are the advantages of GenisisWeb?
5. How GenesisWeb is useful for the libraries?

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LESSON 5.1

UNIT – V: INTRODUCTION TO INTERNET

(Basics of Internet)

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STRUCTURE

1.1 Learning Outcomes

1.2 Introduction

1.3 What is Internet?

1.4 The History of Internet

1.5 What is World Wide Web?

1.6 Computer Networks

1.7 LAN, MAN, WAN and WLAN

- 1.7.1 LAN (Local Area Network)
- 17.2 Metropolitan area network (MAN)
- 1.7.3 WAN: Wide Area Network
- 1.7.4 Wireless Local Area Network (WLAN)
- 1.7.5 Other Types of Network

1.8 Network topology

- 5.8.1 Types of network topologies

1.9 How does Internet work?

- 1.9.1 DSL
- 1.9.2 Dial-Up

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1.9.3 ISDN

1.9.4 TCP/IP

1.9.5 HTTP

1.9.6 DNS

1.10 Web Browser

1.11Email

1.9.1 Modules of an Email

1.9.2 Email Protocol

1.9.3 SMTP

1.9.4 POP3

1.9.5 IMAP

1.12 Internet Security

In-Text Questions

1.13 Summary

1.14 Glossary

1.15 Answers to In-Text Questions

1.16 Self-Assessment Questions

1.17 References

1.18Suggested Readings

1.1LEARNING OBJECTIVES

In this Unit No. 5 an effort has been made that learners can understand the basics of the internet, search engines, Meta Search engines, and internet search techniques.

After going through this lesson, you will be able to,

1. Understand about the internet and the world wide web
2. Get an idea about Network, LAN, MAN, WAN and WLAN etc.
3. Know how does Internet is working
4. Identify various terminology used in the Internet

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5. Get the knowledge about Search Engines, Seach Engine working mechanisms, their components etc.
6. Aware about what is Metasearch engines, its architecture with various examples
7. Understand the internet search techniques, why internet search with reasons
8. Know the type of internet searching
9. Understands about email system on the internet
10. Identify network topology
11. Know internet security into the interne
12. Learn the techniques of how the Internet aplied in libraries

1.2 INTRODUCTION

The World Wide Web, which is frequently called "the Web," which we exploring and experiencing today has become a part of our day to day life. Throughout day the day we search through the Internet to get any text, images, and other resources which are available on over the internet. Any bit of i.e. information of a news platform, an advertisement, an online library, a forum for sharing recipes, or an educational site everything became internet base today's life for reading the newspaper we search for newspaper articles on the web or to watch any TV shows we search the YouTube, so everything information is available on the internet or on the web. Today it seems that, once you are connected with the internet you are connected with the whole world.

1.3 WHAT IS INTERNET?

The internet is a universally connected network structure that enables worldwide communication and access to data through a massive connection of private, public, business, academic and government networks. It is governed by agencies like the IANA, which organized universal protocols. Once you connect your computer to a network, you can access programmes, share files, and have conversations with other connected computers.

1.4 THE HISTORY OF INTERNET:

Department of Defense's Advanced Development Projects Agency (ARPA), USA supported time-sharing computer research in the 1960s. Some of the earliest studies of packet switching, a key component of the Internet, may be traced back to the early 1960s, to the work of Paul Baran and, independently, to 1965, when Donald Davies began his own studies. Several resource sharing networks were constructed in the late 1960s and early 1970s, including the ARPANET, the Merit Network, and CYCLADES, all of which featured packet switching from the proposed NPL network.

Early 1970s, ARPANET was first used to connect a lesser number of network in various cities like Boston, San Francisco, and Los Angeles. Then, over time, ARPANET

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grew into a communications network that linked remote centres and military bases in the United States. This network was far from cities and had no central control.

1.5 WHAT IS WORLD WIDE WEB?

Internet is not a World Wide Web. It is a Web, an information system that lets people access documents and other web resources over the Internet. Web servers make documents and media that can be downloaded available on the network. Programs like web browsers can be used to get to these files. Character strings called Uniform Resource Locators are used to find servers and other resources on the World Wide Web (URLs). Hypertext Markup Language (HTML) web pages were the first and are still one of the most common types of documents (HTML) on the web.

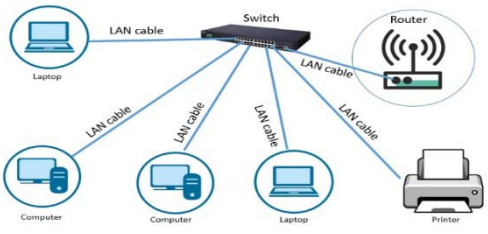
1.6 COMPUTER NETWORKS:

Computer Network is the communication between two deferent devices which are called network devices they comprises, hubs, routers, switches like components. A network's computers can communicate with one another via physical connections like cables and wires, or through more abstract means like radio waves, satellites.

1.7 LAN, MAN, WAN AND WLAN

1.7.1 LAN (Local Area Network):

LAN, or local area network, computers in a small area can communicate with one another and share resources like files and software. Using a private address in limited area as specified by the TCP/IP protocol, a switch or stack of switches connects the computers and devices in the network. In LAN data are transmitted in fast mode. LAN is established in small area that cover office building, library, hospitals, schools etc. Servers and workstations are two broad classifications that can be used to computers that are connected to LAN.



Local Area Network

(Fig. 1: Image source: www.itrelease.com)

1.7.2 Metropolitan area network (MAN):

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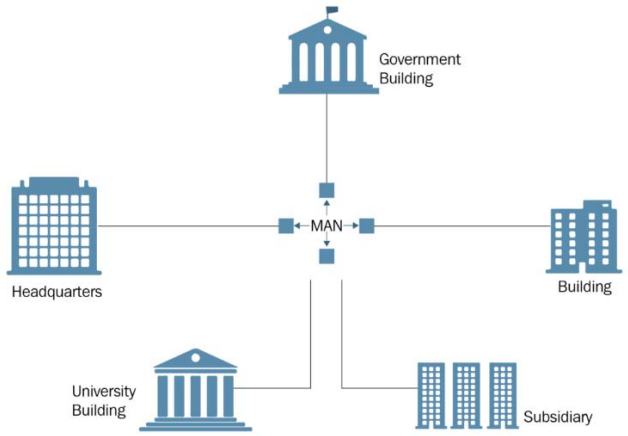
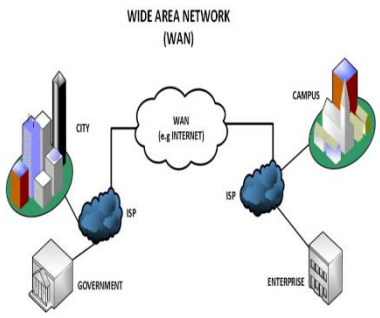
A metropolitan area network or (MAN) is a computer network that links computers in a cosmopolitan area, which may be a single large city, a group of cities and towns, or any large area with multiple buildings. A MAN is bigger than a local area network (LAN) but smaller than a wide area network (WAN). MAN consists high-speed connectivity.



(Fig. 2: Image Source: cyberhoot.com)

1.7.3 WAN: Wide Area Network:

Wide area networks or WAN are a type of telecommunications network that can link devices from diverse places and all over the world. Access of WAN can be possible through links i.e. virtual private networks (VPNs) or lines. Anyone can access data through WAN from anywhere.



(Fig. 3:Image source: jstech.com.ng)

1.7.4 Wireless Local Area Network (WLAN):

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Wireless LAN is also called as a Wi-Fi connection. Compared to a wired LAN, it is little slow. Wi-Fi is slower than 1 Gbps. IEEE 802.11 is the standard that Wi-Fi uses. Wireless LAN has a high latency rate, which means it takes a long time for data to move from one place to another. If many devices are sending and receiving data wirelessly, there is a good chance that your data will get mixed up with the other data, or that the signals will clash. We connect different devices in a wireless LAN by using a Wi-Fi hotspot. To make a wireless connection, no need any wires. A wireless modem, a wireless router, and a wireless network card are the devices that are used to make a wireless connection active. Wireless Internet connection uses radio-frequency instead of cable network. One can access the wireless internet from any location as long as the user is within the network area. It is a continuous connection that is more expensive and is mainly available in urban areas or large institutions. A 3G USB data card is used in every personal computer or laptop with a mobile internet connection. 3G USB data card is used especially to use internet anytime. It provides smooth and fast internet with high speed up to 7 Mbps. A 3G datacard eliminates the need for complicated wiring and landlines. 3G data card is also known as dongle (Dongle) or connect card (Connect card) and among its different types USB data card is more popular. BSNL, MTNL, Airtel, Vodafone, Tata etc. provide this facility. This type of datacard is easy to set up and automatically detects the datacard in the PC or laptop that is connected to it. Datacards have become extremely popular due to the facility of roaming, easy configuration, flexibility and cost effective. Figure 4 shows a sample of WLAN.

(Fig. 4: Wireless Local Area Network)

1.7.5 Other Types of Network:

SAN – Storage area Network, System Area Network or Server Area Nerwork

CAN- Campus Area Netwok, Cluster Area Network

PAN- Personal Area Network

DAN- Desk Area Network

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1.8 NETWORK TOPOLOGY:

The physical and logical structure of a network's nodes and links is known as topology. Devices like switches, routers, and software with switch and router functionality are typically included in nodes. A graph is a common way to represent network topologies.

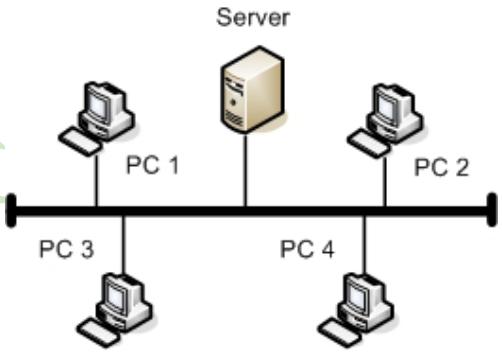
Network topologies explain how networks are set up and where traffic flows are located in relation to one another. Different network topologies exist for accommodating various network configurations. Network topology plays a big role in functioning network system. Selecting the right topology can help to increase performance and enhance effecincies.

1.8.1 Types of network topologies:

Physical network topologies and logical network topologies are two types of network topologies. A physical topology is a physical structure of nodes and connections.

1.8.1.1 Bus Topology:

In Bus topology, all of the devices share a single communication line or cable. There is a possibility of issues occurring in bus topology when numerous hosts deliver data at the same time. Therefore, in order to resolve this condition, Bus topology either implements CSMA/CD technology or designates a single host as the Bus Master



(Fig: 5 Image Source: certificationkits.com)

1.8.1.2 Star Topology:

In a star topology, every host is connected via a point-to-point link to a central component called the hub. In other words, the hosts and hub are connected point to point. Any of the following can serve as the hub. In Bus topology, if hub signal fails connectivity of all hosts will be failed. while in star topology if one cable failed the connectivity will not be failed.

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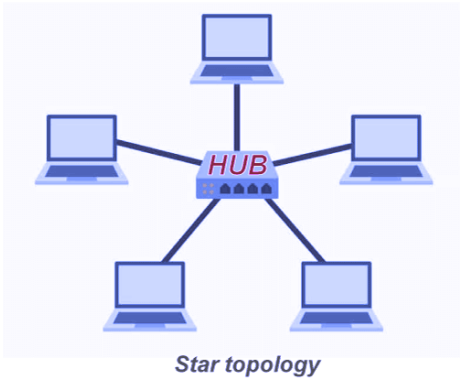
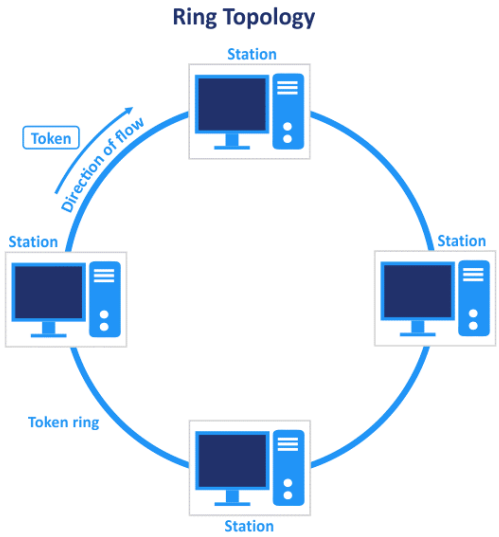


(Fig.6 Image Source: javatpoint.com)

1.8.1.3 Ring Topology:

In a ring topology, all nodes are connected in a circle, and data travels around in ring shape across the network.In a ring topology, terminators are required. Through a series of computers connected in a ring, signals move in a linear fashion. Data can also be travel in both the directions. Synchronous Optical Network-based metro network is the most popular method of ring topology.



(Fig. 7: Image source: www.nakivo.com)

1.8.1.4 Mesh Topology:

A host in this Mesh topology may have connections to other hosts, both single and multiple. Point-to-point topologies consist of networks in which each node makes a direct link to every other node in the network, or to a small subset of the network at most. Mesh topology has two types

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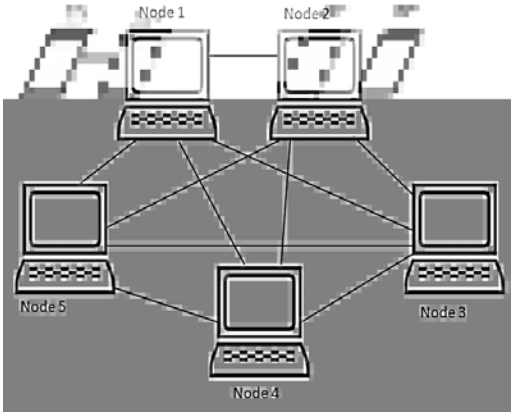
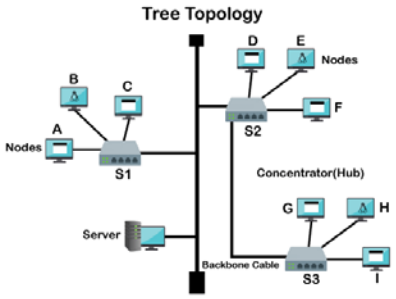
1. Full Mesh and 2. Partially Mesh



(Fig. 8: Image Source: computerhope.com)

1.8.1.5 Tree Topology:

Tree Topology is type of Hierarchical Topology which is currently the most used setup. The features of the bus topology are replicated here in what is essentially an expanded Star topology. This topology divides the network system into multiple layers. Mainly in LANs, a network is split into three categories of network devices. Layer 1 is the physical connection to the network, where machines are located. The middle layer is known as distribution layer, which functions as mediator between upper layer and bottom layer. The core layer is the topmost level of a network and represents its hub, the point from which all other branches extend.



(Fig. 9: Image Source: www.javatpoint.com)

1.9 HOW DOES INTERNET WORK?

There are definite ways to get online and connect to the Internet. So, it is needed an ISP (Internet Service Provider) to get this. The type of ISP you choose will depend on how many are in your area and what services they offer to their customers. So, here is a list of some of the most common ways to use the internet:

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1.9.1 DSL:

Digital Subscriber Line (DSL) is a technology that uses a Broadband connection,which has been popular for a few years. Even if you don't own a phone, your Internet service provider will connect your home with a telephone wire.

1.9.2 Dial-Up:

Dial-up connection: It is used to connect the system with the help of a dial-up connection, which is one of the slowest ways to connect to the Internet This is used to enable internet connectivity with the help of a telephone line and the user must have multiple connections then only they can use a Dial-up connection to enable internet.

1.9.3 ISDN:

ISDN is called for Integrated Serives Area Netowk This connection is also identified as a Dial-up connection. The speed of data is higher than dial-up connection. To connect the ISDN a dedicated telephone line is needed. In this connection cost is relatively high than other connections like dial-ip and DSL.in this connection a dedicated modem is also required to established the connection.

1.9.4 TCP/IP:

TCP/IP is a set of internet protocols that allow a sender and a receiver to talk to each other. TCP (Transmission Control Protocol) and IP (Internet Protocol) make sure that all users who are connected to the internet have a unique address called an IP Address. TCP, on the other hand, decides how data will flow into what segments (packets) and how fast it will move. IT breaks the message into small pieces and puts them back together before sending them to the receiver.

1.9.5 HTTP:

The Internet is built on HTTP (Hypertext Transfer Protocol), which is used to communicate in all over the WWW (World Wide Web). The idea behind HTTP is to send data over the Internet. When a user opens a web browser, they connect to the internet and set up an HTTP connection. Tim Berners-Lee built the first parts of HTTP in the 1990s. HTTP runs on top of the TCP/IP network. HTTPS is nowadays secured web communication protocol.

1.9.6 DNS:

DNS stand for Domain Name System. DNS turns domain names into IP addresses so that browsers can access data on the Internet. Each Internet-connected device has a unique IP address that further machines use to find it. IP addresses are such 192.168.1.0 (in IPv4), more complex and advanced IP address are also available in network system which are like 2500:cb00:2148:1::c629:d8a9 (in IPv6). The process of DNS converts IP address into domain name like www.example.com and which are user-friendly and easy to remember.

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1.10 WEB BROWSER:

To retrieve the information from the web on the computer screen, a programme is required which make the information, documets, and other web resources available as requested by users. This application is referred as a 'web browser' or 'browser'. Usually browser works with the web, although this process can also be used with personal networks. The first web browser was develpoed in 1990 by Surrey and Team Berners Lee. It was known as WorldWideWeb. The main function of the browser is to fetch and information from the web to the user. The browser identifies the resource through a URI (Uniform Resource Identifier). Commonly used URIs are prefixed with http. And it identifies resources to be retrieved from Hyper Text Transfer Protocol (HTTP). HTTP is discussed in this unit here. A URI starting with HTTPS indicates that the connection between the client and the browser is encrypted for security purposes. Some Basic Characteristics of Web Browsers (Some Preliminary Characteristics of Browsers) Information on the web can contain text, numbers, letters, symbols, sounds, videos and animations. For this the browser should be of the type that can work with multimedia information. The browser should be user friendly by providing useful options on the screen. Space allocated for URI / URL, file actions to store files, navigation actions to go to next and previous pages, other buttons like Refresh, Bookmark, Help etc. should be included in options.
FireFox, Google Crome, Microsoft Edge, Brave, Opera, Safari are popular web browsers.

1.11 EMAIL:

Email is short name of electronic mail, and it's the standard term for communicating via the Internet. Nowsday an important medium to communicating each other is an email, and the primary way of contact. Over the past few years, emails have undergone significant changes. The security and anti-spam measures, as well as the syncing and messaging capabilities, have been improved. To send or recive an email we need to have electronic device. Email can work across the network in Local Area network and over the internet. Email system is hosted on Email server which accept, send, forward, reject and store the email data. Earlier onliy text massages were sent and recived afterward attached of all forms media are uncluded to send the email. The extention of email program are eml, emlx, msg, and mbx.

1.11.1 Modules of an Email:

- **Sender:** The sender is responsible for drafting an email containing all of the necessary information for the recipient.
- **Receiver**: The receiver obtains the information sent by the correspondent via email.
- **Email address:** Like a physical mailing address, an email address is where messages are delivered to the sender and received by the recipient.
- **Email Client:** Email client is the application to send, receive, store write, dedet, and manage emais. Which are Outlook, Gmail, Thunderbird, Mailbird, eM Client etc.

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1.11.2 Email Protocol:

Email protocol is a set of rules to assure that emails are sent and received without any problems through the internet. In fact, email protocols that handle email transactions. They allow us to exchange electronic mail across hardware, networks, and computer system
In addition, you can use these email protocols to check and manage your inbox from any device or computer with an internet connection.

1.11.3 SMTP:

SMTP, which refers as Simple Mail Transfer Protocol, is responsible for the delivery of email messages. Email clients and mail servers utilise this protocol to exchange emails between computers.

1.11.4 POP3:

POP3 is an Internet standard protocol used by local email software clients to collect emails from a remote mail server through a TCP/IP connection. Since the initial version was introduced in 1984, the Post Office Protocol (now at Version 3) has become one of the commonly utilized protocols and is utilised by nearly all email clients. Its popularity stems from the protocol's ease of configuration, operation, and maintenance. Using POP3 Email can be doawnloded, read offline.

1.11.5 IMAP:

IMAP is also a important protocol for mail server. It is known as a Internet Message Access Protocol (IMAP). IMAP is an application layer protocol that functions as a contract for receiving emails from a mail server. It was developed by Mark Crispin in 1986 as a protocol for remote access to mailboxes, and its current version is IMAP4. It is the most popular protocol used for retrieving emails. This term is also identified by the names Internet mail access protocol, Interactive mail access protocol, and Interim mail access protocol.

1.12 INTERNET SECURITY:

Internet security is a word that describes the safety of online activities and transactions. It is a subset of the broader concepts of cybersecurity and computer security, encompassing browser security, online behaviour, and network security. We spend a significant amount of our life online, and we may experience the following internet security threats:

Hacking: When unauthorized persons gain access to computer systems, email accounts, or websites, this is known as hacking.

Malware/ Virus: Malware refers to viruses or malicious software that can harm data or make systems vulnerable to other attacks.

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Identity theft: in which thieves may steal personal and financial data.

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IN-TEXT QUESTIONS

1. HTML stand for?
   A. Hypertext Makeup language
   B. Hypertext Markup Language
   C. Hypertext Machine Langage
   D. None of the Above

2. What is MAN?
   A. It's a network protocol
   B. Local Area Network
   C. Wide Area Network
   D. Metropolitan Area Network

3. Which is not an application-level protocol?
   A. FTP
   B. S/MIME
   C. PGP
   D. HTTP

4. Which IP is reserved for the local host?
   A. 192.168.1.1
   B. 192.168.0.1
   C. 127.0.0.0
   D. None of above

5. The IPv4 size is.
   A. 16 Bits
   B. 32 Bits
   C. 64Bits

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1.13 SUMMARY

In this chapter, various concepts and applications of the internet are included. The technology used in the internet, network concepts its topologies, how does internet work, components of the internet, and web browser are covered. In addition to that, the Email system, and the concept of internet security have also been discussed.

1.14 GLOSSARY

ARPA: Advanced Development Projects Agency

Browser: A software program or application avail for view Websites and web contents

IP: Internet Protocol

LAN: Local Area Network

MAN: Metropoliton Area Netwok

Network: Computer network is the communication between two different devices, which arecalled network devices. They comprise hubs, routers, and switches-like components.

Network Topology: Physical network topologies and logical network topologies are two types of network topologies. A physical topology is a physical structure of nodes and connections

Server: A computer with a high configured host that shares files and controls the client computers

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TCP: Transmission Control Protocol)

WAN: Wide Area Network

WLAN: Wireless Local Area Network

WWW: Word Wide Web

1.15 ANSWERS TO IN-TEXT QUESTIONS

1. (A) Hypertext Markup Language
2. (D) Metropolitan Area Network
3. (A) FTP
4. (C) 127.0.0.0
5. (B) 32 Bits

1.16 SELF-ASSESSMENT QUESTIONS

1. What is LAN, Explain in detail.
2. Write a note on TCP/IP.
3. What is network topology, brief in detail.

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LESSON 5.2

UNIT – V: INTRODUCTION TO INTERNET

Topic: Search Engines and Meta Search Engines

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STRUCTURE

1.1 Learning Objectives

1.2 Introduction

1.3 What is a Search Engine?

1.4 How does a search engine work?

1.5 Search Engine Components

1.5.1 Web Crawler
1.5.2 Database
1.5..3 Search Interfaces

1.5.4 Rank Algorithm

1.6 Search Engine Examples

1.6.1 Google

1.6.2 Bing

1.6.3 Yahoo

1.6.4 Ask.com

1.6.5 Yandex

1.7 Meta Search Engine

1.8 What is Metasearch Engine

1.9Architecture of Metasearch Engine

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1.9.1 Interface

1.9.2 Dispatcher

1.9.3 Display

1.9.4 Personalization

1.10 Advantages of Metasearch Engines

1.11 Examples of Metasearch Engines

1.11.1 Dogpile

1.11. 2 Excite

1.11.3 MetaCrawler

1.11.4 MetaGer

1.11.5 Mamma

1.12 Differences between a Search Engine and a Metasearch Engine

1.13 Metasearch for SEO

1.14 In-text Questions

1.15 Answer of In-Text Questions

1.16 Self-Assessment Questions

1.17 Summary

1.18 Glossary

1.19 References

1.20 Suggested Readings

1.1 LEARNING OBJECTIVES

1. In this Unit No. 5 an effort has been made that learners can understand the basics of the After learning this section Unit, you will be able to:
2. Know the search mechanism, and search engines
3. Get familiar with various components of search engines

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4. Acquainted with different types of search engines
5. Understand the Metasearch engines and its applications
6. Familiar with architecture of Metasearch Engine
7. Advantage of Metasearching
8. Deffenrt examples of Metasearch engine

1.2INTRODUCTION

Today, Search Engines are playing an vital role with many of us, and we are depended on search engine to find any bite of information. Technically, Archie was the first search engine. Archie, was build up in 1987 at McGill University and was intended to look for files online (on FTP servers), not Web content. Oscar Nierstrasz further launched W3Catalog (formerly known as "Jughead") at the University of Geneva in September 1993. The service mostly converted already-existing lists or catalogues of web sites into searchable formats. Then, one of the most widlyAliweb (Archie Like Indexing for the Web) was the first web search engine. Aliweb, which went live in November 1993, allowed webmasters to submit their webpages along with the pertinent keywords and descriptions. One year later, two Stanford University graduates founded "Yahoo!" in 1994 as a conventional web directory before introducing a search engine the following year. Yahoo didn't develop any powerful new technologies, Yahoo's popularity was entirely due to its appealing branding and user-friendly interface. After all, Google was founded by Larry Page and Sergey Brin at Stanford University in 1998 and changed the concept of search engines.

1.3 WHAT IS A SEARCH ENGINE?

A search engine is a software program that can be accessed via the Internet and searches databases of data in response to user queries. The search engine offers a list of outcomes that most closely match the user's search criteria. The Internet is now home to a wide variety of search engines, each with its own competencies and features. Archie, the first search engine ever created, was used to look for FTP files, while Veronica, the first text-based search engine, was deemed the first. Today Google is currently the most widely used and populat search engine across the gblob. AOL, Ask.com, Baidu, Bing, DuckDuckGo, and Yahoo, Bing are some of the other well-known search engines.

1.4 HOW DOES A SEARCH ENGINE WORK?

Big search engines have thousands or even billions of pages, and many of them categories the results by how relevant they are. Usually, different algorithms are being used

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to figure out to perform the search indexing. All search engine data or database is gathered by a programme called a "spider" or "crawler" that goes to each page on the Internet and gathers information from it. When a page is crawled, the data on it is processed and put into an index database. An indexing process covers text acquisition, text transformation, and Index creation

After the data processing, it is lastly fragmented into files, added to a database, or loaded into memory, where it can be accessed when a search is done.

1.5 SEARCH ENGINE COMPONENTS:

The search engine consists of four basic components:

1.5.1 Web Crawler:

Web Crawler basically a software application that crawls out and collect massive amount of data from the web.
Googlebot is the widely used web crawler.

1.5.2 Database:

The search engine database is non-relational database. This database stored all web information data from the Internet. It consists abundance of data into the database. Amazon Elastic Search Service and Splunk are two of the most well-known database type of search engines.

1.5..3 Search Interfaces:

The search Interface is the key component of any search engine. It is an interface between the database and the public at large. It facilitates database queries, which is its primary function. Operators, Phrase Searching, Truncation are the basic features of search interface for any search engine.

1.5.4 Rank Algorithm:

Google applied this ranking algorithm to determine where various websites should be located in the search engine's overall results.

1.6 SEARCH ENGINE EXAMPLES:

1.6.1 Google:

Today, The Google Search Engine has become most widely used to be the best search engine available in the world. Google has confronted more tha 70% of the search

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engine industry. To offer better service to its users, Google search is constantly upgrading and refining its search engine algorithm. While Google may be the most well-known search engine, as of 2015.

1.6.2 Bing

Bing is developed by Microsoft and launched in the year 2009. Microsoft's Internet Explorer uses Bing as its built-in search engine. Bing's developers are constantly working to improve the search engine, but they still have a ways to go before they can genuinely challenge Google. Microsoft's search engine features multiple features, such as image, web, and video search in addition to maps. Bing introduced the Places application recently.

1.6.3 Yahoo

Yahoo, founded in 1994 by Jerry Yang and David Filo, then Stanford University undergraduates. In 1995, they released Yahoo! Search, a tool that performed as a search engine for the Yahoo! Directory. It was the first widely used search engine available on the Internet. In January 2010, Microsoft take over yahoo.

1.6.4 Ask.com

Ask.com, a search engine which was formerly known as Ask Jeeves,ans also is an Internet company that focuses on providing answers to questions and was established in 1996 in Berkeley, California by Garrett Gruener and David Warthe.

1.6.5 Yandex

Yandex is a Russin base search engine company. This search engine provides an internet base search engine service since 1997.

1.7 META SEARCH ENGINE:

Meta-search engine is a web-based application that compiles data from various search engines on the web. it is a search engine that integrates the results of multiple search engines and returns a single result. It can also be considered as an internet tool for information retrieval. Every search engine responds to several inquiries each second.

1.8 WHAT IS METASEARCH ENGINE:

Meta-search engine is a web-based application that compiles data from various search engines on the web. it is a search engine that integrates the results of multiple search engines and returns a single result. It can also be considered as an internet tool for information retrieval. Every search engine responds to several inquiries each second.

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Metasearch engines execute queries on most other search engines and then return the results as summaries of those sites in an explicit way.

Daniel Dreilinger from Colorado State University developed Metasearch Engine. Daniel created Search Savvy, which searches twenty websites and returns a single result. Then, Erik Selberg, a student at the University of Washington, developed MetaCrawler. It was an upgraded version of the Search Savvy software. A metasearch called HotBot was further created in 1996; and it was faster than its predecessors and was search within their search engines' results. Later, it was reduced time. India's first meta search engine, HumHaiIndia.com, was developed by Sumeet in the year 2000. The website eventually changed its name to Taaza.com.

1.9 ARCHITECTURE OF METASEARCH ENGINE:

1.9.1 Interface:

The Metasearch Engine has an interface that is aesthetically consistent with that of major search platforms like Google and Yahoo. It also lets you specify which search engines it should use and which specific results you want it to return.

1.9.2 Dispatcher:

The generator of queries is the dispatcher function for the entire indexing process.

1.9.3 Display:

The queries are used to generate output, which is then written back to the screen. For this purpose, it employs several approaches like page ranks, parsing methods, clustering, and stitching.

1.9.4 Personalization:

The personalization is a unique feature of meta searching, which differ the standard search engines. In other words, the customization is based on the user. This means putting the results next to each other and comparing them.

1.10 ADVANTAGES OF METASEARCH ENGINES:

There are several exciting possibilities that meta-search could go in on today's web 2.0 (and soon to be web 3.0) environment.

- The meta searching is user-friendly and simple, and easy to download.

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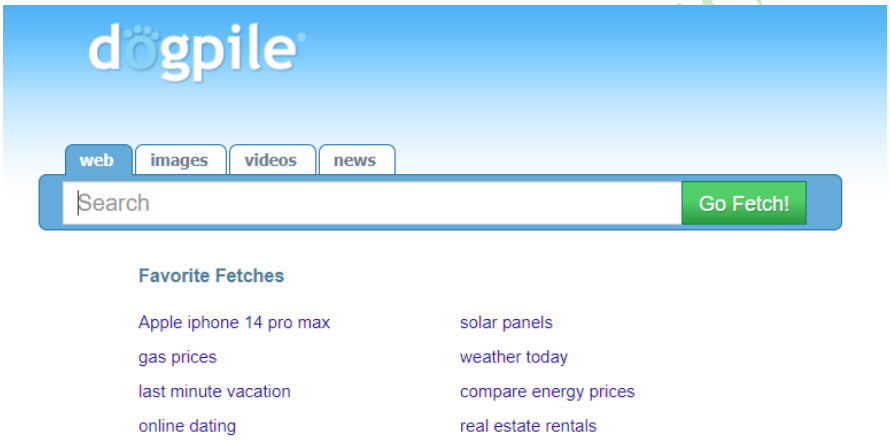
- Now Meta search engines are freely available like other search engines
- It retrieves comprehensive results rather than standard search engine
- It saves customers time by providing complete results in a short amount of time rather than forcing them to individually search for results across multiple sites.
- Metasearch engine is more secure application it hides IP addresses and stops vulnerability.

1.11 EXAMPLES OF METASEARCH ENGINES:

1.11.1 Dogpile:

Dogpile is developed by Metasearch technology. It collects results from various sources, including Google, Yahoo!, Yandex, Bing. This URL is http://dogpile.com



(Fig. 1: Source: www.dogpile.com)

1.11. 2 Excite:

In June 1993, Graham Spencer and Joe Kraus founded Excite Metasearch Engine asArchitext in a garage in Cupertino, California, to create a new kind of meta searching.URL for Excite is https://www.excite.com

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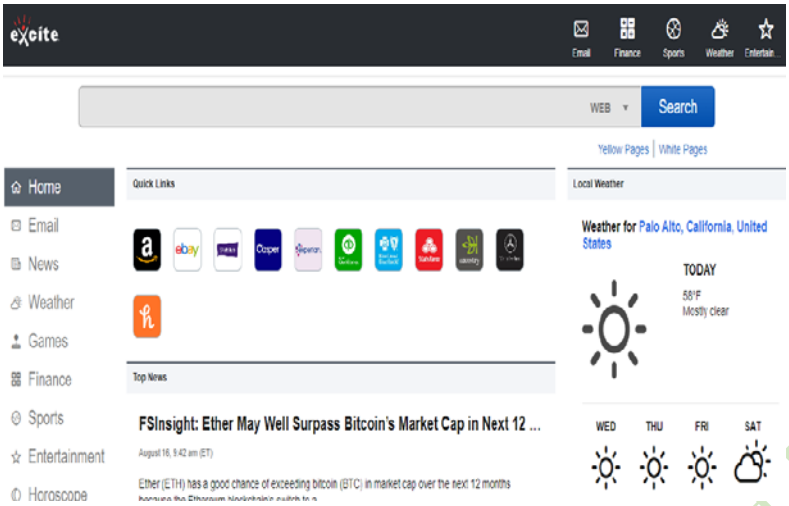
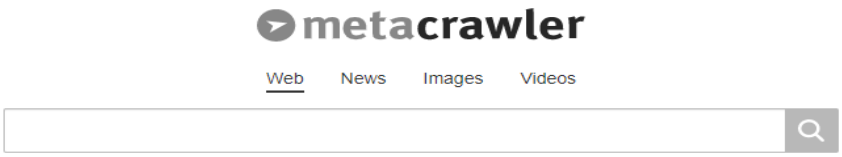


(Fig.2: Source: excite.com)

1.11.3 MetaCrawler:

MetaCrawler metasearch engine is developed by InfoSpace company by Erik Selberg. It indexes web search results from Google, Yahoo, Bing, Ask.com, About.com MIVA.

MetaCrawler also delivered the option to search for , news, images, video, , and telephone directories, and and audio. MetaCrawler launched in the year of 1995. The URL is https://www.metacrawler.com



(Fig . 3: Image source: metacrawler.com)

1.11.4 MetaGer:

MetaGer is a metasearch engine with a key focus on the privacy of the users. The University of Hannover and the German non-governmental organisation SUMA-EV (Association for Free Access to Knowledge) started this meta-searching project in 1996. The URL is https://metager.org

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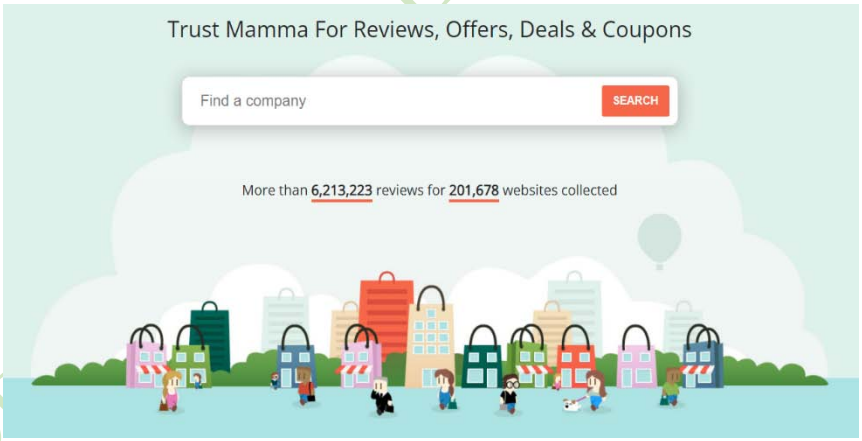
(Fig. 4: image source: metager.org)

1.11.5 Mamma:

Mamma is also a popular search engine in Metasearch Engines tools. You can use the Mamma metasearch engine to include or exclude search engines based on your preferences. Mamma is great for video searches and directories.



(Fig. 5: Source: https://www.mamma.com)

1.12 DIFFERENCES BETWEEN A SEARCH ENGINE AND METASEARCHENGINE:

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In order to determine which websites' content most closely matches the search query submitted into the search engine, search engines send out queries to those websites. According to algorithms, it returns a results page with the results listed in order of relevance.

Multiple search engines are queried by a metasearch engine, which then compiles the results into a list. This list that they originated from can be sorted by subject or relevancy by the search engine. The user can then decide which result best correspond to their search measures.

1.13 META SEARCH FOR SEO:

Metasearch engines can helpful in a variety of ways especially for search engine strategies. With a metasearch engine, you can quickly and easily access specialized search engines when researching exact topics and texts. Metasearch engines, on the other hand, can aid in keyword optimization because they typically have a large site diversity with regard to a specific topic or keyword. This makes it easier to find possible synonyms or meaningful phrase combinations for a given keyword. A time-saving benefit of meta search engines is that several search engines do not need to be individually searched.

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IN-TEXT QUESTIONS:

1. Which one of the examples of the search engine?
   A. Window
   B. Ubuntu
   C. Google
   D. MS Word

2. What is the functions of Web Crawler?
   A. Collect the massive amount of data from the Internet
   B. Slipt data in different parts
   C. Create a database for search engine
   D. None of the above

3. The basic function of Meta-search engine is?
   A. Compile data from various search engines
   B. Compile data from web pages
   C. Index data from various information sources
   D. None of the above

4. Which one of the following is not a Metasearch engine?
   A. Yahoo
   B. Excite
   C. Dogpile
   D. MetaGer

5. Dispatcher is a feature of?
   A. Web page
   B. Browser
   C. Search engine
   D. Metasearch engine

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1.14SUMMARY

This lesson emphasizes the search functionality of search programs called a search engine. Search engines are web-based tools for doing online document or object searches. The several types of search engines, such as simple search engines, meta-searching engines, and search directories are familiar with users. Simple and advanced search interfaces are available on search engines. Advance search or special search makes search work easier to conduct several types of searches, including Boolean, truncation, case-sensitive, fields-level, file-type, stop-word, and sorting searches. Metasearch enigne, its components, advantages and examples of Meta Search engines are covered in this lesson.

1.15 GLOSSARY

Search Engine: A search engine is a software program that can be accessed via the Internet and searches information databases in response to user queries.

Web Crawler: Web Crawler basically a software application that crawls out and collects massive amount of data from the web.

Algorithm: An algorithm is a set of instructions or rules to adhere to for carrying out a particular task or resolving a particular problem.

Meta Search Engine: Meta-search engine is a web-based application that compiles data from various search engines on the web. It is a search engine that integrates the results of multiple search engines and returns a single result.

Dispatcher: The generator of queries is the dispatcher function for the entire indexing process.

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1.15 ANSWERS TO IN-TEXT QUESTIONS

1. (C), Google
2. (A), Collect the massive amount of data from the Internet
3. (A), Compile data from various search engines
4. (A), Yahoo
5. (D), Metasearch engine

1.16 S

1. W h a t is a search engine? Explain with an example of at four three search engines?
2. Write a short note on Metasearch engine and discuss it advantages.
3. Discuss Metasearch engine architecture with its components.

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LESSON 5.3

UNIT – V: INTRODUCTION TO INTERNET

Topic: Search Engines Techniques

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STRUCTURE

1.1 Learning Objectives

1.2 Introduction

1.3 What is an Internet Search

1.4 Reason for Internet Search

1.5 Types of Web or Internet Search

- 1.5.1 Basic Search
- 1.5.2 Specific Search
- 1.5.3 Boolean Search
- 1.5.4 Navigational Search
- 1.5.5 Informational Search
- 1.5.6 Transactional Search

1.6 Search Engine Optimization (SEO)

1.7 How does SEO work?

- 1.7.1 Website Content
- 1.7.2 Who is referring to you
- 1.7.3 Title Tags and Meta Tags

1.8 Summary

1.9 Glossary

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1.10 Answers of In-text Questions

1.11 Self-Assessment Questions

1.12 References

1.13 Suggested Readings

1.1 LEARNING OBJECTIVES

After reading this lesson, the learner will be able to

1. Understand search techniques of information resources
2. Get familiar with various types of internet search
3. Know search engine optimization

1.2INTRODUCTION:

Today, The Internet has grown to be the world's information resource. And it has become a library of information. To finding out information on the internet has became more of a challenge due to the great volume and information. Numerous search engines can be found on the web.. This alphabetical index features general-purpose search engines are also on the web. information can be found on the internet through searching the information with apprpreate mode. And which required information search skills. Information consists web pages, images, audio, video etc.

1.3 WHAT IS AN INTERNET SEARCH:

Internet search is also an inquiry of information into a search engine that yields both paid and organic results. The paid results are the ads that appear at the top and bottom of the page and are labeled as such. Organic results are unmarked results that appear in between advertisements.

1.4 REASON FOR INTERNET SEARCH:

We conducted search for many reasons, determining what kind of information is needed, to acquire knowledge, to get business information, for news, for investigation or research, for analysis. Getting the correct information from the web is a challenging task for anyone. So to fulfill this information need search techniques and strategies are a significant part.

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1.5 TYPES OF WEB OR INTERNET SEARCH:

Looking the user's perceived need for web search there are five types of web search:

1.5.1 Basic Search:

Basic search is very simple search, whatever we may think to search using search engine we type the random word and perform the search, the search engine will resposethousads of pages.

1.5.2 Specific Search

This search technique is also known as an advanced technique in general. To perform a search for the exact expression of a keyword, we required a specific search query using various truncations or operators i.e. adding Quotations marks, boolean operations etc.

For example, "Digital Library."

+ Operator and – operator (+ and – can be added to limit the search result)

'+' Operator

Through '+' sign we may expand the search result i.e., digital library +PDF

The result on the digital library with all PDF will be desplaied from search engine.

'-' operator

Through the '-' sign, we may limit the search result. i.e,library science – science, in this case, only library science results will be displayed.

1.5.3 Boolean Search:

Boolean searches are a type of query that use Boolean logic to combine many search terms into one.

Boolean arguments like (**AND, OR, NOT**) may narrow or expand the search result. The word should be in **CAPITAL LETTERS** in between the keywords.

AND (expand the search result)

i.e. library science AND information technology

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in this search the result will be displayed on library sceince as well as information technology

OR (narrow the search result)

i.e. Dr. S.R. Rangnathan OR Library Classification

on the above search either Dr. S.R. Rangnathan or Library Classification realted search result will be displayed.

NOT (narrow the search Result)

NOT-operator may narrow down the search result, for exaple search for Dr. S.R. Rangnathan NOT Library Classification mean we need result only for Dr. S.R. Rangnathan, not for Library Classification.

':' Colon sign for searching the specific site for example image: library building, the result will be displayed on images.

1.5.4 Navigational Search

A navigational search is a type of keyword search performed when the user has a specific plan in mind, such as a website or page within a website. For instance, finding the infomration about the Prime Minister of India, so just type the keyword in Google like search engine, Google will perform the search result with the result. The list will be displayed with the link, and clicking on the link, the webpage for Prime Minster will be directed.

1.5.5 Informational Search:

These search queries cover a wide-ranging area (e.g., digital library or media center) and it may be a plethora of search results. Once anyone move to an informational search query into Google or any another search engine information search will result from wiki pagaes first. This is one type of answering the question. For instance we ask how to create video using coreldraw? Etc.

1.5.6 Transactional Search:

A transactional search query is a search where a complete transaction would be included, i.e. creating a purchase. It contains the specific brand name or product name, i.e. digital kiosk etc.

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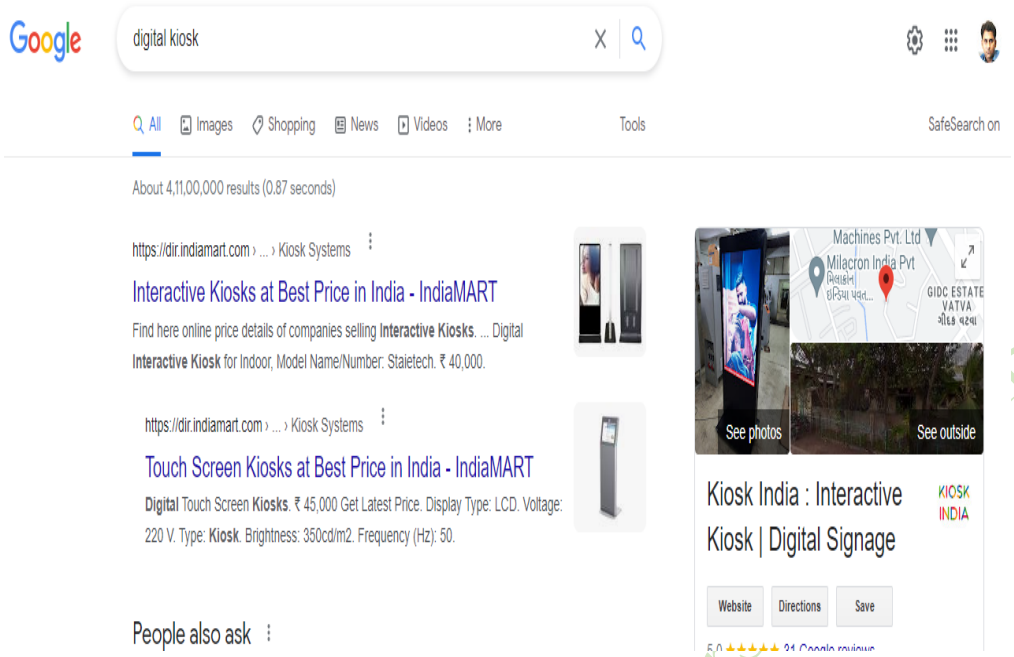

(Fig: 1.Source: www.google search)

1.6 SEARCH ENGINE OPTIMIZATION (SEO):

Search engine optimization or SEO is a technique or method for increasing a website's visibility and ranking through search engines. An effective SEO strategy is essential for increasing both the quality and number of visitors to your website. To increase the traffic on our website, what we do, we post our website on the blogs, or market on facebook, Yutube or Linkdin and on other hand we advertise our website but can not get optimum number of result on search engine. And the third way to make our website search engine obtimzed. Making SEO base website means, I can radically improve my website ability to tank in the search engine that grow my potential users.

1.7 HOW DOES SEO WORK?

Big search engines like Google and Bing applie Crawlers (also known as bots or spiders) which are are used by to index the entirety of the web and compile detailed information about its contents. The crawler begins its journey from an established web page, from which it explores the site's internal linking structure and any external linkages to other sites. The crawler is able to determine the information of each page and its semantic

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relationship to the other pages that make up the search engine's massive and create big index database. If the website is not indexed with this index there are no possibility to appear the website on the search engine.

When deciding how to rank the website, search engines take two primary aspects into account.

1.7.1 Website Content:

Search engine crawlers read your website's HTML source code, looking for certain tags, descriptions, and instructions that will help them determine what themes your site covers and thereby which pages to index.

1.7.2 Who is referring to you:

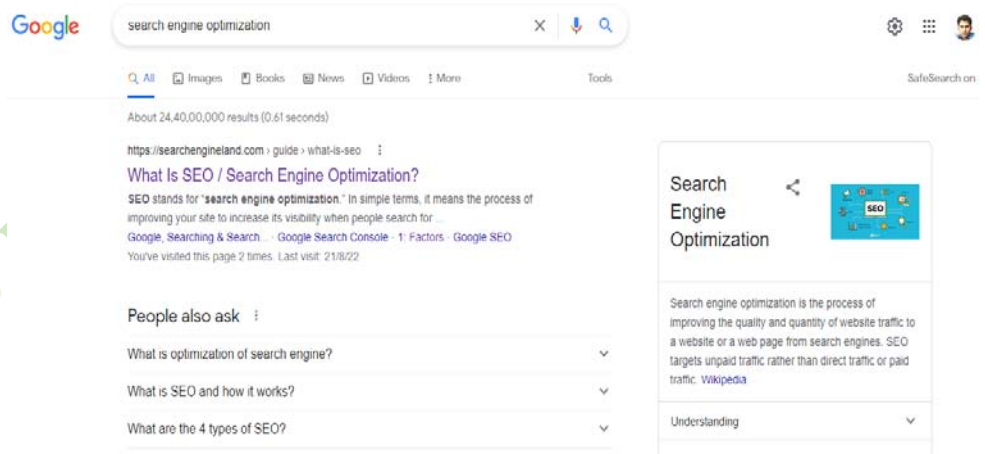
When crawling the website for indexing operations, search engine bots also look for external links to follow. The greater a website's number of incoming links, the greater its reliability and credibility. To put it simply, an increase in the number of incoming links to a website is like an affirmation of its content to other website.

In response to a user's query, a search engine retrieves the most relevant results from its index and delivers them on the SERP (Search Engine Results Page). Afterwards, and it also ranks the result by how the website is authentic and relevant.

Once you conduct same search with two deferent search engines, the search result may vary because each search engine applies deferent algorithm that takes into account a number of factors to decide what results to put on the SERP when type a search query.

Here we may coduct same seach with two search engine i.e. **Google** and **Bing**

Google search engine results:



(Fig. 2 Bing search engine results)

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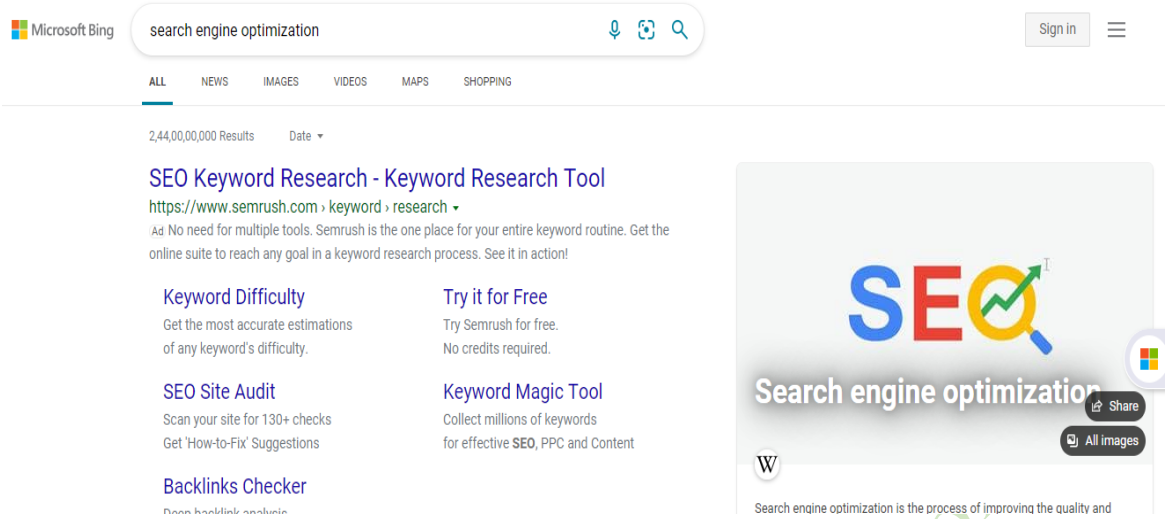

(Fig. 3 Searh in Bing Search Engine)

When determining what information to display in the SERP, a search engine algorithm may take into account with the following:

- HTML backend codes of the webpages
- Link type (social media sharing i.e. Facebook, linked in, twitter)
- Page content (Tags, Keywords, media)
- The past performance of a listing
- Topographical (Geographical) location of the inquirer (user)

1.7.3 Title Tags and Meta Tags:

Ttitle Tags: Every webpage that you make has a title tag, in addition to any actual text headlines that may be included on the page. This is the snippet of text that displays in the top left corner of your web browser or on the tabs of your web browser. Additionally, the title tag is the blue link that appears when the search engines list your webpage in the SERP. This link is displayed by the search engines. The maximum number of characters allowed for title tags is 75.

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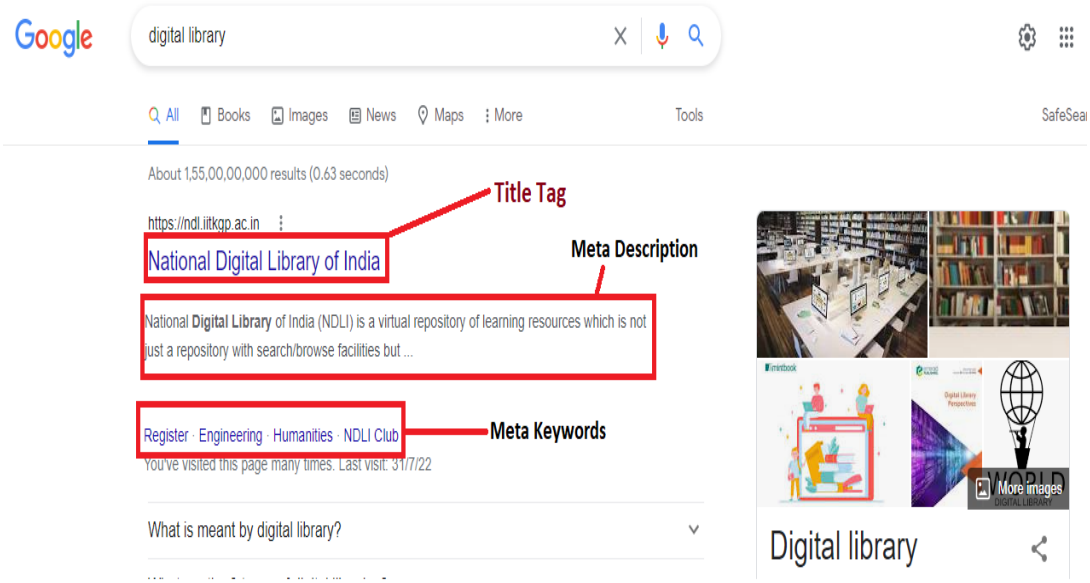
Meta Tags: Meta tags are snippets of code that can be included into the HTML of a website.In the head of your HTML document, the meta tags are typically located closer to the code for the title tag.

There are two different types of meta tags: the meta description and the meta keywords.

Meta description: A snippet which indicates what your particular webpage is all about is referred to as the meta description. When a search engine is listing your website on the SERP, the meta descriptions will usually be the first place they look for text to post under the blue link representing your domain name. If you do not include a meta description, the search engines will usually choose an article at random from the page they are connecting to as their description. There is a character count cap of 150 for the meta description.

Meta keywords involves of an additional contents snippet in the HTML that lets you to list a few diverse keywords that relate to your webpage.



(Fig. 4 SERP)

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IN-TEXT QUESTIONS:

1. What do you mean by specific search?

   A. A search usages keywords
   B. A search usages truncation or operators
   C. A search usages paragraph
   D. None of above

2. '**AND**' operator in Boolean search mean narrow down the search (True/False)

3._____increasing the visibility of website.

4. The maximum number of characters allowed for title tags are_____.

1.8SUMMARY

In the field of computing, Internet has now become a buzzword. Today no such place remains to connect with the internet, whether it a business or agriculture or space science or architecture, arts or library center. For libraries, plenty of information resources are available at fingertips. To fulfill the information needs, the search engines play a crucial role and have become more popular today. To find a inforamtion on the web knwoledge of search techniques and search strategies are essential for all engine. This unit includesconcept of internet, application of internet in library and information domain, concept of LAN, WAN, MAN and WLAN, information of TCP/IP, various network topology over the internet, email system, internet security. In the second section, the search engine basics, metasearch engines, type of search engine, type of metasearch engines, search tequenics, various types of search are included.

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1.9 GLOSSARY

Bing: Bing is a search engine developed by Miscrosft and it was earlier known as a MSN Search

Boolean search: isBoolean searches are a type of query that use Boolean logic to combine many search terms into one.

Crawling: It refers to the procedure by which search engines find your online presence.

Indexing: The storing and organizing of information or data found through the harvesting.

Internet search: Internet search is also an inquiry of information into a search engine that yields both paid and organic results. The paid results are the ads that appear at the top and bottom of the page and are labeled as such. Organic results are unmarked results that appear in between advertisements.

Organic: Having search engine responses without paying for it.

SEO: SEO is a short name ofsearch engine optimization which is a technique or method for increasing a website's visibility and ranking through search engines. An effective SEO strategy is essential for increasing both the quality and number of visitors to your website

1.10 ANSWERS TO IN-TEXT QUESTIONS

1. A search usages truncation or operators
2. False
3. SEO
4. 75

1.11 SELF-ASSESSMENT QUESTIONS

1. Explain the types of navigational, informational Search, and transactional Search.
2. How Does SEO works? Explain.
3. What do you mean by Meta description please discuss in detail?

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LESSON 5.4

E-Resources and Online Databases

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Concept of e-resources
1.4 Need of e-resources
1.5 Managing e-resources
- 1.5.1 Selection
- 1.5.2 Acquisition
- 1.5.3 Staffing
- 1.5.4 Licensing
- 1.5.5 Budgeting
- 1.5.6 Cataloguing
- 1.5.7 Maintenance
- 1.5.8 Staff refresher course and user education

1.6 Format of e-resources
1.7 Types of e-rsources
- 1.7.1 E-journals
- 1.7..2 E-reports
- 1.7.3 E-books
- 1.7.4 E-thesis and dissertations
- 1.7.5 Electronic databases
  - 1.7.5.1 Bibliographic Databases
  - 1.7.5.2 Full-text Databases
- 1.7.6 Institutional repositories

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1.14 Self-Assessment Questions
1.15 References
1.16 Suggested Readings

1.1 LEARNING OBJECTIVES

After finishing this Lesson you will understand the following points:

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- Meaning of e-resources
- Subcategories of e-resources
- e-books and e-journal definitions;
- differentiate between various database types.
- Discover some of the top academic databases

1.2 INTRODUCTION

The numerous facets of e-Resources are the module's main focus.Digital technology, is now simpler, faster, quicker more comfortable to apply the stored resources. Remote locations have easy access to electronic resources. Electronic resources reduce information overload and address storage issues. Sources from print are being digitalized. For the academic community, electronic information sources are becoming more and more crucial. Technology's development has forced libraries to expand their holdings. The e-resources are the most well-known of all. This lesson gives an overview of these online resources, their administration procedure, and various formats. It also discusses the benefits and drawbacks of each.

Data processing by computers is possible under certain conditions. Data can be processed by computers at breakneck speeds. The amount of data that computers process is enormous. Data must be structured for storage in order to be processed quickly and effectively. Database management systems are specializedprograms that make it easier to store data in an organized manner. You will study the idea of databases and how it relates to daily life in this lesson.

1.3 CONCEPT OF E-RESOURCES

The 21st century's libraries and information services are evolving quickly. With the quick growth of electronic publication, libraries are not only buying reading materials like physical books and journals but also setting up access to a variety of online learning resources. Users' lives and educational experiences are altering as a result of online resources and tool use. While in its early stages the World Wide Web was primarily used for push-type applications to provide users with information and resources, the growth of Web 2.0 and the adoption of open source software, and the concept of shared use have placed a greater emphasis on user-generated content and applications for sharing. This has prompted the quick growth and widespread use of electronic resources. This has prompted the quick growth and widespread use of electronic resources. E-Resources make up a large amount of the world's literature. They make reference to online information sources. e-books, e-journals, databases, CDs/DVDs, e-Reports, e-Maps, e-Pictures/Photographs, e-Manuscripts, e-Theses, e-Newspaper, Internet/Websites - Listservs, Newsgroups, Subject Gateways, USENET, FAQs, etc. are some examples of the various forms of e-resources.

DEFINITIONS:

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According to AACR2, 2005 Update, an electronic resource is: "Material (data and/or program(s)) encoded for manipulation by a computerized device. This material may require the use of a peripheral directly connected to a computerized device (e.g., CD-ROM drive) or a connection to a computer network (e.g., the Internet)." This definition does not include electronic resources that do not require the use of a computer, for example, music compact discs and videodiscs.

According to Library and Information Technology Glossary "Term used to describe all of the information products that a library provides through a computer network... ..

" According to Wikipedia, Electronic Resources means "Information (usually a file) which can be stored in the form of electrical signals, usually on a computer; Information available on the Internet".

According to Gradman glossary, "A publication in digital format which must be stored and read on a computer device. There are two types: Direct access: these are physical objects such as CD-ROMs, diskettes, computer tapes, and computer cards, containing text, images,

IN-TEXT QUESTIONS

1. Access to back volume of e-journals aregenerly sold based on _____.
2. COUNTER is related to_____.
3. The body for settling the dispute to arbitration related to subscription of e-resources in India is_____.
4. A to Z list is generly associated with_____.
5. Application of VPN and EzyProxy in library is associated with_____.

1.4 NEED OF E-RESPOURCES

E-resources give the librarian the ability to serve the user community more effectively. Following are a few important points:

a) To provide access to an information source by several users.
b) E-Resources can be rapidly sought.
c) The user can quickly locate these.
d) Vast quantities of these materials can be kept.
e) The length of time spent using the online resources.
f) Examines the respondent's motivation for using online resources.
g) Know the many types of online resources that respondents frequently use.
h) To gather, organize, and store information in digital form such that speedy searches of sources are possible.
i) To promote efficient and inexpensive information distribution to all consumers.

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j) To encourage joint initiatives to protect and share research resource investments,

IN-TEXT QUESTIONS

6. Shibboleth is used for _____.
7. E-ShodhSindhu Consortium is funded by _____.
8. The process by which a library checks the existing duplicate e-resources is known as _____
9. 360 resource manageger is assocated with _____.
10. SERU stands for _____.

1.5 MANAGING E-RESOURCES

The following are tasks involved in managing e-resources:

1.5.1 Selection

Any of the following strategies may be used to choose an electronic resource:

i. Serendipity (finding by accident anything which is valuable and beneficial) (finding by chance something which is useful and beneficial)
ii. as they are using the Internet
iii. faculty suggestions

iv.taking a look at the electronic journals given by other libraries

iv. Publisher marketing

1.5.2 Acquisition

A library purchases printed materials to possess. However, libraries only receive licences for access rights to electronic resources. The following are some significant steps in the purchase of e-resources:

i. establishing the cost,
ii. haggling with the vendor,
iii. concluding the licensing agreement,
iv. allocating funds,
v. placing the order, and
vi. confirming the title is available.
vii. Contacting the vendor if it is unavailable
viii. Processing the invoice for payment, section

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1.5.3 Staffing

The library must determine whether to assign ordinary personnel or staff with experience working with electronic formats to execute acquisition duties for e-journals. The personnel needs to be skilled at negotiating licensing and conversant with the electronic format in order to obtain and process electronic resources.

1.5.4 Licensing

A license is typically a formal agreement or contract between the publisher and the library. An agreement may include provisions on payment calculations, user definitions, usage limitations, archive rights, etc. The library staff must be especially attentive to negotiating advantageous terms for the library because licensing agreements are typically drafted for the vendors' advantage.

1.5.5 Budgeting

Libraries usually have a separate budget for procuring e-resources.

1.5.6 Cataloguing

The library's OPAC is cataloged and updated with information on e-resources. Some libraries might choose to list them online and provide links to them. They might not list them.

1.5.7 Maintenance

Maintenance is a major concern for e-resources. To maintain its electronic materials, the library maintains workers. The team makes sure that the subscribed e-resources are usable on the institute's IP (Internet Protocol) ranges. Access to some of the electronic resources requires a Username (UN) and Password (PW). The task of dispersing UN/PW to authorized users has been given to the employees. If an e-resource cannot be accessed and the staff is unable to fix the issue, the publisher is informed of the situation.

1.5.8 Staff Training and User Education

The team needs to receive training on how to use e-resources to access, browse, and retrieve information. In order to teach users how to use e-resources and so encourage and improve the usage of e-resources among users, libraries must conduct user education programs.

1.6 FORMAT OF RESOURCES

There are several formats of resources have identifies are as follows:

a. **HTML Format:**Most online sites utilize this hypertext markup language. A typical browser like Microsoft Internet Explorer can be used to read HTML. No specialized tools are required.

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b. **PDF:**It is a file type that has all the characteristics of a printed document in an electronic image that you can see, navigate, print, or send to another person. Using Adobe Acrobat or Acrobat Capture, you can produce this file.
c. **TIFF (Tagged Image File Format):** This file type is used to store images like line drawings and photographs. Applications for picture modification support it widely.
d. **CHM Format:**This is an addition to the virtually entirely HTML-based Microsoft assistance program's produced HTML file format. It includes numerous compressed HTML files, together with the images and Java script that they link to. Full-text searching and the table of contents index are included.
e. **PostScriptipt Format**: This page description language is used to describe the contents of printed pages primarily in electronic and desktop publishing contexts.
f. **Desktop Author Format**: With the help of this electronic publication technology, digital web books with virtual page flipping can be created. This format can be used to create documents like e-books, and digital pe-card, but also e-cards, digital diaries, online resumes, quizzes, tests, and exam booklets.
g. **Rich Text format**: The majority of word processors can read and create these documents because they were built by Microsoft in 19 cross-platform platforms.

1.7 TYPES OF E-RESOURCES

There are different types of e-resources as mentioned below:

1.7.1 E-Journals

A periodical publication that is published in an electronic format, typically online, has been referred to as a "e-journal." A periodical publication is one that is released on a regular basis, such as weekly, fortnightly, monthly, quarterly, or annually. The following publications have been referred to as "electronic journals":

- An electronic version of an established print journal like Cell, New Scientist, Scientific American, etc.
- An e- only journal like Ariadne, D-Lib magazine, etc.
- An established journal could stop its print version and transfer to e- only format.
- An electronic journal can be free or fee-based through an annual subscription, licensing, or pay per use

Libraries procure subscriptions to e-journals through consortia in order to saveon money. In this consortia approach, libraries form an association or network, or cooperative organization to procure and share journals. Some of the examplesof consortia that provide access to e-resources are as under:

DeLCON-Electronic Library Consortium-(delcon.gov.in/)

UGCInfoNet digital Library consortium(http://www.inflibnet.ac.in/econ/

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1.7.2 E-Reports

A report is a written document that presents information in a narrative, graphic, or tabular fashion. Depending on the situation, it may be created occasionally, periodically, or on a regular basis. A report could make reference to a particular time, occasion, or topic. It may be conveyed to the general audience verbally or in writing. E-reports are reports that are available online in digital format.

For example, universities release yearly reports that detail their spending, activities, and accomplishments. Additionally, these reports are available online.

1.7.3 E-Books

A digital publication with text and images is called an "e-book," sometimes known as an "electronic book" or "digital book." To be read on a computer or other digital device, it is created or published. E-books are the counterpart of traditional printed books in the digital age. There are many different formats for e-books. While some can only be read online when connected to the Internet, others can be downloaded in full and read offline.

Some of the examples of suppliers of e-books are given as under:

a. Myilibrary (http://www.myilibrary.com/)
b. E-library (http://www.ebrary.com/corp/index.jsp)
c. EBSCO (http://www.ebscohost.com/ebooks/home)
d. Springer (http://www.springer.com/librarians/e-content/ebooks?SGWID=0-40791-0-0-0)

Springer: Through Springer Link, Springer provides users with access to more than 88,000 e-books. Depending on their needs, libraries can either buy the complete annual collection or a variety of subject collections. Libraries must get in touch with aggregators or online retailers like amazon.com or springer shop at springer.com to obtain certain titles.

Oxford University Press: 8000 scholarly monographs spanning 20 different topic areas, including the humanities, social sciences, law, and medicine, are accessible through Oxford University Press. Oxford Scholarship Online is the name of the website. Three times a year, new titles are added to the collection.

Safari Technical Books: Safari, which specialises in user and training manuals for computer applications, offers 8000 e-books from more than 100 publishers. Visit our website at http://www.safaribooksonline.com/mkt/brochures/html/WhoWeAre.html.

There are many e-books freely available on the internet. Some of them are givenas under :

a. CARRIE: Full-TextElectronic Library (http://vlib.iue.it/carrie/)
b. Free books (http://www.e-book.com.au/freebooks.htm)
c. Internet Classics Archive (http://classics.mit.edu/)

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d. Internet Public Library (http://www.ipl.org/)
e. Online Books Page (http://digital.library.upenn.edu/books/)
f. Project Gutenberg (http://www.gutenberg.org/wiki/Main_Page)
g. UC Press e-books Collection (http://publishing.cdlib.org/ucpressebooks/)

1.7.4 E-THESES AND DISSERTATIONS

A thesis or dissertation is a piece of writing that is submitted in support of an application for a professional or academic degree. It displays student-produced work or study together with any conclusions or findings. Users submit printed theses and dissertations to universities and other institutions. E-theses and dissertations refer to theses and dissertations in their digital format. The theses and dissertations of research scholars pursuing M.Phil. and Ph.D. degrees in Indian universities must be submitted digitally or electronically. Currently, libraries are digitizing the theses and dissertations they own and making them available online. Digital repositories are another term for collections of electronic theses and dissertations.

Examples are as under:

The **Shodhganga@INFLIBNETCenter** offers research students a platform to deposit their doctoral theses and make them open access to the whole academic community. The repository has the capacity to collect, index, store, share, and preserve electronic theses and dissertations that scholars have submitted.

Vidyanidhi: Indian digital library of electronic theses by the University of Mysore.

1.7.5 ELECTRONIC DATABASES

A collection of records with data that may be numerical, textual, or visual are referred to as a "database." Online databases are those that can be accessed online. These online databases were accessible as CD-ROM databases prior to the development of the Internet. A journal database is a collection of journal articles that have been organized into searchable individual records. The databases can be full-text or bibliographic.

1.7.5.1 Bibliographic databases

A bibliographic database is a collection of organized digital references to published literature. It is a database of bibliographic records. It might be of a general nature or maybe focused on a specific issue. J-Gatehttp://jgate.informindia.co.in. is a bibliographic database that makes journal material available to users. It contains indexes for 29513 e-journals from 9483 publishers and links to the full texts of those journals' websites. Here are a few instances:

a. **Abstract on Hygiene and Communicable Disease (AHCD)**
   http://www.cabi.org/default.aspx?site=170&page=1016&pid=70
b. Current Contents

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http://thomsonreuters.com/products_services/science/science_products/a-z/current_contents_connect/

1.7.5.2 Full-text databases

Complete-text databases are those that offer the full text of journal articles, book chapters, conference papers, etc.. Examples are **Science Direct, JSTOR, and PROQUEST.**

Other Examples:

a. CABI Full Text(http://www.cabi.org/)
b. Academic Search Complete (http://www.ebscohost.com/academic/
c. academic-search-complete)
d. JSTOR (http://www.jstor.org/)
e. Project MUSE (http://muse.jhu.edu/)

1.7.6 Institutional Repository

An institutional repository is an online database that gives users internet access to the digital theses, dissertations, e-prints, and other collections of a certain institution. It offers associated metadata for the document, such as the student's name, the name of the school they attended, their graduation year, the title of the paper, an abstract, keywords, etc. Digital repositories are another name for institutional repositories. These repositories were established by universities and research institutes to gather, arrange, and highlight the intellectual contributions of their academic members and scientists. Additionally, these institutional repositories could give users access to annual reports, previous year's test questions, and early versions of articles written by professors and researchers at the university and institution.

1.8 ADVANTAGES AND DISADVANTAGES OF E-RESOURCES

There are several advantages and disadvantages of using e-resources:

ADVANTAGES OF E- RESOURCES

E-resourcesces have many advantages; some of these are :

a. E-resources can be accessed online, in item a. Users are not required to go to the library in person. For users who live in rural and far-off places, this is incredibly helpful. The articles are available for users to download and save on their computers.
b. Multiple users may access the same resource, such as an article or journal, at the same time.
c. E-resources can be accessed wherever and whenever it's most convenient for the users.

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d. Through a single search interface, users can conduct a comprehensive search of many resources at once.
e. E-Resources also offer usage statistics that assist library personnel in determining how often a given product is used.
f. Journal articles and issues can be found online before they are published in print.
g. Links and the hypertext style of online resources direct readers to relevant content and articles.
h. Audio, video, and animation elements are available in electronic resources that are absent from print versions.
i. Libraries can save space by subscribing to e-resources.

DISADVANTAGES OF E- RESOURCES

a. To read electronic materials, users must have access to the Internet.
b. It is not guaranteed that a library will still have access to back issues of an e-journal if it cancels or ends its subscription. While the library, which possesses printed materials, undoubtedly has back issues of that publication. If a library cancels its subscription to an e-book, it will no longer have access to that particular e-book. Unlike the actual copy, which once purchased, always remains in the library's control.
c. Using electronic resources necessitates reading on a screen, which is tiresome and hazardous.

1.9 CONCEPT DATABASES

Information that has been categorized into a certain subject or kind is typically referred to as a database. One database that offers details on where a specific book could be found in the library is the TSU Library's Online Catalog. Similar to this, full-text articles are accessible through electronic periodical indexes like EbscoHost and Infotrac, while citation information is accessible through citation indexes like CINAHL. The steps below can be used to identify and access our databases online from our website:

If you're on campus:

- Type in **http://www.tnstate.edu**
- Click on Library
- Click on Databases
- Click on the top line. That will take you to our database page.
- Click on a letter of the alphabet that corresponds with the first letter of the database you are looking for. For example, click on the letter"E" for Ebsco Host.

If you're off campus:

- Type in **http://www.tnstate.edu**
- Click on Library

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- Click on Databases
- Click on the bottom line. That will take you to our Remote Access page.
- The first time you log in, give us your TSU assigned username (usually your first name and your last initial), and the last six digits of your Social Security Number.
- The system will prompt you to change your password.
- Type the last six digits of your Social Security Number again.
- Make up a new password that is easy for you to remember.
- Type it in twice.
- Click on Save Changes. This will take you to a list of choices.
- Click on either Online Databases by Title or Online Databases by Subject.
- If you choose Online Databases by Title, click on a letter ofthe alphabet that corresponds with the first letter of thedatabase you are looking for. For example, click on the letter“E” for Ebsco Host. Should you choose the Online Databases by Subject link, you would be taken to a list of databases subdivided by subject area.

1.10 METHOD OF DATABASE BROWSING

Thousands of results are frequently returned by most search engines or databases. Therefore, it is crucial to utilize tactics that focus on results and move the most pertinent pages to the front of the results list in order to successfully use search engines and databases. Several methods for improving search engine/database performance are listed below. Discovering what you need will be challenging without these methods, and anyone may boost the likelihood of finding useful material online by taking the time to clearly define their needs.

1.10.1 SEARCH STRATEGIES:A user of a database or search engine should be aware of the search tactics that must be used in order to reach the right destination. Some of these steps are listed in the paragraphs that follow.

i) Step 1: Framing the need: Clearly express your demand using suitable language. For example, One would require knowledge about "Digital libraries of India”.

ii) Step 2: choose keywords: Find the statement's essential words or major ideasIn the above example, the keywords will be <digital library><India>.

iii) Step 3: Choose synonyms and alternative word forms: Discover each keyword's synonyms, different spellings, and alternative word forms. In the above example the synonyms of <digital library> will be <Virtual Library>, <Library without wall>, and <Institutional Repository>.

iv) Step 4: Combine Boolean Operators With Synonyms, Keywords, and Variant Word Forms: Synonyms are now combined with Boolean OR. Put quotation marks around OR statements. Therefore, in the aforementioned example, the search phrases would be "Digital Library" or "Virtual Library" or "Institutional repository" and India. Please take note that

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some search engines treat "OR" and "AND" as "+," "*" and "NOT," respectively, and "-." You should appropriately blend your words.

If you don't know the entire word, you can choose the truncation option marked with an asterisk (*). For instance, typeLibrar* to find documents that contain the words "library," "librarian," and so forth.

v) Step 5: Check Your Spelling: Search engines will return webpages with words that match your searches if you check your spelling. Your search results will include web pages with the misspelled version of the keyword if you type it incorrectly. Therefore, verify your spelling one last time.

1.10.2 BOOLEAN OPERATORS: A full system for logical operations is boolean logic. It was given the name George Boole in honor of the English mathematician who developed the algebraic system of logic in the middle of the 19th century at University College Cork.

1.10.2.1 Boolean AND: When search terms are connected with AND, the search engine is instructed to return websites that contain ALL of the keywords. As a result, AND significantly reduces the number of outcomes.

Example: OCLC and Classify

Please note that the **star sign (*) is the equivalent of AND** in some search engines (Google).

1.10.2.2 Boolean OR: When search terms are connected with OR, the search engine is instructed to return web pages with ANY and ALL keywords. The search engine returns sites that contain all keywords, a single keyword, and several keywords when OR is used. Therefore, OR show more search results.

Example: Librarian or Library

Please note that in many search engines, the **plus symbols can be used as alternatives to Boolean OR.**

1.10.2.3 Boolean NOT: NOT instructs a search engine to return results for pages with one term but not another.

Example: OCLC not DDC

The search engine is told in the example above to return websites about OCLC but not anything about the "DDC." When a keyword has more than one meaning, one can use NOT. As an alternative to Boolean NOT, the minus signs (-) are sometimes employed in search engines.

Instead of using AND, OR, and NOT, AltaVista's Simple Search requires the usage of plus and minus. For comprehensive Boolean (AND, OR, and NOT) searches, you can use AltaVista's Advanced Search.

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1.10.2.4 Complex Search Using Boolean Logic: Example: Library AND (Acquisition OR Classification). This expression will search for results matching the document of Library acquisition or classification.

1.10.3 SOME OTHER SEARCH TECHNIQUES: Some other popular search techniques that can be used over the web in many search engines are listed below.

1.10.3.1 Phrase Searching: When you use double quotes to enclose a set of terms, the search engine is instructed to only return documents that contain those words together. Use phrase searching as much as you can because it's a terrific way to dramatically narrow your search results.

Example: “Five Laws of Library Science”

1.10.3.2Phrase Searching With Boolean Operators: Using Boolean logic, you can also combine a phrase search with other terms.

Example: “Five Laws of Library Science” * Dr. S R Ranganathan

1.10.3.3 Title Search: One of the best methods for focusing results and putting the most pertinent websites at the top of the results page is field searching. Several fields, including title, domain, host, URL, and link, make up a web page. Combining field searches, phrase searches, and Boolean logic improves the effectiveness of your search. For instance, you may do the following search to learn more about Dr. S. R. Ranganathan and the Five Laws of Library Science:

Example: +title:"Five Laws of Library Science" + Dr. S R Ranganathan

Example: title:"Five Laws of Library Science" and Dr. S R Ranganathan

The example title search given above instructs the search engine to return web pages that have both the words Dr. S R Ranganathan and the phrase Five Laws of Library Science in the title. Please take note that there is no space between the colon (:) and the keyword, unlike plus and minus.

1.10.3.4 Domain Search: You can restrict results from the domain search to just include particular domains, such as websites from the United Kingdom (.uk), educational institutions (.edu), or official websites (.gov).

Example: +domain:in +title:"Guwahati"

Example: domain:in and title:"Guwahati"

Example: +domain:in +title:"Guwahati" * Dispur

Example: domain:in and title:"Guwahati" * Dispur

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1.10.3.5 Host Search: When you need to locate something at a big site without an internal search engine, the host search is useful (if the site has an internal search engine then for the best result you should use it). Using the host search method, you can search all of a website's pages (stored in the engine's database) for specific terms or phrases.

Example: +host:www.kkhsou.org +"PhD"

Example: host:www.kkhsou.org and "PhD"

1.10.3.6 URL Search: The URL search restricts search results to websites whose URLs or website addresses contain the keyword. A URL search can focus extremely broad results on websites with content specific to the keyword topic.

Example: +url:NET +title:UGC

Example: url:NET and title:UGC

1.10.3.7 Link Search: When you want to find out which websites are related to a specific site of interest, do the link search. Use the Link search, for instance, if you have a home page and want to know if anyone has linked to it from their website. Link searches are used by researchers to perform backward citations.

Example: link:http://www.lislinks.com

Any search engine or database that you use to do a search has some variations. The following perspectives are available for the variants:

1.10.3.7.1 Capital Letters: Lower case letters are typically interpreted by search engines as either uppercase or lowercase. Therefore, put your keywords in all lower case letters if you want both upper and lower case occurrences returned. However, put your keywords that way if you wish to restrict your results to terms with capital letters in the first position (for example, "George Washington") or all uppercase letters.

1.10.3.7.2 Plural Forms: Most search engines determine whether a query is singular or plural based on its context. Make your keywords plural if you only want the plural forms; otherwise, disregard it.

1.10.3.7.3 Alternate Spellings: Several search engines have truncation or wildcard options that permit spelling or word form changes. When a word is marked with an asterisk (*), the search engine is instructed to return different ways to spell the word at that location. Catalog*, for instance, returns web pages that have both catalogue and cataloguer.

1.10.4 PRACTICING WITH SEARCH ENGINE: Several well-known search engines in terms of the tools they offer to search their databases for instance, Google, HotBot, Alta Vista, and All The Web.

1.11 TYPES OF DATABASES

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The kind of information located in a database will determine its type. The most common types of databases include Bibliographic, Full-text, Numeric, Image, Audio, and Mixed.

1.11.1 Bibliographic databases: Although it doesn't have the articles displayed on the screen, it does have information about where the articles may be located. A bibliographic database's information may include details like the author, title, publisher, publication date, volume and issue numbers, among other things. Citations are a common name for these documents. These documents occasionally include abstracts (summaries) or item descriptions. An abstract can help you decide if an item will be helpful to you in your research. You may want to use this kind of database to make bibliographies if you're looking for information or citations on a specific subject.The source cited in the record must be found, or you can utilize a full-text database if you need to find the article in its entirety. The following is an illustration of a bibliographic database, such as an online catalogue:

Title: Contemporary Issues in Lung Cancer: a Nursing Perspective / edited by Marilyn Haas

Call Number: RC280.L8 C656 2003

Publisher: Sudbury, Mass. : Jones and Bartlett, c2003

Subject Heading(s): Lungs—Cancer

Display Related Subjects (if any)

Description: xvi, 322 p. : ill. ; 24 cm.

Notes: Includes bibliographic references and index.

ISBN: 0763719145 : $42.00

Item Holdings

Location – Shelf – TSU

Call Number - RC280.L8 C656 2003

Volume –

Material – Book

Status – Available

1.11.2 Full-text databases: These databases include the entire text of the articles and/or journals they index, these databases are referred to as full-text.

For example, ProQuest Nursing Journals provides full-text articles from peer-reviewed or scholarly journals along with summaries or abstracts.

1.11.3 Numeric Databases: These databases offer numerical data, as the name infers, such as statistics, census data, and other data.

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For example,The U.S. Bureau of the Census provides census data, which also includes other numerical data types such as birth and death statistics.

1.11.4 Image Databases: Access to photographs, animations, art prints, and other kinds of images is made possible via these databases.

For example, the Library's Virtual Reference web page provides a Nursing and Medicine link which will take you to a list of nursing and medical websites.

For example, click on the U.S. National Library of Medicine, and then click on Dream Anatomy, and then click on Gallery, and that will bring up anatomical images.

1.11.5 Audio Databases: These are databases that provide access to audio clips to music and sound effects.

For example, Through software like Real Audio, you may watch and listen to videos of Ray Brooks, Steve Wood Quintet, Pamela Wise, and other artists on the Internet Public Library Listening Room through the library's virtual web page. The websites of radio stations like WPLN, WLAC, WWTN, and others are other examples of places where you could listen online.

1.11.6 Citation Database: It is a collection of cited papers, books, articles, and other materials that have been organised and consistently recorded into an online database. Databases created for reviewing publications are called citation databases. You can examine and count citations using the citation databases.

Examples of citation databases include **PsycINFO and Web of Science**

1.11.7 Indexing and abstracting databases: Although not often, A&I databases contain links to the whole texts of the publications cited.

Some examples of A&I databases include Readers Guide Retrospective from H.W. Wilson, Historical Abstracts, or International Index to Music Periodicals.

1.12 EXAMPLES OF TOP ACADEMIC DATABASES

Finding the material you're looking for is simple with the help of academic research databases. In order to assist you in beginning your study, we have put together the definitive list of dependable academic resources:

1.12.1 SCOPUS

One of the two major commercial bibliographic databases that covers academic literature from virtually every discipline is Scopus. Scopus offers academic journal rankings, author profiles, and an h-index calculation in addition to research article searches.

- Coverage: approx. 71 million items

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- References: 1.4 billion
- Discipline: Multidisciplinary
- Access options: Limited free preview, full access by institutional subscription only
- Provider: Elsevier

1.12.2 WEB OF SCIENCE

The second largest bibliographic database is the Web of Science, commonly referred to as the Web of Knowledge. On their campus network, academic institutions typically offer free access to Web of Science or Scopus.

- Coverage: approx. 100 million items
- References: 1.4 billion
- Discipline: Multidisciplinary
- Access options: institutional subscription only
- Provider: Clarivate (formerly Thomson Reuters)

1.12.3 PubMed

For anyone looking for literature in biology or medicine, PubMed is the best resource. More than 30 million papers' abstracts and bibliographic information are stored in PubMed, which also offers full-text connections to publisher websites or links to free PDFs on PubMed Central (PMC).

- Coverage: approx. 30 million items
- References: NA
- Discipline: Medicine, Biological Sciences
- Access options: free
- Provider: NIH

1.12.4 ERIC

ERIC is the top resource for education sciences. The database ERIC, which stands for Education Resources Information Center, is dedicated to housing material about education.

- Coverage: approx. 1.3 million items
- References: NA
- Discipline: Education science
- Access options: free

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- Provider: U.S. Department of Education

1.12.5 IEEE Xplore

The premier academic database for engineering and computer science is IEEE Xplore. You can search not only for journal articles but also for conference papers, standards, and books.

- Coverage: approx. 5 million items
- References: NA
- Discipline: Engineering
- Access options: free
- Provider: IEEE (Institute of Electrical and Electronics Engineers

1.12.6 SCIENCEDirect

The entry point to Elsevier's millions of scholarly publications is ScienceDirect. A single interface may search through more than 40,000 e-books and 2,500 journals.

- Coverage: approx. 16 million items
- References: NA
- Discipline: Multidisciplinary
- Access options: free
- Provider: Elsevier

1.12.7 DIRECTORY OF OPEN JOURNALS (DOAJ)

The DOAJ is a particularly unique academic database because every article it indexes is open access and available without fee.

- Coverage: approx. 4.3 million items
- References: NA
- Discipline: Multidisciplinary
- Access options: free
- Provider: DOAJ

1.12.8 JSTOR

Another excellent place to find research articles is JSTOR. JSTOR makes every article published in the United States before 1924 freely accessible, and it also provides independent researchers with scholarships.

- Coverage: approx. 12 million items
- References: NA

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- Discipline: Multidisciplinary
- Access options: free
- Provider: ITHAKA

1.13 ANSWERS TO IN-TEXT QUESTIONS

1. Prepetual Access	6. Access Management
2. Usage Statistics of E-resources	7. MHRD
3. ICADR, New Delhi	8. Overlap Analysis
4. Access to E-reources	9. ProQuest
5. Remote Access to E-resources	10.Shared Electronic Resource Understanding

1.14 SELF-ASSESSMENT QUESTIONS

1. What do understand by E-resources? Explain the different types of e-resources with example.
2. Discuss the different types of online databases with example.
3. Differentiate between electronic resources and digital resources. Elaborate the benefits and drawbacks of E-resources.

1.15 REFERENCES

MODULE-4 Database Management Systems 418. (n.d.).

Types of E-Resources and its utilities in Library. (n.d.). Retrieved from https://www.researchgate.net/publication/268508509

The best academic research databases [2019 update]. (n.d.). Paperpile. https://paperpile.com/g/academic-research-databases/

LibGuides: Evaluating scholarly publications: Citation Databases. (2019). Retrieved from Libguides.com website: https://uva.libguides.com/bibliometrics/citation_databases

1.16 SUGGESTED READINGS

Chatterjee, A. (2016). Elements of information organization and dissemination (1st ed.). Chandos Publishing. https://doi.org/10.1016/C2016-0-01692-3

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Wikoff, K. (2012). Electronics resources management in the academic library : A professional guide. Libraries Unlimited.

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LESSON 1

Installation and Functions of Different Operating Systems: Window XP, Vista, Windows NT, Linux

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projesroy@hotmail.com

STRUCTURE

1.1 Learning Objectives
1.2Introduction
1.3 Windows XP Operating System
1.4 Windows Vista
1.5 Windows NT Installation
1.6 LINUX Operating System

1.1 Learning Objectives

The objectives of the lesson are to know about the different functions of operating system, types of operating system we are using our days to day life and its practical demonstration step by step for the installation of Windows XP Operating System, Windows Vista, Windows NT and LINUX Operating. The operating system is prerequisite of the functionality of a computer system. This chapter is only focused on the operating system, it features and how all operating system is different from each other.

1.2 Introduction

The first independent version of Microsoft Windows, version 1.0, was released in the year 1985. Since then, Microsoft released different versions of windows (windows 2.0, 3.0, 3.1, windows 95, windows 98 and windows XP) over a period till 2001. Later in the year 2007, Microsoft released Windows Vista.

You might be thinking when to use the Network O.S. and when to use Other O.S. like Windows XP, the answer is that, when you are supposed to develop software in client server Environment or networked environment then use the Server edition of an O.S. else use other O.S., but generally professional applications are developed on NT or server technologies.

1.2.1 Important functions of an operating System:

Security – The operating system uses password protection to protect user data and similar other techniques. It also prevents unauthorized access to programs and user data.

Control over system performance – Monitors overall system health to help improve performance. records the response time between service requests and system response to having a complete view of the system health. This can help improve performance by providing important information needed to troubleshoot problems.

Job accounting – Operating system Keeps track of time and resources used by various tasks and users, this information can be used to track resource usage for a particular user or group of users.

Error detecting aids – The operating system constantly monitors the system to detect errors and avoid the malfunctioning of a computer system.

Coordination between other software and users – Operating systems also coordinate and assign interpreters, compilers, assemblers, and other software to the various users of the computer systems.

Memory Management – The operating system manages the Primary Memory or Main Memory. Main memory is made up of a large array of bytes or words where each byte or word is assigned a certain address. Main memory is fast storage and it can be accessed directly by the CPU. For a program to be executed, it should be first loaded in the main memory.

Processor Management – In a multi-programming environment, the OS decides the order in which processes have access to the processor, and how much processing time each process has. This function of OS is called process scheduling.

Device Management – An OS manages device communication via their respective drivers. It performs the following activities for device management. Keeps track of all devices connected to the system.

File Management – A file system is organized into directories for efficient or easy navigation and usage. These directories may contain other directories and other files. An Operating System carries out the following file management activities. It keeps track of where information is stored, user access settings and status of every file, and more… These facilities are collectively known as the file system.Moreover, Operating System also provides certain services to the computer system in one form or the other.

1.3 WINDOWS XP OPERATING SYSTEM

The Operating System named Windows is a very successful product of Microsoft's, a renowned company in the arena of operating systems. It has been around a long time and is used by most people running PCs (personal computers). In 1983, Microsoft announced the development of Windows, a graphical user interface (GUI) for its own operating system (MS-DOS), which was not Graphically enabled, Figure 1 shown below, where c:\> is the DOS prompt, referring to directory C:\. Since then, Microsoft has developed many versions of Windows, and the product line has changed from a GUI product to a modern operating system. How ever you can switch yourself from one mode to other i.e. GUI to Non GUI (i.e.CLI), depending on your choice. Below the installation process of Windows XP is given, once it is loaded, then you can click your mouse on Start menu, go to Run, click in it a window will pop up, in the box simply write cmd and press enter, you will see the DOS prompt as shown below which is the CLI of the GUI i.e. Windows XP loaded by you.

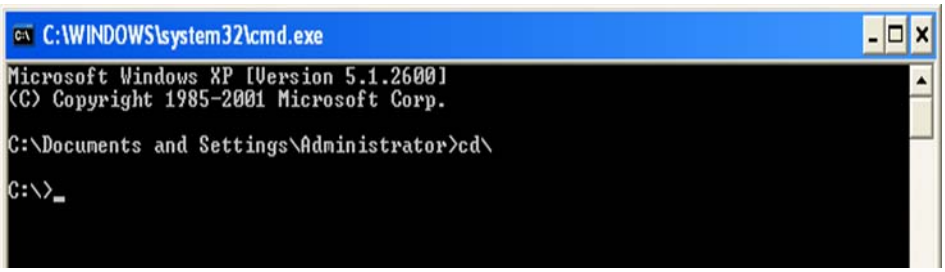


Figure 1: DOS Prompt of Windows XP

1.3.1 Installation of Windows XP

Windows XP is a versatile O.S. which took over various laggings in the earlier O.S. given by Microsoft. You will come across these differences when you work with a machine having Windows 98 as an O.S., and then you switch over to a machine loaded with Windows XP as the O.S. One major component which really improves the performance and working is the availability of various device drivers which really make device operation as simple as plug-n-play. However, there are some sacrifices to enjoy such features, i.e., you need to have system i.e., hardware with minimum configurations as given below in Table 1.

Table 1 : Minimum System Requirements for Windows XP

System Requirements	Minimum Recommended
Processor	233 MHz- 300 MHz or higher
Memory	64 MB RAM 128 MB RAM or higher
Video adapter and monitor	monitor Super VGA (800 x 600) or higher
resolution Hard drive disk free	space 1.5 GB or higher
Drives CD-ROM	drive or DVD drive
Input devices	Keyboard. Microsoft Mouse or compatible pointing device Sound
Sound	Sound card. Speakers or headphones

If the minimum system requirement is not fulfilled then you will not be able to install this O.S. on to your machine, however, Windows 98 might serve the purpose. But to work with Windows 98 you need to install drivers of almost all the devices you want to work with and this hinders the plug-n-play features. So, Windows XP is in huge demand globally, let us learn how to load it before making us to work on it.

The following step by step procedure will help you to install Windows XP. The installation procedure is shown with the figure appears on your screen after doing a step.

1) Insert the Windows XP CD into your computer and restart.
2) If prompted to start from the CD, press SPACEBAR. If you miss the prompt (it only appears for a few seconds), restart your computer to try again.

3) WindowsXPSetupbegins.Duringthisportionofsetup,yourmousewillnotwork,soyoumustusethekey board.OntheWelcometoSetuppage,pressENTER.

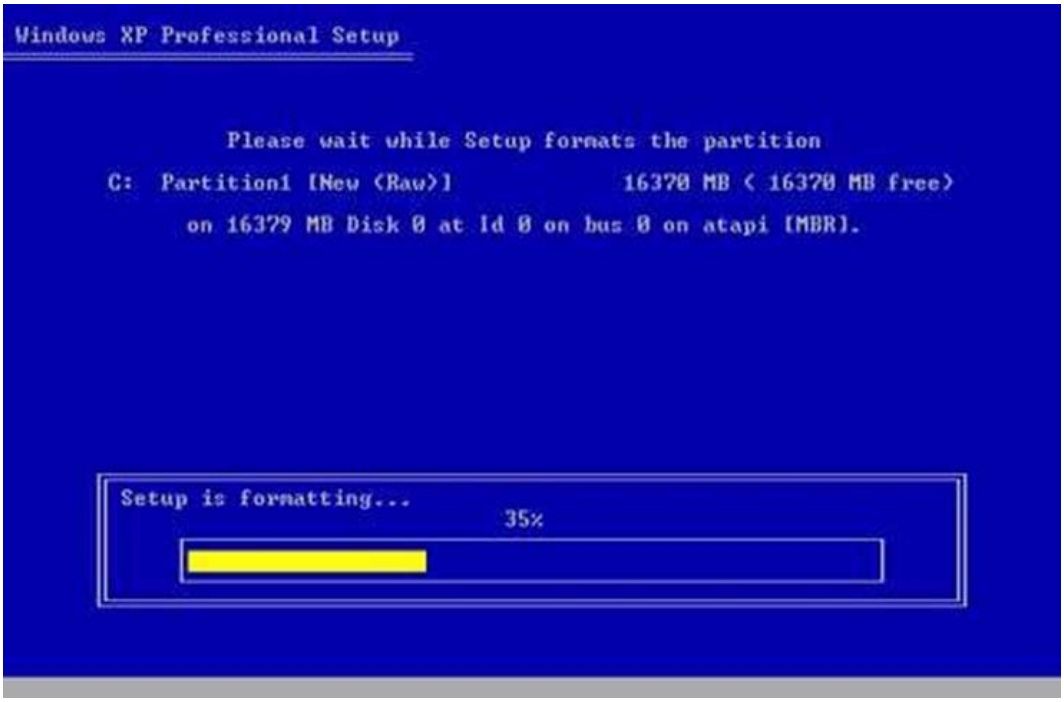
4) OntheWindowsXPLicensingAgreementpage,readthelicensingagreement.Press the PAGE DOWN key to scroll to the bottom of the agreement. Then pressF8

5) This page enables you to select the hard disk drive on which Windows XP will beinstalled. Once you complete this step, all data on your hard disk drive will beremoved and cannot be recovered. It is extremely important that you have a recentbackup copy of your files before continuing. When you have a backup copy, pressD,andthenpressL whenprompted.Thisdeletesyourexistingdata.

6) PressENTERtoselectUnpartitionedspace,whichappearsbydefault.

7) PressENTERagaintoselectFormatthepartitionusingtheNTFSfilesystem,whichappears by default.

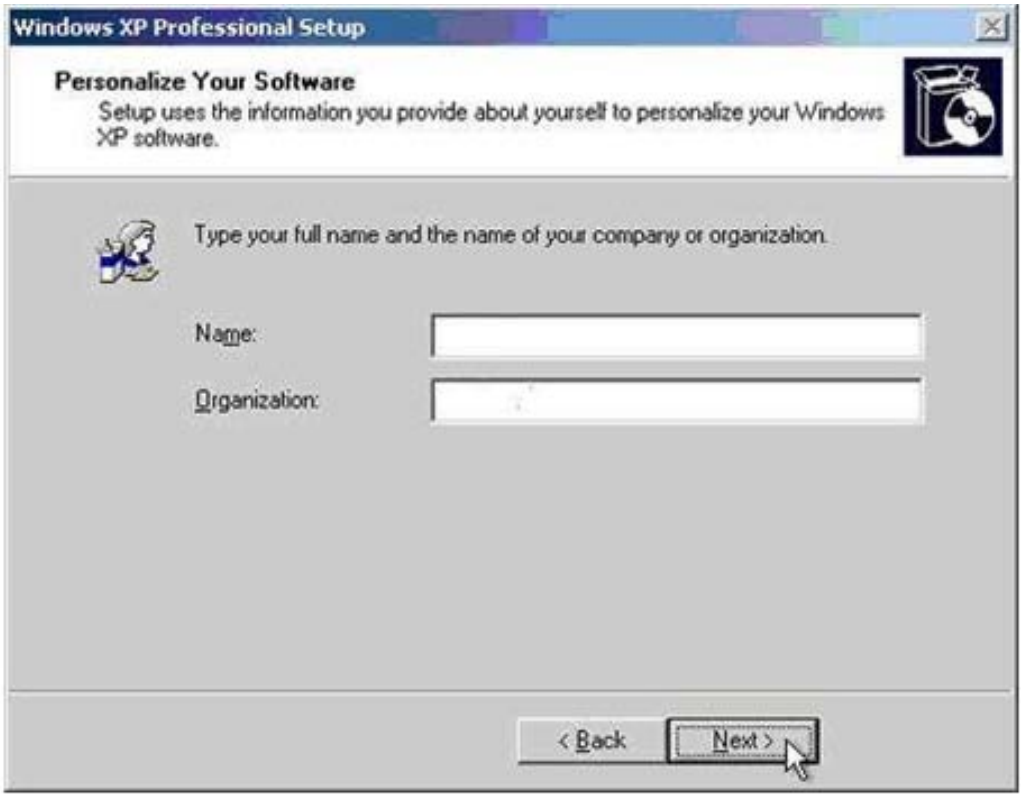
8) Windows XP erases your hard disk drive using a process called formatting and thencopiesthesetupfiles.Youcanleaveyourcomputerandreturnin20to30minutes.



9) Windows XP restarts and then continues with the installation process. From thispointforward,youcanuseyourmouse.Eventually,theRegionalandLanguageOptionspage

appears.ClickNexttoacceptthe defaultsettings.If youaremultilingual or prefer a language other than English, you can change languagesettingsaftersetup iscomplete.

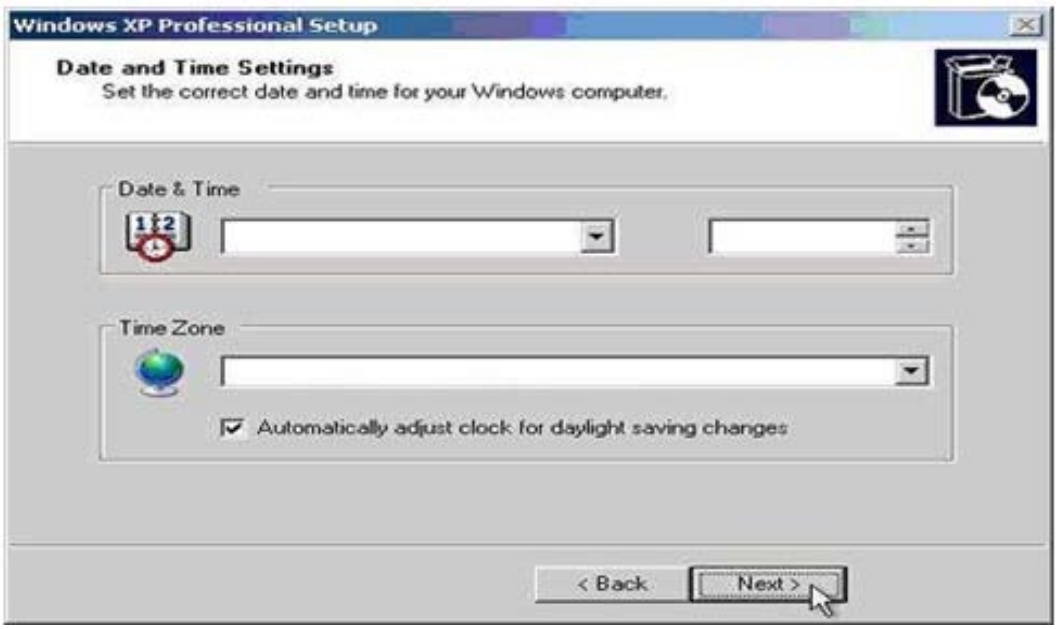
10) On the Personalize Your Software page, type your name and your organization name. Some programs use this information to automatically fill in your name when required. Then, click Next.



11) On the Your Product Key page, type your product key as it appears on your Windows XP CD case. The product key is unique for every Windows XP installation. Then, click Next.

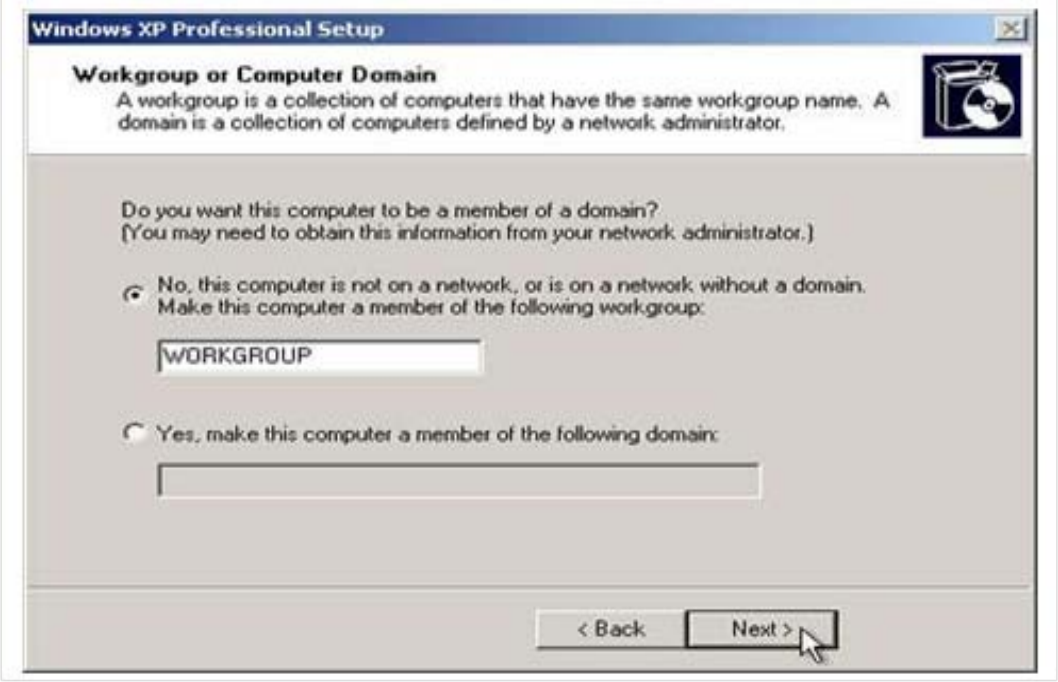
12) On the Computer Name and Administrator Password page, in the Computer name box, type a name that uniquely identifies your computer in your house, such as FAMILYROOM or TOMS. You cannot use spaces or punctuation. If you connect your computer to a network, you will use this computer name to find shared files and printers. Type a strong password that you can remember in the Administrator password box, and then retype it in the Confirm password box. Write the password down and store it in a secure place. Click Next.

13) On the Date and Time Settings page, set your computer's clock. Then, click the Time Zone down arrow, and select your time zone. Click Next



14) Windows XP will spend about a minute configuring your computer. On the Networking Settings page, click Next.

15) On the Workgroup or Computer Domain page, click Next.



16) Windows XP will spend 20 or 30 minutes configuring your computer and will automatically restart when finished. When the Display Settings dialog appears, click OK.

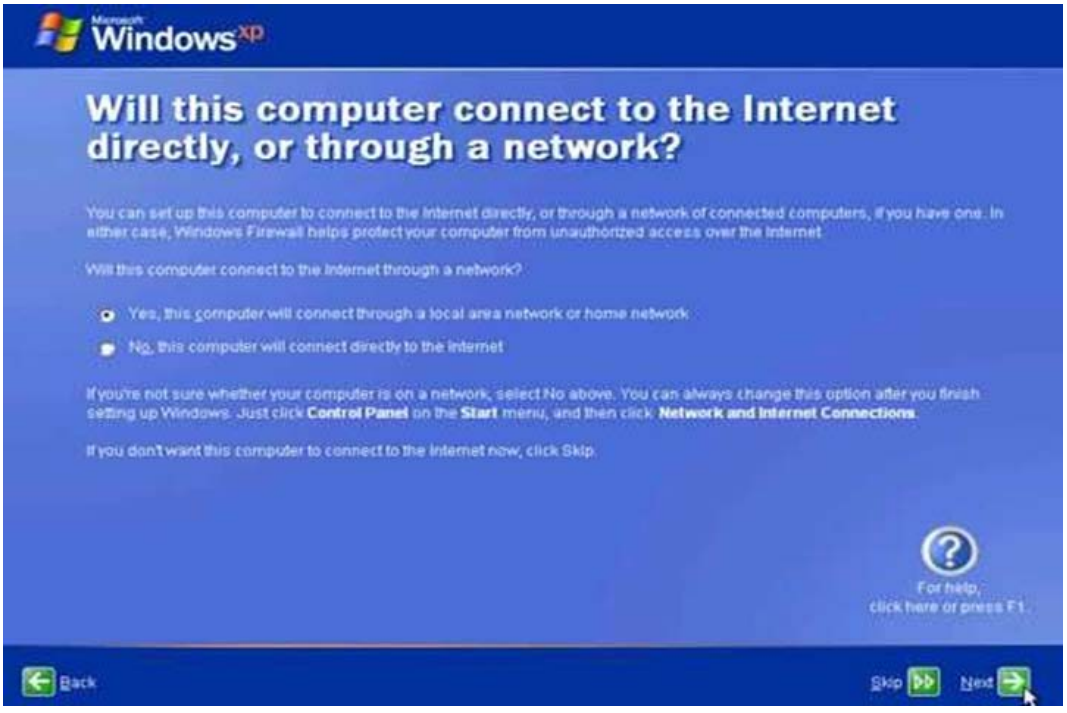
17) When the Monitor Settings dialog box appears, click OK.

18) The final stage of setup begins. On the Welcome to Microsoft Windows page, click Next.

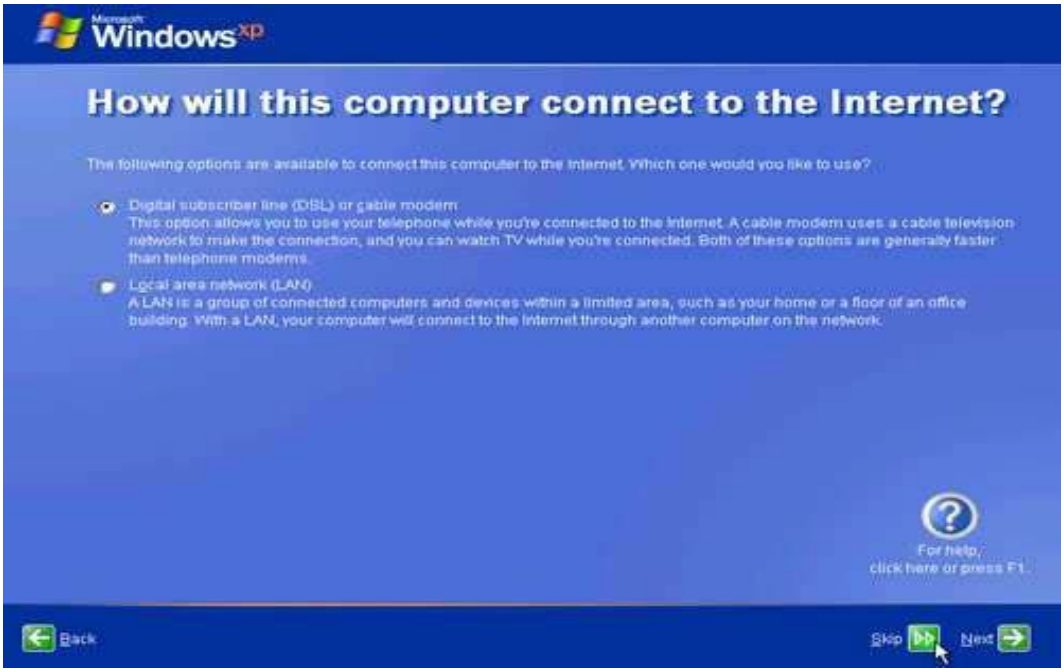
19) On the Help protect your PC page, click Help protect my PC by turning on Automatic Updates now. Then, click Next

20) Windows XP will then check if you are connected to the Internet:

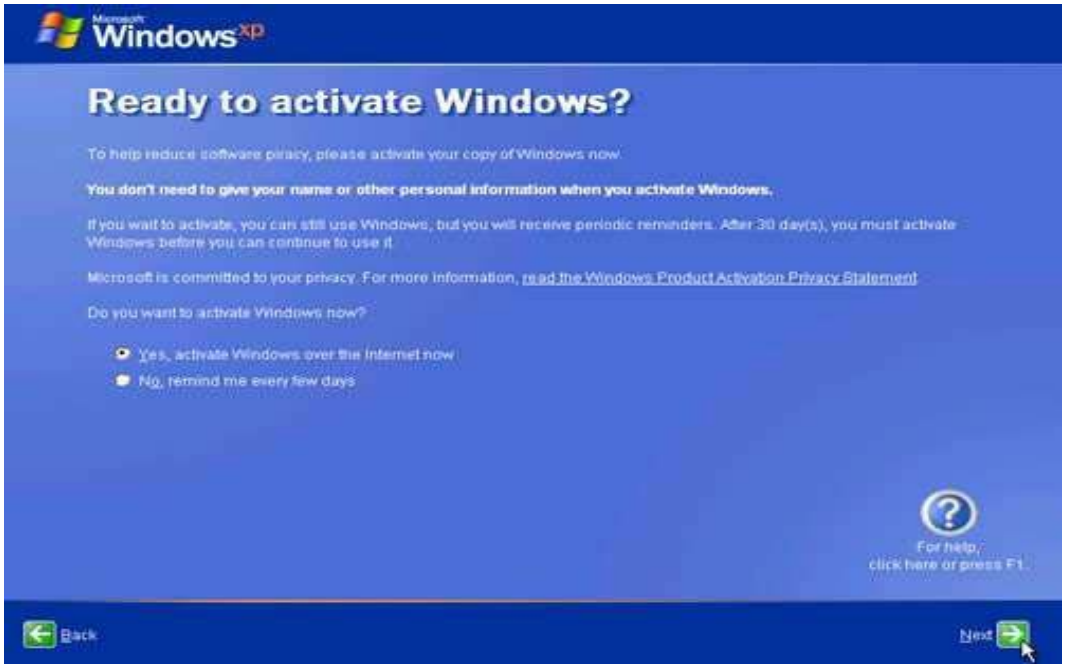
If you are connected to the Internet, select the choice that describes your network connection on the Will this computer connect to the Internet directly, or through a network? page. If you're not sure, accept the default selection, and click Next.



21) If you use dial-up Internet access, or if Windows XP cannot connect to the Internet, you can connect to the Internet after setup is complete. On the How will this computer connect to the Internet? page, click Skip.



22) Windows XP Setup displays the Ready to activate Windows? page. If you are connected to the Internet, click Yes, and then click Next. If you are not yet connected to the Internet, click No, click Next, and then skip to step 24. After setup is complete, Windows XP will automatically remind you to activate and register your copy of Windows XP.

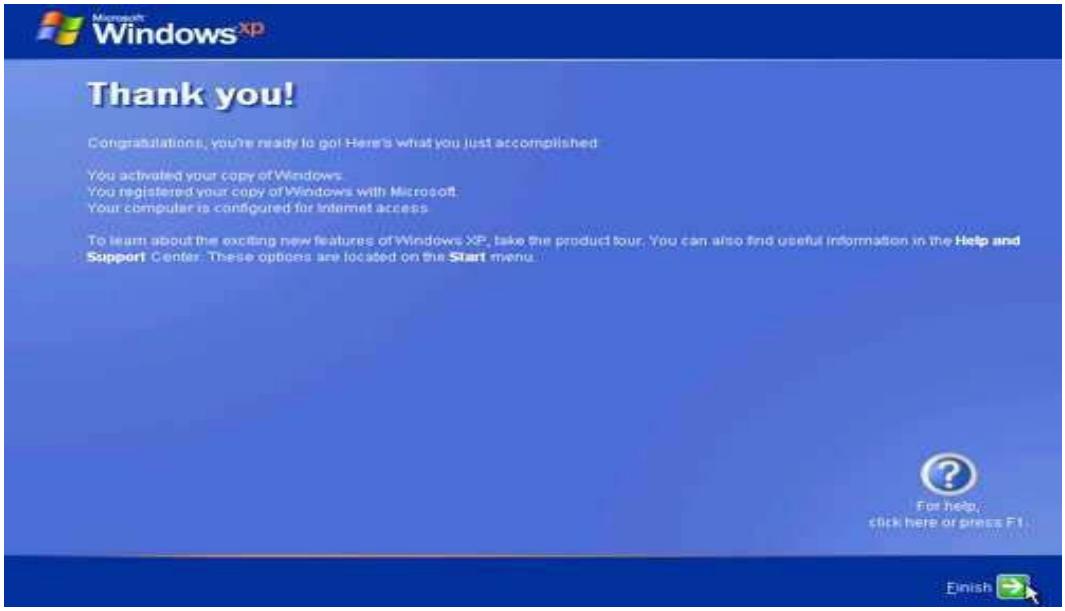


23) On the Ready to register with Microsoft? page, click Yes, and then click Next.

24) OntheCollectingRegistrationInformationpage,completetheform.Then,clickNext.

25) On the Who will use this computer? page, type the name of each person who will use the computer. You can use first names only, nicknames, or full names. Then click Next. To add users after setup is complete or to specify a password to keep your account private, read Create and customize user accounts.

26) On the Thank you! page, click Finish.



Congratulations! Windows XP setup is complete. You can log on by clickingyour name on the logon screen. If you've installed Windows XP on a newcomputer or new hard disk drive, you can now use the File and SettingsTransfer Wizard to copy your important data to your computer or hard diskdrive.

1.4 Windows Vista

Microsoft's newest version of its operating system is Windows Vista. For many users, upgrading to Vista won't seem as dramatic as the upgrade from 3.1 to Windows 95. But Windows Vista has a number of new features.

Windows Vista's GUI is a 3-D interface calledWindows Area. Of the four editions of Windows Vista, three Home Premium, Business and Ultimate -- support Windows Aero. Home Basic, the most scaled-down edition of the OS, uses a less graphics-intensive GUI instead of Aero. The other editions can also use this basic GUI, so people with older computers that can't support lots of 3-D graphics can still upgrade to Vista. This is why the requirements for a Premium Ready computer sound like what you'd expect from a 3-D game. It must have

The minimum Hardware (HW) and Software (SW) requirements as following

- 2GHz processor
- 512MB RAM for Windows XP and older versions
- 1GB RAM for Windows Vista
- 2GB RAM for Windows 7 and Windows 8
- 4GB RAM for Windows 10
- Screen resolution 1024 x 768 with 24-bit or 32-bit color depth

1.2.1 Functions of Microsoft Windows Vista

1. **Advanced Graphics**: - Windows Vista was the first operating system to fully support the Microsoft DirectX 10 functionality. Microsoft DirectX 10 allows newer video games to run with at a higher video quality. However, you must have a video card that supports DirectX 10 to take advantage of this functionality. Windows Vista will automatically run in DirectX 9 mode if the video card does not support DirectX 10.
2. **Child Safety**: - Windows Vista has a new functionality called "Parental Controls" that was not present in Windows XP. This function allows you to control what type of games, websites and programs that your child has access to. You can also use this function to restrict the amount of time that your child can use the computer each day.

3. **Entertainment: -** Microsoft released an edition of Windows XP called Windows XP Media Center Edition that was designed primarily for home entertainment purposes. Windows Vista retains that functionality in a program called Windows Media Center, which allows you to play movies, music and TV right from within the Windows Media Center user interface. It also features several other functions, such as the ability to view photos and play games.
4. **File Backup: -** Windows Vista comes with the Backup and Restore Center, which you can use to back up any important files on your computer. This function also gives you the option of restoring any backed up files. The Backup and Restore Center offers your computer additional security by including the option to create system restore points as well as the ability to restore the operating system.
5. **Photos Viewing and Editing: -** Windows Vista has two programs that you can use to view and edit photos. The Windows Picture and Fax Viewer has the capability of opening photos in a number of file formats, while the Windows Photo Gallery offers several options to edit and save photos. These programs come built-in with every edition of Windows Vista.

1.4.1 Install Windows Vista

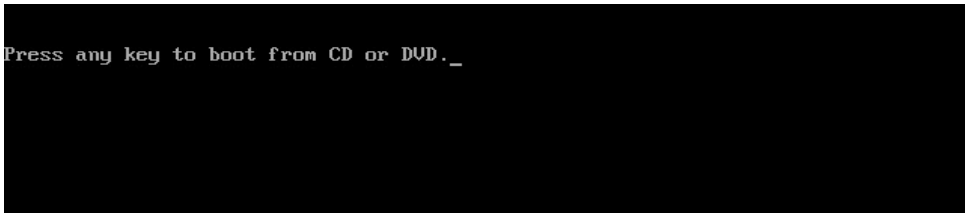
RecommendedEquipments:

Thefollowingequipmentisrequiredforthisexercise:

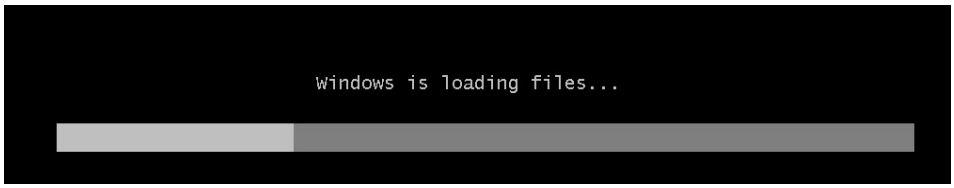
- A computer with a blank hard disk drive.
- Windows Vista installation DVD or USB flash drive.

Step-1 InserttheWindowsVistainstallationDVDintotheDVD-ROMdriveorplugtheUSBflashdriveintoaUSBport.

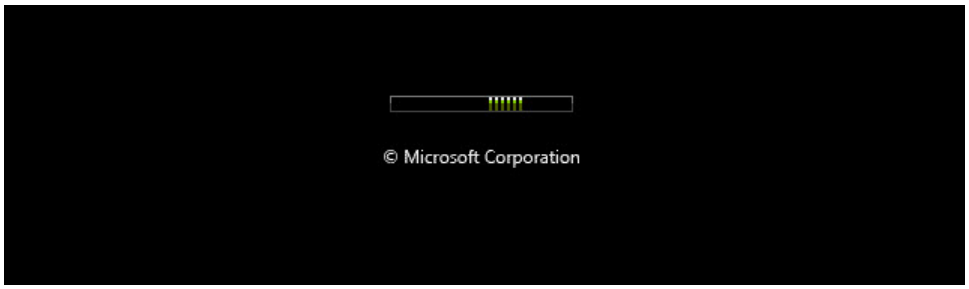
Whenthesystemstartsup,watchforthemessage“PressanykeytobootfromCDorDVD.”.Ifthemessageappears,pressanykeyonthekeyboardtobootthesystemfromthe DVD. If the press any key message does not appear, the computer automatically starts loading files fromtheDVD.



Thecomputer startsloadingfilesfromtheDVDorUSBflashdrive.



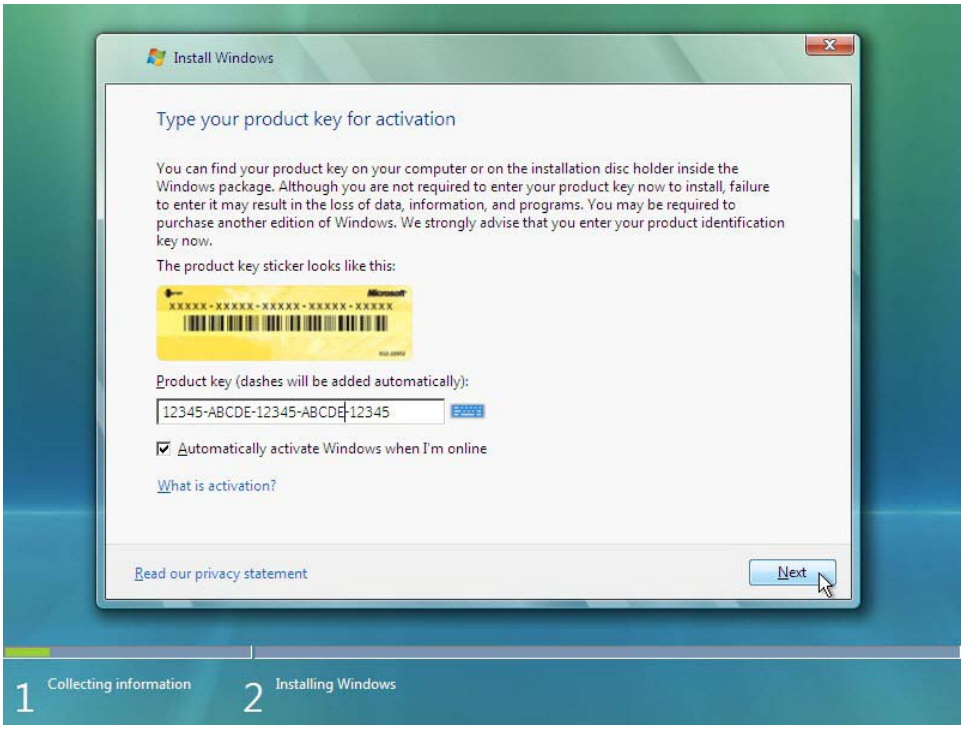
Step-2 TheWindowsVistabootscreenappears.



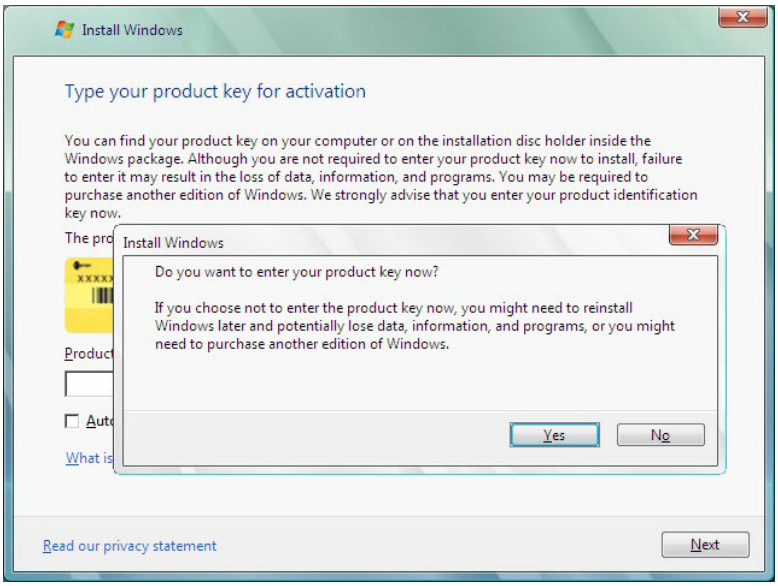
Step-3 The“InstallWindows”windowopens.Press Next unlessyouneedtochangethedefaultsettings.

Step-4 Press Install now tocontinue.

Step-5 TheCollectinginformationsectionoftheinstallationbegins.The “Type your product key for activation” screen appears. On this page, type your product key as itappearsonyourWindowsVistaDVDcase.Click Next.



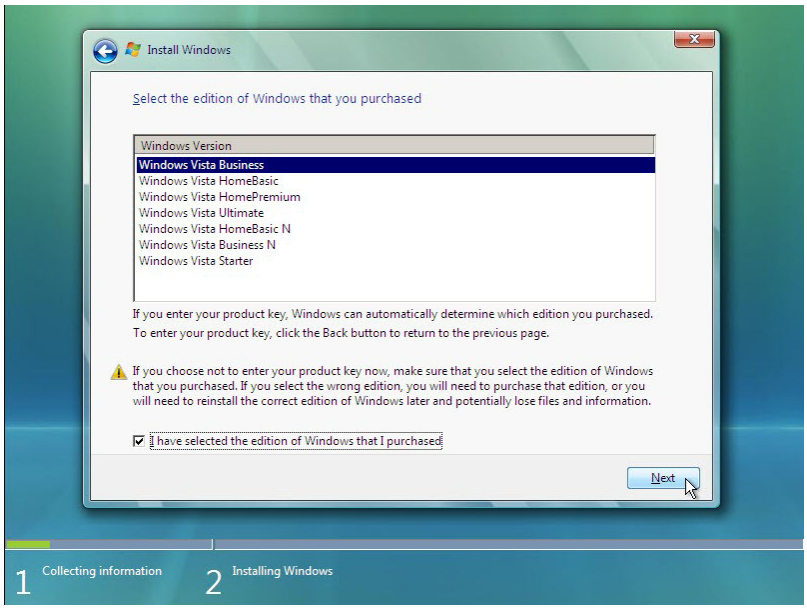
Note: If you entered your product key, Setup will determine the Vista product editionto install and will notdisplaythenexttwoscreens.Becauseyouhaveleftttheproductkeyfieldblank,the“Doyouwanttoenteryourproductkeynow?”windowappears.Ifyouwereinstructednottoenteraproductkey, click No.



Setup now prompts you to select the Vista version you purchased. In general, you should choose

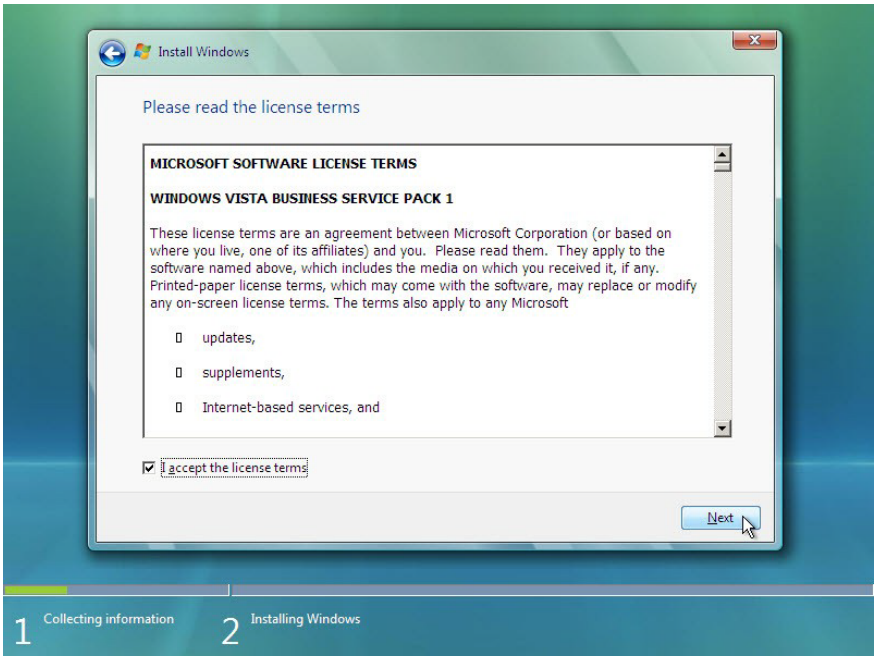
theversionyoupurchased,butnotethatyoucaninstallanyVistaversionlistedandexperimentwithitforalimitedtimebeforeproductactivationrequiresyoutoactivatetheversionyoupurchased.

Select the Windows Vista version that will be installed, check the item title "I have selected the edition ofWindowsthatIpurchased,"andthenclick Next.

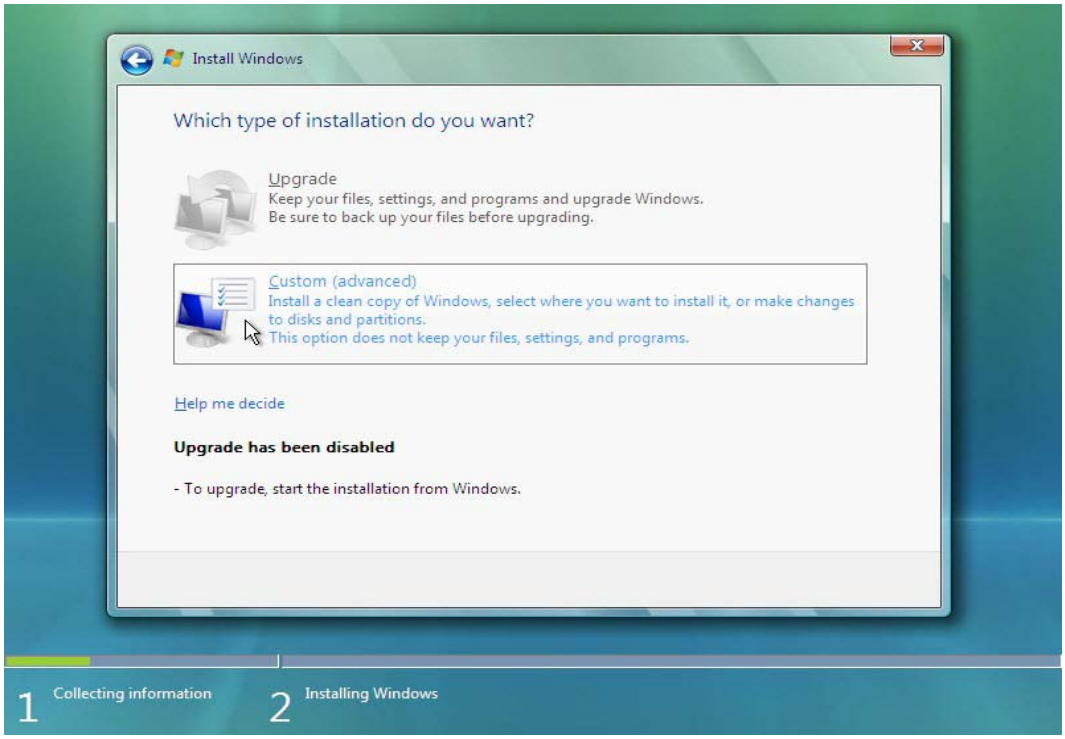


Step-

6The“Pleasereadthelicenseterms”screenappears.Readandconfirmthatyouacceptthelicensebyselectingthebox“Iacceptthelicenseterms”.Click Next.

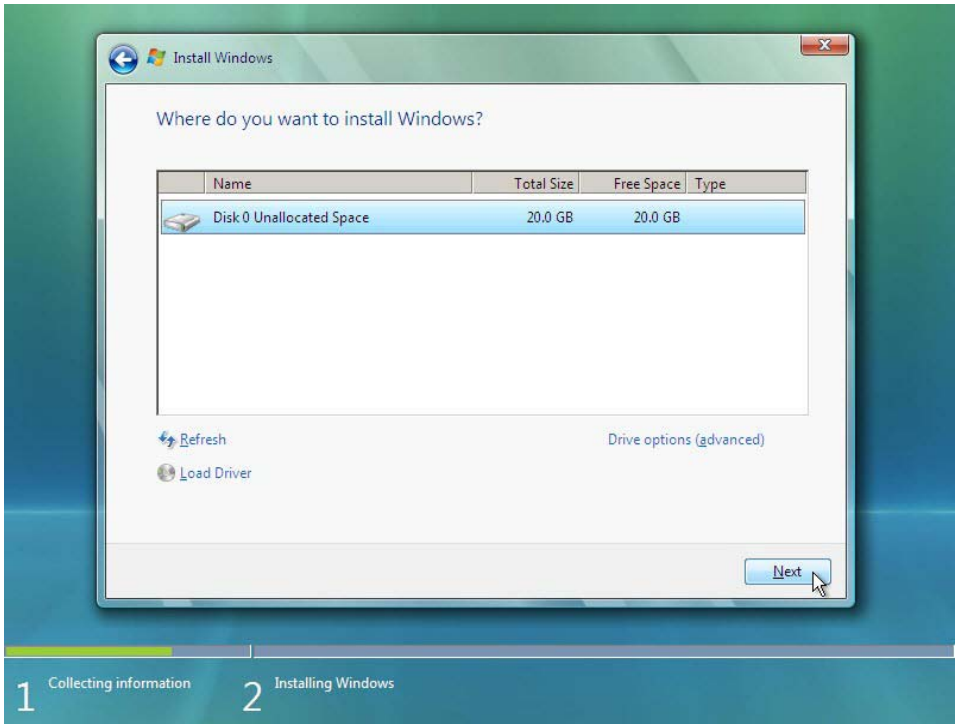


Step-7 The“Whichtypeofinstallationdoyouwant?”screenappears.Click Custom (advanced).



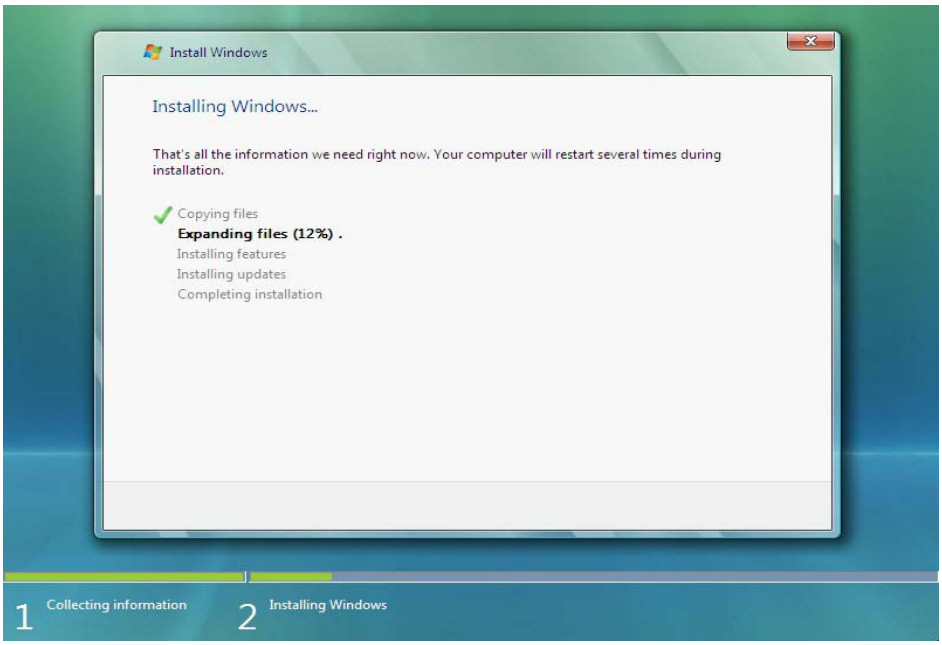
Step-8 The “Where do you want to install Windows?” screen appears. Select the hard drive or partition on whichWindowsVistawillbeinstalled.

Click Next toselect“Disk0UnallocatedSpace”,whichisthedefaultsetting.

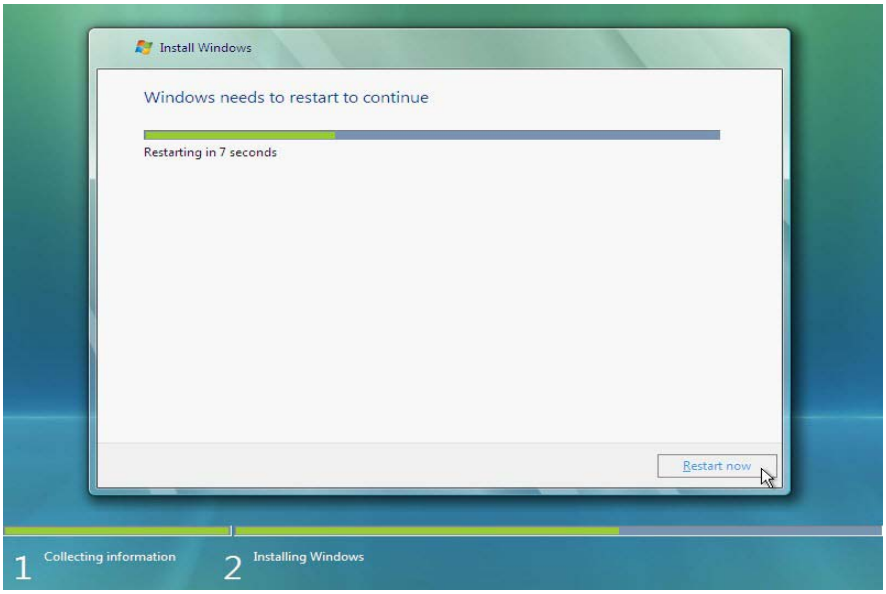


TheCollectinginformationsectionoftheinstallationends.

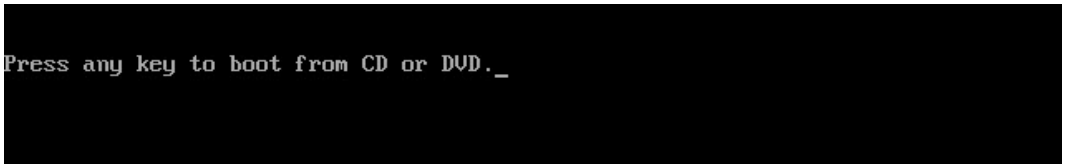
Step-9 TheInstallingWindowssectionbegins.The “Installing Windows …” screen appears. Windows Vista Setup may take up to 50 minutes toconfigureyour computer.



Step-10 The “Windows needs to restart to continue” screen appears. Your computer will automatically restart oryoucanclick Restart now.



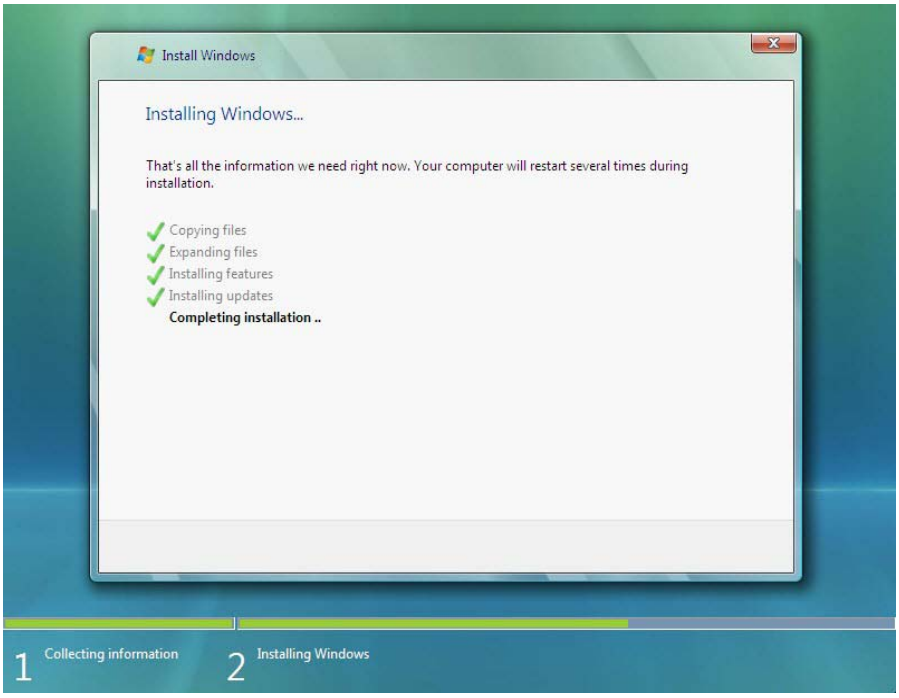
If you get the message “Press any key to boot from CD or DVD.”, do not press any key and Windowswillbootfromtheharddisktocontinuetheinstallation.



Step-

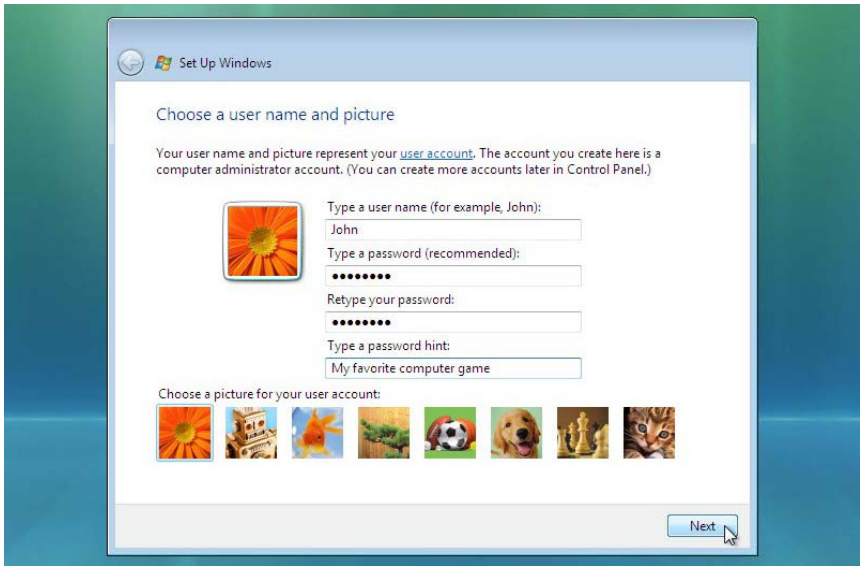
11The“PleasewaitwhileWindowscontinuessettingupyourcomputer...”messageappears.

Step-12 The “Installing Windows …” screen appears again. Windows may reboot a few more times. This may takeseveralminutes.



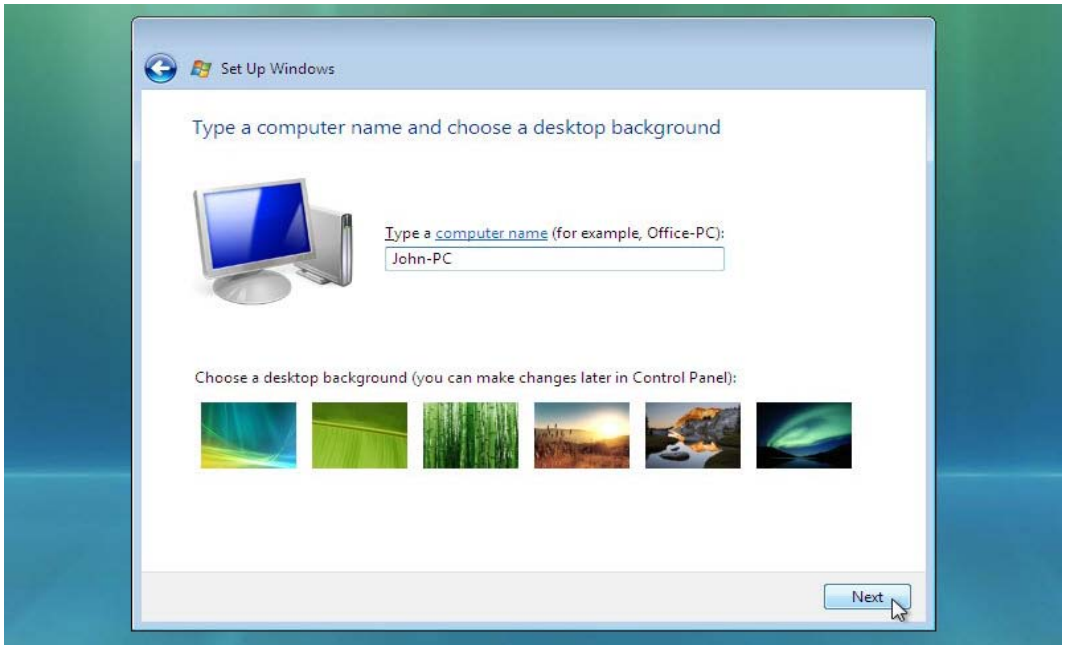
TheInstallingWindowssectionoftheinstallationis completed.

Step-13 The“SetUpWindows”sectionbegins.The “Choose a user name and picture” screen appears. Type the name provided by your instructor. Typethe Administrator password provided by your instructor. When you type in a password, two new fields willappear.Retypethepasswordandthepasswordhint.Click Next

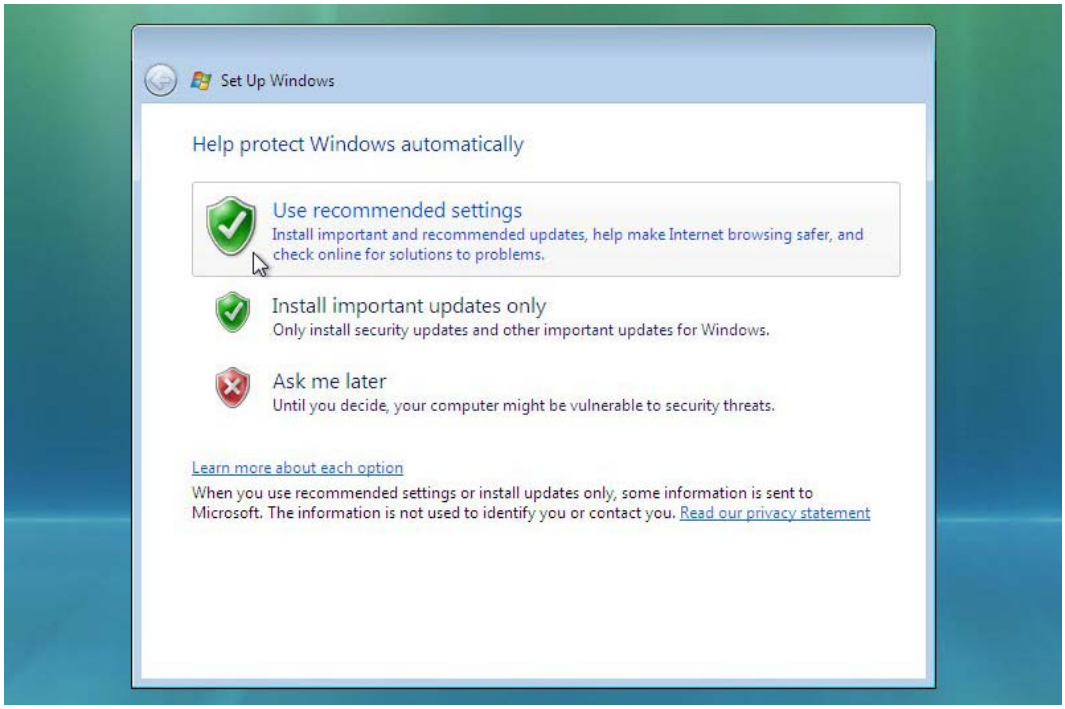


Step-

14The“Typeacomputernameandchooseadesktopbackground”screenappears.Typethecomputernameprovidedbyyourinstructor.Click Next.

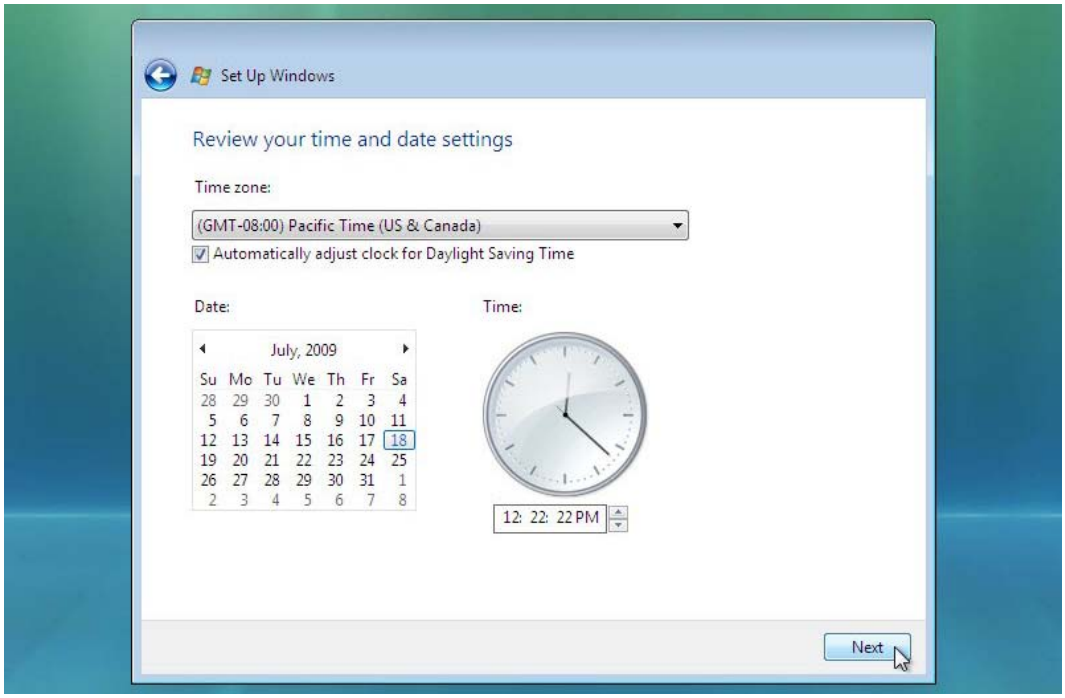


Step-15 Onthe“HelpprotectWindowsautomatically”screen,click Use recommended setting.



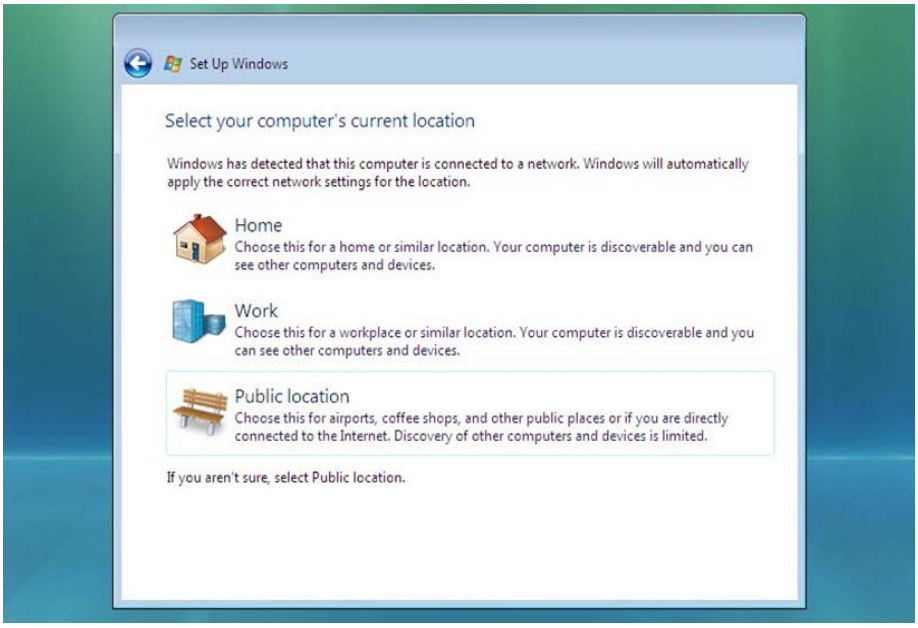
Step-16 On the “Review your time and date settings” screen, configure the computer

clock to match your localdate,time,andtimezone.Click Next.



Step-17 The “Select your computer’s current location” screen appears. Select the option provided by yourinstructor.

Note:Thisscreenwillnotshowupiftheinstallationdidnotcorrectlyinstalldriversforthenetworkcard.

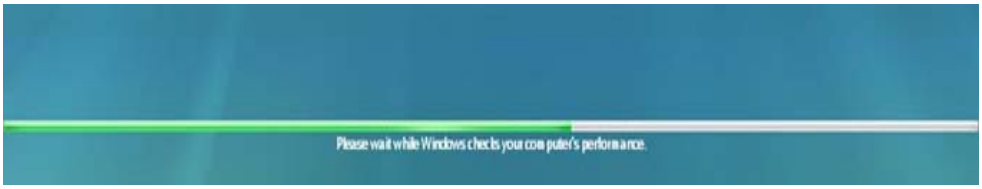


Step-18 Onthe“Thankyou”screen,click Start.

The “Set Up Windows” section is completed.

Step-19

The“PleasewaitwhileWindowschecksyourcomputer'sperformance”messageappears.



Step-20 WindowsVistabootsforthefirsttime.

Step-21 The login window appears. Enter the password that you used during the install process and click the blue arrow tologin.

Step-

22The“Preparingyourdesktop…”messageappears.Youraccountprofileiscreatedandconfigured.

Step-23 The“Welcome”screenappears.WindowsVistaisnowinstalled.

1.5 Windows NT Installation

Windows NT is a Microsoft Windows personal computer designed for users and businesses needing advanced capability. NT's technology is the base for the Microsoft successor operating system, Windows NT (which may originally have stood for "New Technology," although Microsoft doesn't say) is actually two products: Microsoft NT Workstation and Microsoft NT Server.

The Workstation is designed for users, especially business users, who need faster performance and a system a little more fail-safe than Windows 95 and Windows 98. The Server is designed for business machines that need to provide services for network-attached computers.

Windows NT Workstation: Microsoft says that 32-bit applications run 20% faster on this system than on Windows 95 (assuming both have 32 megabytes of RAM). Since older 16-bit applications run in a separate address space, one can crash without crashing other applications or the operating system. Security and management features not available on Windows 95 are provided. The Workstation has the same desktop user interface as Windows 95.

Windows NT Server: The NT Server is probably the second most installed network server operating system after Novell's NetWare operating system. Microsoft claims that its NT servers are beginning to replace both NetWare and the various UNIX-based systems such as those of Sun Microsystems and Hewlett-Packard. NT Server 5.0.

1.5.1The feature of windows NT are as follows: -

(1) it is multitasking, Multi-use and Multithreading O.S.

(2) it is also supporting virtual Memory management system to allow multiprogramming.

(3) Symmetric multiprocessing allows to it Schedule various task on any CPU in a multiprocessor system.

(4) it is new technology file system which implement fault tolerance, security and support for large file.

(5) if is 32-bit O.S.

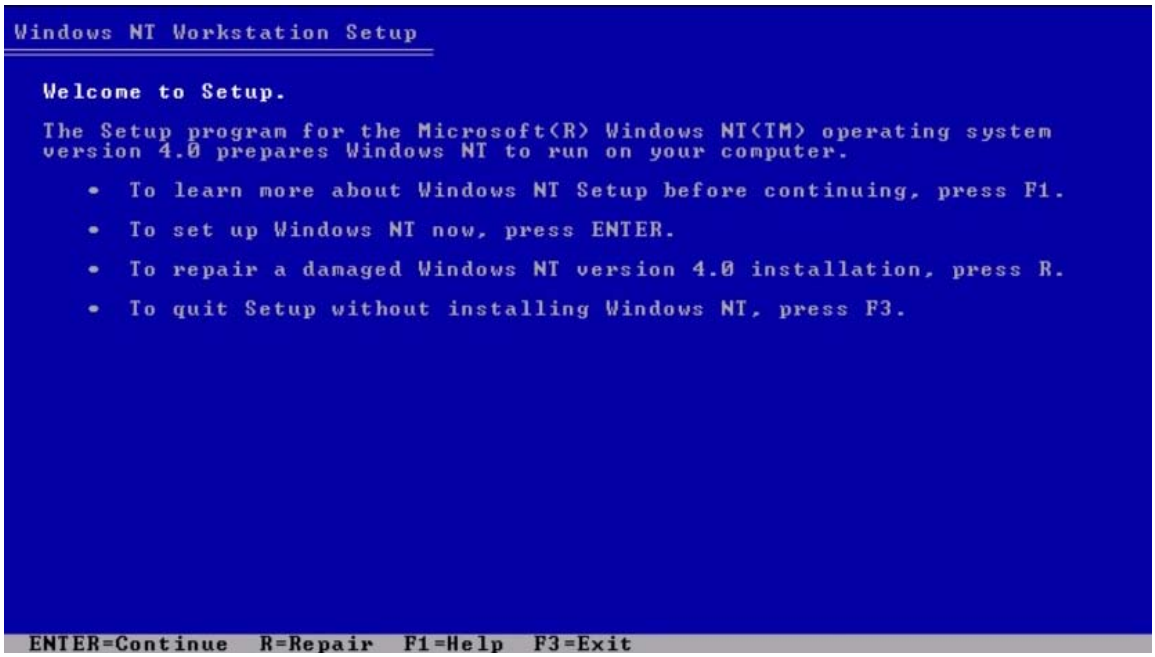
1.5.2 NT 4.0 Installation

Wecan install windows NT 4.0 workstation using following steps: -

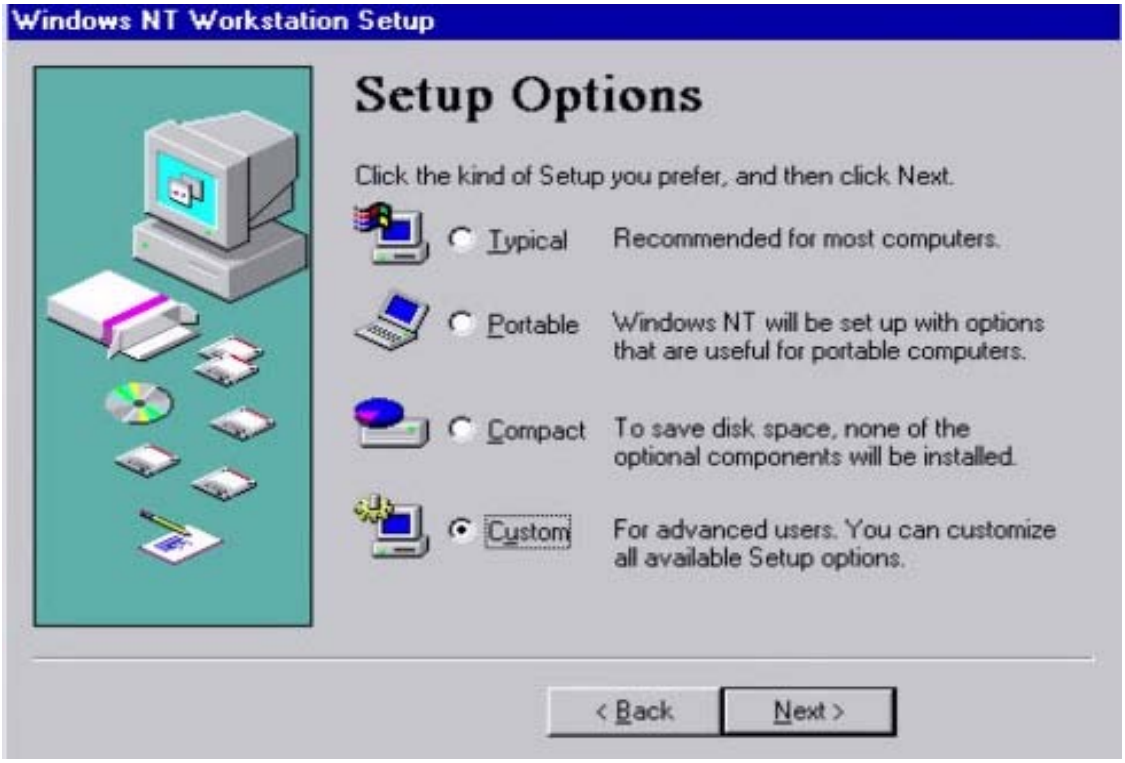
(1) First, we need to turn on our computer and the we can insert NT disc insert CD

ROM drive.

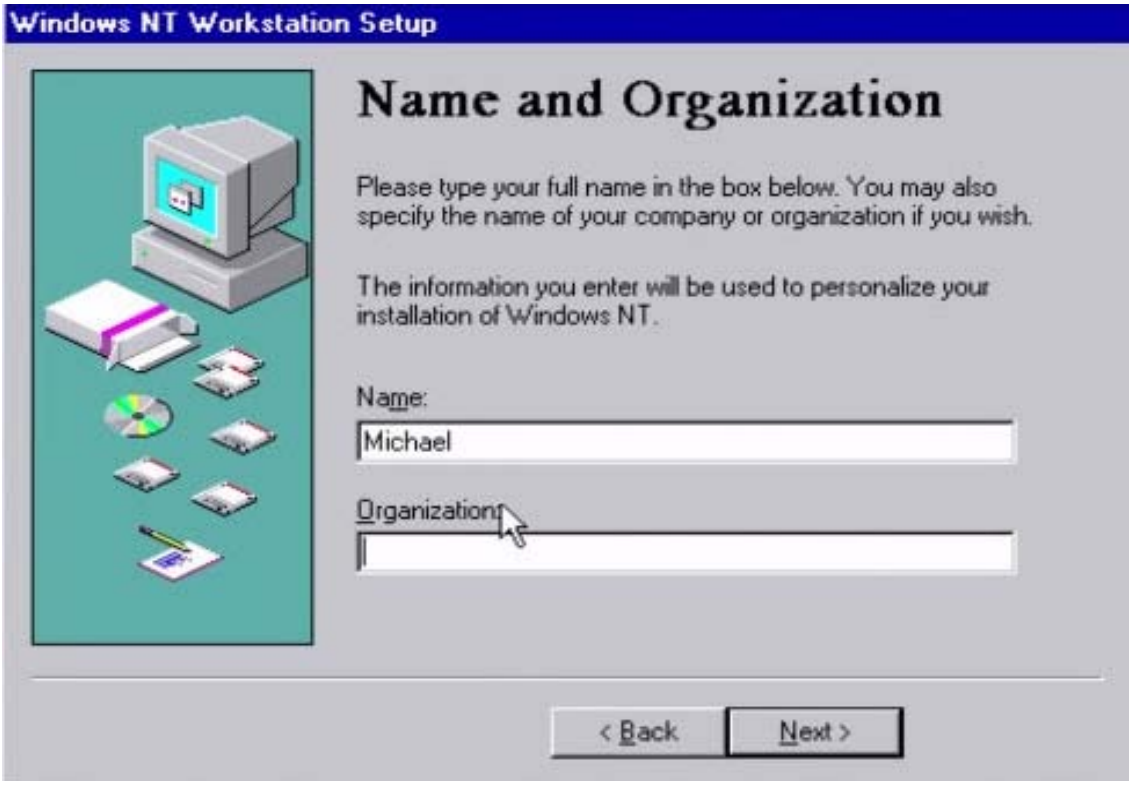
(2) Now we need to follow text mode on screen instruction.



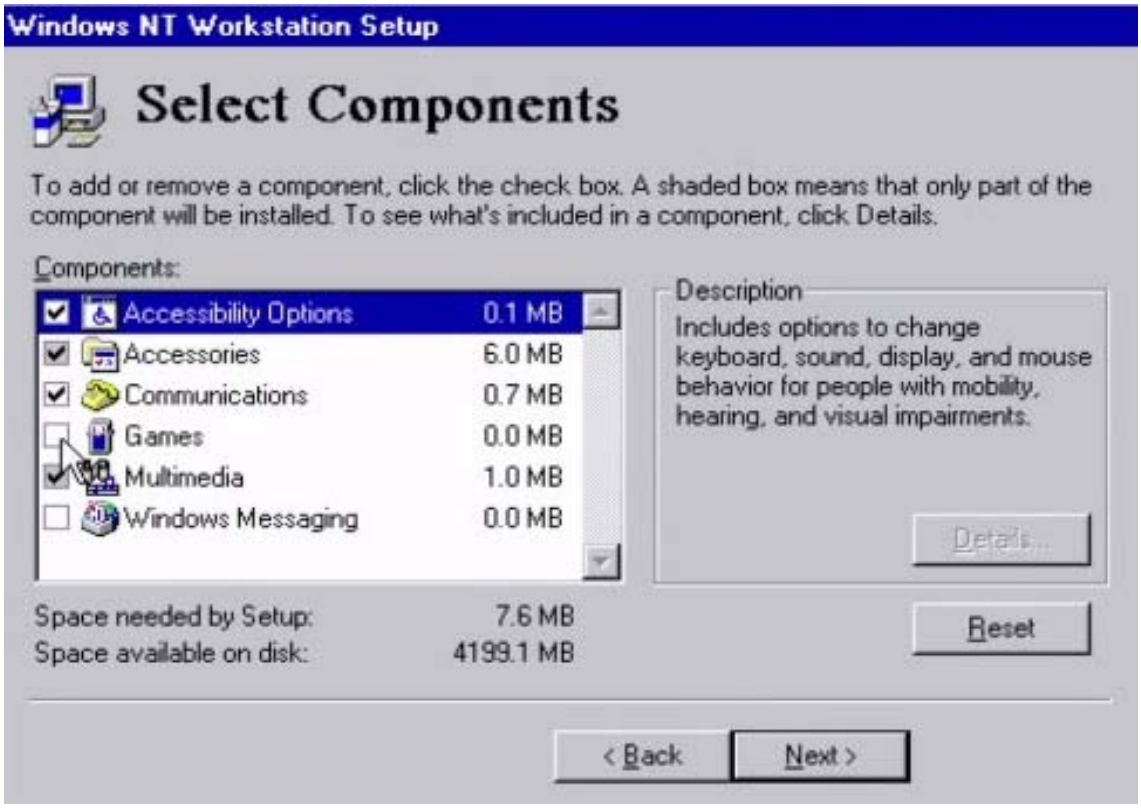
(3) When graphical mode begins, we need to choose an installation type then we can select custom type



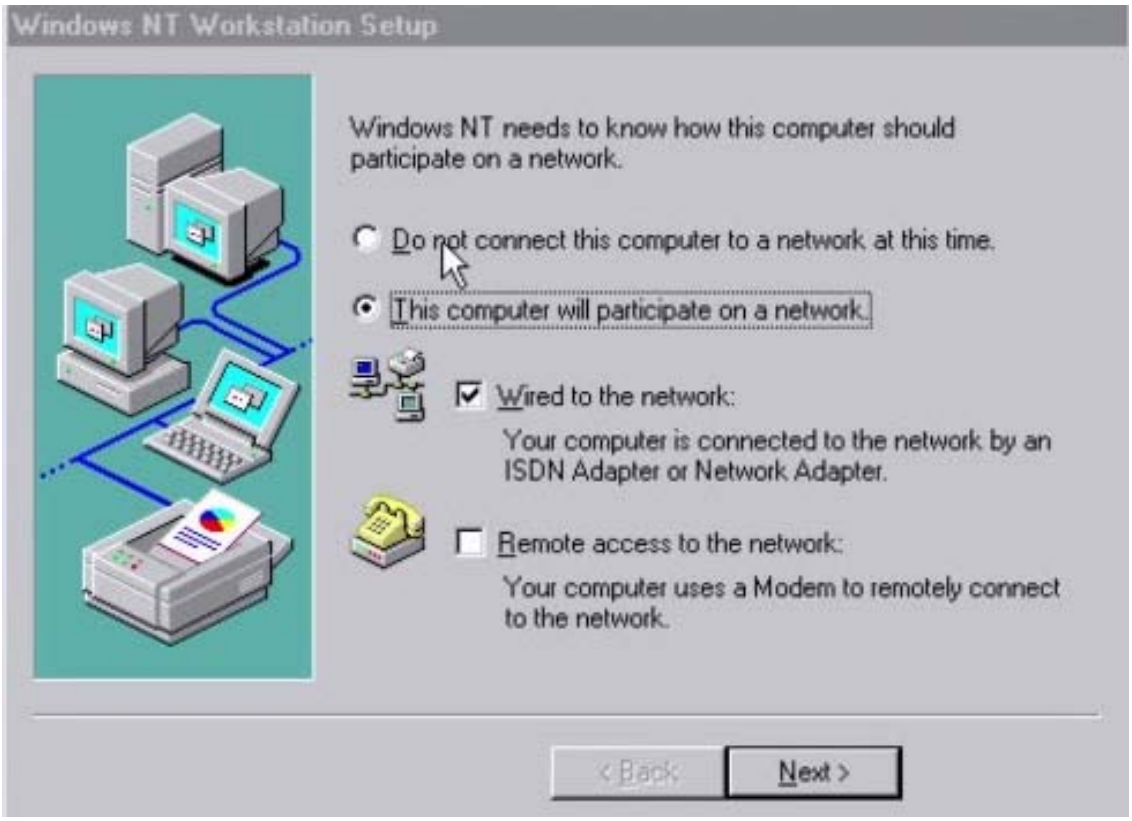
(4) Then we need to enter our name , organization name, computer name, password when promped



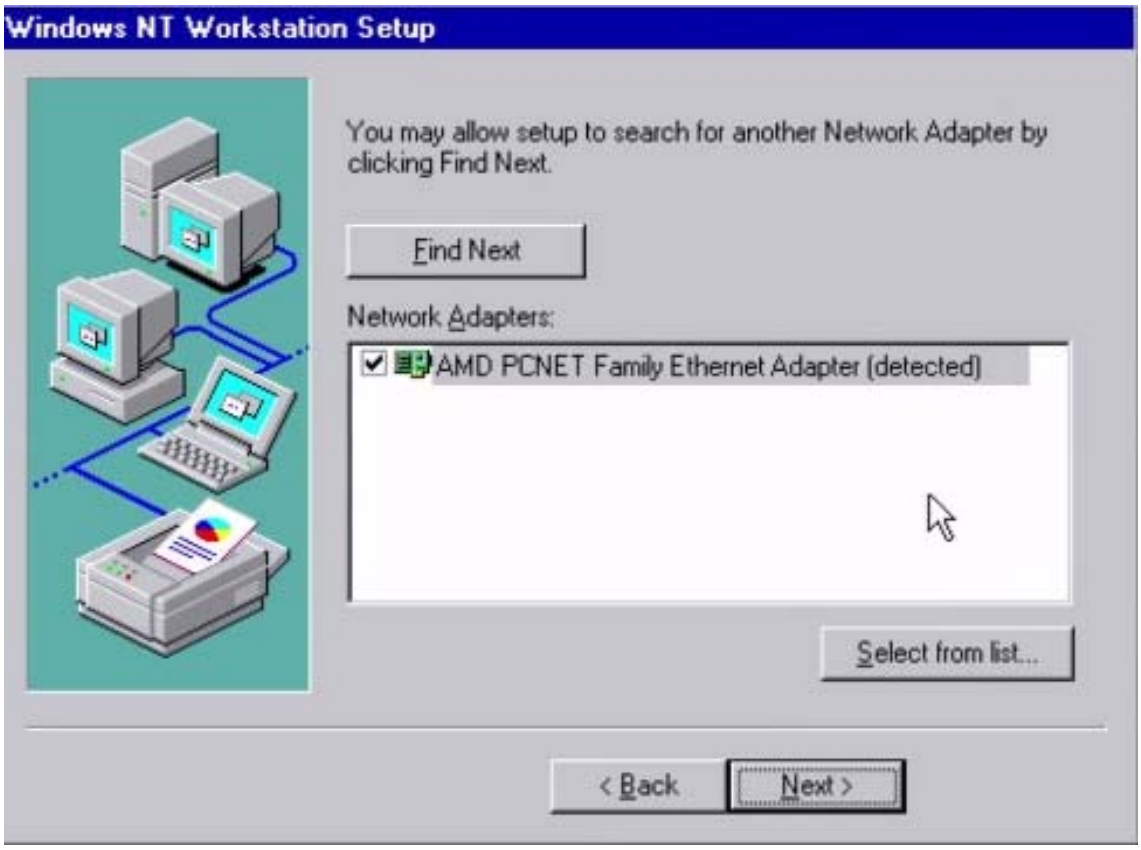
(5) Now we can go through each of the installation options and choose the components that we need also we can click details to see on each category



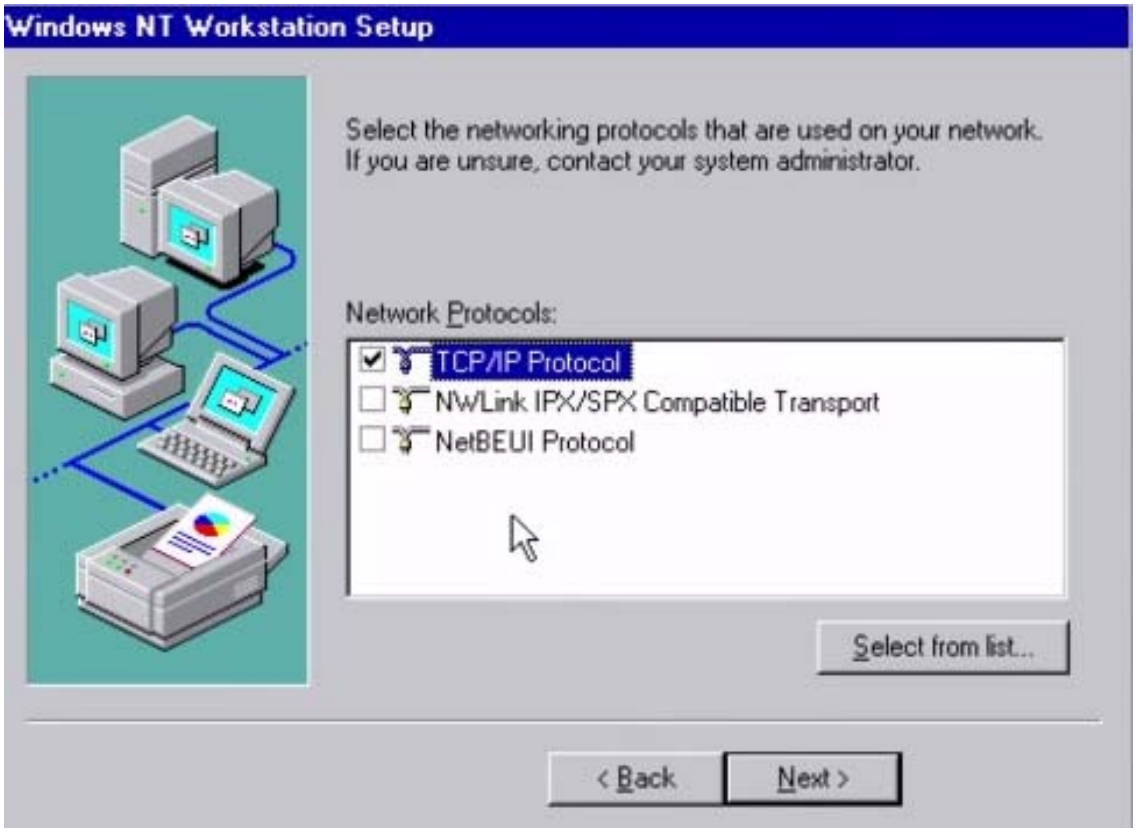
(6) Now on the network installation screen we need to select participate on network option



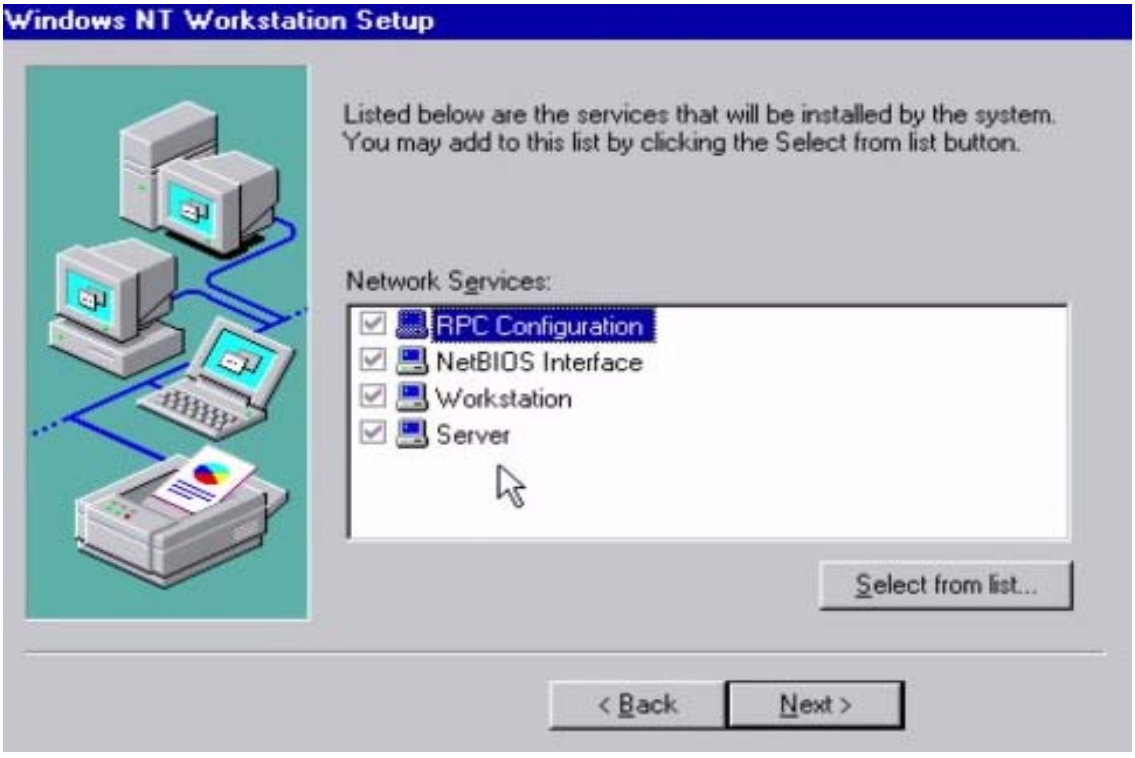
(7) Now we need to install network adapter drivers



(8) In the next step we need to ensure that we only install the protocols TCP/IP or Net BEUI Protocol that we need



(9) Now we can accept to default network now we can complete the installation providing additional drivers and information if required



(10) Once on the windows NT 4.0 desktop we can install rest of our Hardware driver Service Pack updates etc.

1.6 LINUX OPERATING SYSTEM

Linux is a freely available, open source, Unix-like operating system. Writtenoriginally for the PC by Linux Torvalds, with the help of many other developersacross the Internet, Linux now runs on multiple hardware platforms. Because of itsspeed, stability, and low cost, Linux became the fastest growing operating system forservers. Today, Linux is widely used for both basic home and office uses. It is themain operating system used for high performance business and in web servers. Linuxhas madeahugeimpact inthisworld.

ThefollowingarevariousfeaturesofLinuxoperatingsystem:

1)**LowCost**: There is no need to spend time and huge amount money to obtain licenses since Linuxand much of its software come with the GNU General Public License. There is noneedto worryabout anysoftwarethat youuseinLinux.

2)**Stability:** Linux has high stability compared with other operating systems. There is no need toreboottheLinuxsystemtomaintainperformancelevelsrarely.Itsfreezesuporslowdown.It hasacontinuousup-timesofhundredsofdaysormore.

3)**Performance:**Linuxprovideshighperformanceonvariousnetworks.Ithastheabilitytohandlelargenum bersof userssimultaneously.

4)**Networking**: Linux provides a strong support for network functionality; client and server systemscan be easily set up on any computer running Linux. It can perform tasks like networkbackupmorefasterthan other operatingsystems.

5)**Flexibility:**Linux is very flexible. Linux can be used for high performance server applications,desktop applications, and embedded systems. You can install only the neededcomponentsforaparticularuse.Youcanalsorestricttheuseofspecificcomputers.

6)**Compatibility:**ItrunsallcommonUnixsoftwarepackagesandcanprocessallcommonfileformats.

7)**Fast and Easy Installation:** Linux distributions come with user-friendly installation.

8)**Better use of Hard Disk:**Linux uses its resources well enough even when the hard disk is almost full.

9)**Multitasking:**Linux is a multitasking operating system. It can handle many things at the same time.

10)**Open Source:**Linux is an Open source operating systems. You can easily get the source code for Linux and edit it to develop your personal operating system.

1.6.1 How to Install Linux Operating System

The minimum Hardware (HW) and Software (SW) requirements as following

1) 300 MHz x86 processor
2) 64 MB of system memory (RAM)
3) At least 4 GB of disk space (for full installation and swap space)
4) VGA graphics card capable of 640 × 480 resolution
5) CD-ROM drive or network card

System requirements (recommended)

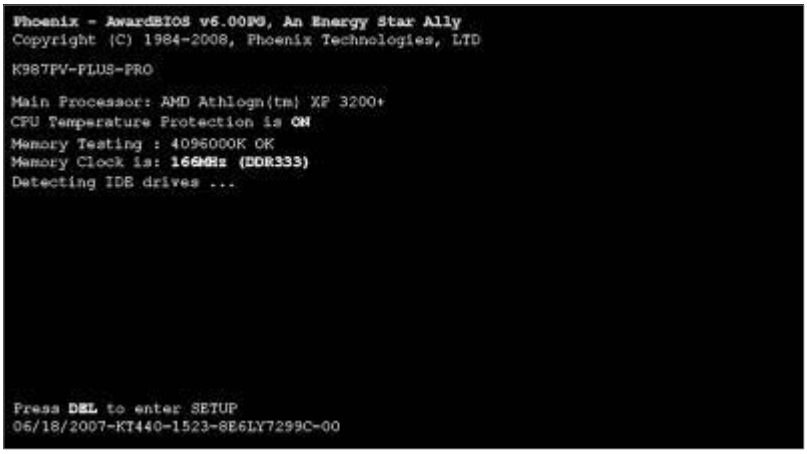
1) 700 MHz x86 processor or higher
2) 384 MB of system memory (RAM) or more
3) 8 GB of disk space or more
4) Graphics card capable of 1024×768 resolution
   Sound card
5) A network or Internet connection

The following step by step procedure helps the student to install Ubuntu12.04. Similar to Windows XP installation procedure, Step by Step figures are also shown for more clarity.
Booting the Installation System
There are several ways to boot the installation system. Some of the very popular ways are , Booting from a CD ROM, Booting from a USB memory stick, and Booting from TFTP.

Here we will learn how to boot installation system using a CD ROM.
Before booting the installation system, one need to change the boot order and set CD-ROM as first boot device.

1) Changing the Boot Order of a Computers

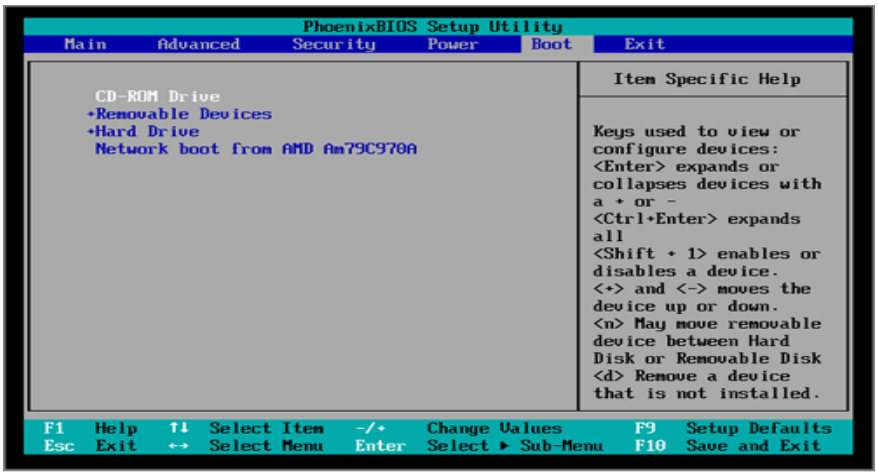
As your computer starts, press the DEL, ESC, F1, F2, F8 or F10 during the initial startup screen. Depending on the BIOS manufacturer, a menu may appear. However, consult the hardware documentation for the exact key strokes. In my machine, its DEL key as shown in following screen-shot.



2) Find the Boot option in the setup utility. Its location depends on your BIOS.

Select the Boot option from the menu, you can now see the options Hard Drive, CD-ROM Drive, Removable Devices Disk etc.

Change the boot sequence setting so that the CD-ROM is first. See the list of “Item Specific Help” in right side of the window and find keys which is used to toggle to change the boot sequence.



3) Insert the Ubuntu Disk in CD/DVD drive.

Save your changes. Instructions on the screen tell you how to save the changes on your computer. The computer will restart with the changed settings.

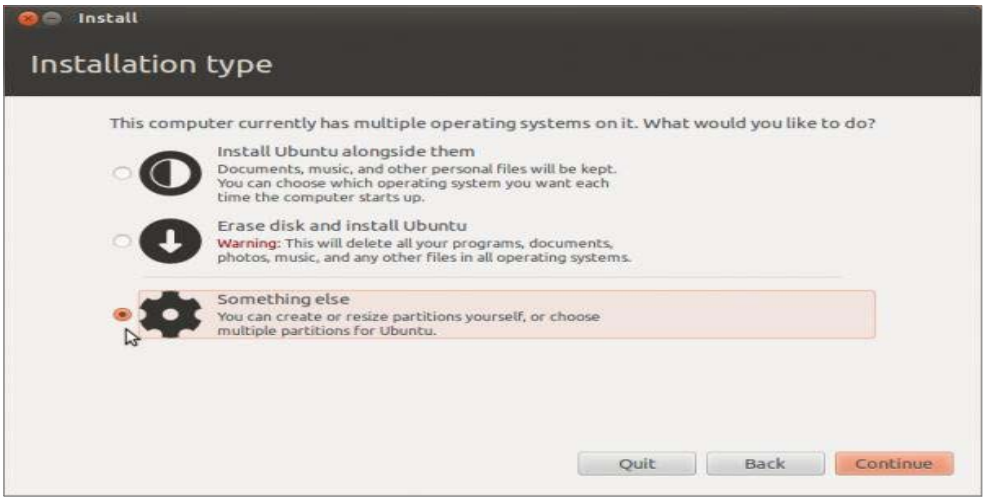
Machine should boot from CD ROM, Wait for the CD to load...

4) In a few minutes installation wizard will be started. Select your language and click the

5)"Install Ubuntu" button to continue...

Optionally, you can choose to download updates while installing and/or install third party software, such as MP3 support. Be aware, though, that if you select those options, the entire installation process will be longer!

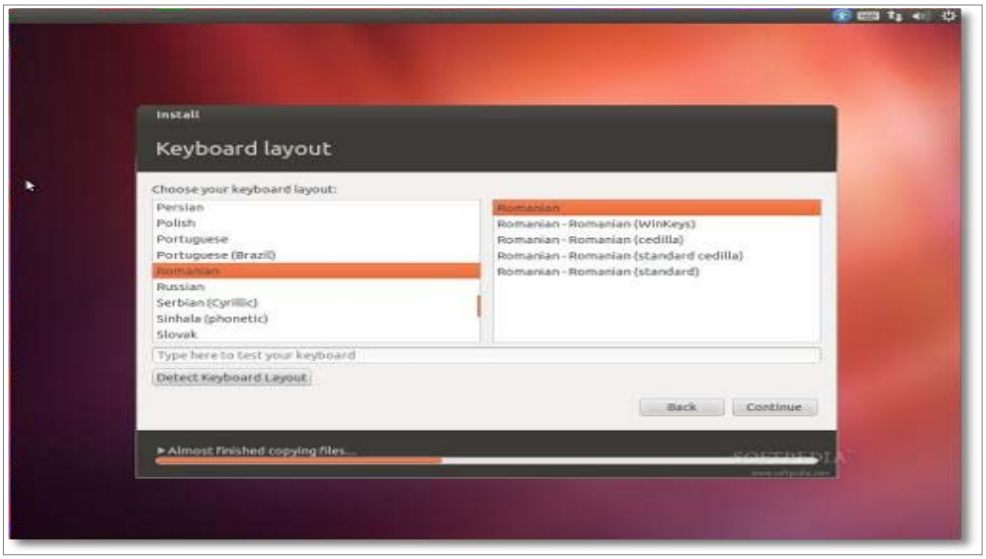
6) Since we are going to create partitions manually, select Something else, then click Continue. Keep in mind that even if you do not want to create partitions manually, it is better to select the same option as indicated here. This would insure that the installer will not overwrite your Windows , which will destroy your data. The assumption here is that sdb will be used just for Ubuntu 12.04, and that there are no valuable data on it.



7) Where are you? Select your location and Click the "Continue" button .

Keyboard layout

8) Select your keyboard layout and UK (English) and Click on “Continue” button

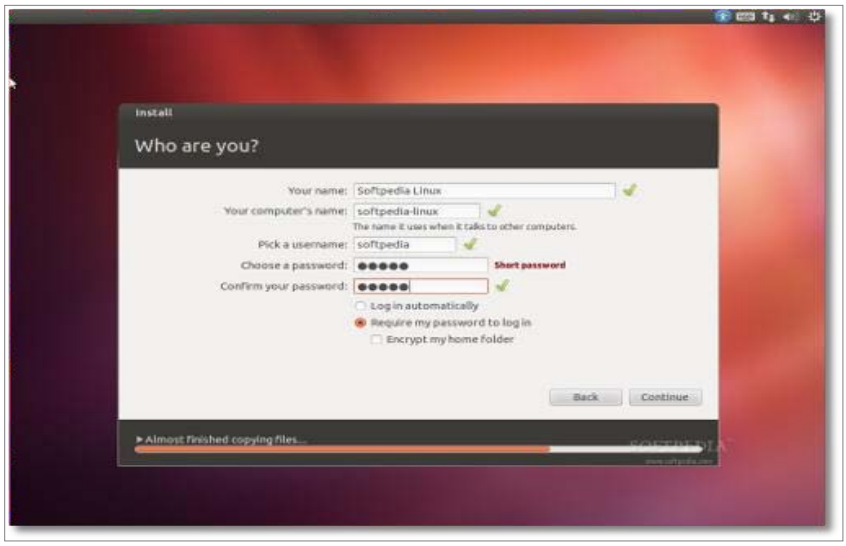


9) Who are you?

Fill in the fields with your real name, the name of the computer (automatically generated, but can be overwritten), username, and the password.

Also at this step, there's an option called "Log in automatically." If you check it, you will automatically be logged in to the Ubuntu desktop without giving the password.

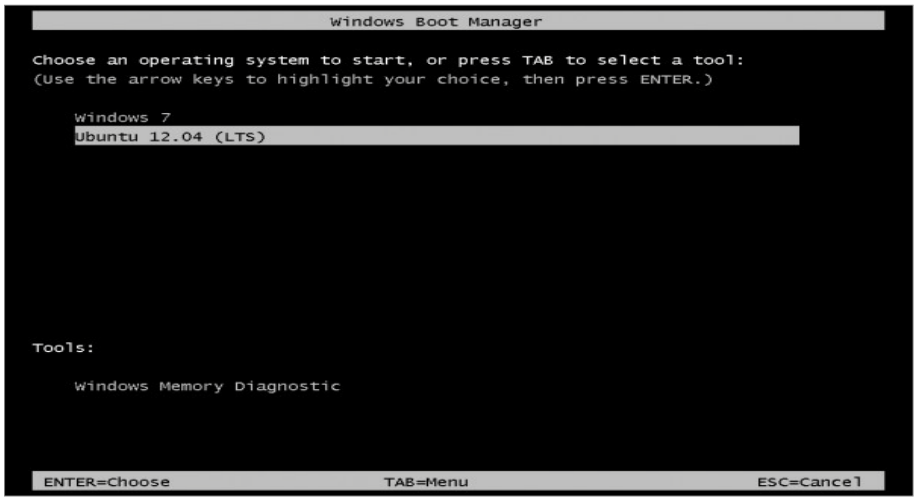
Option "Encrypt my home folder," will encrypt your home folder. Click on the "Continue" button to continue...



10) Now Ubuntu 12.04 LTS (Precise Pangolin) operating system will be installed.

11) It will take approximately 10-12 minutes (depending on computer's speed), a pop-up window will appear, notifying you that the installation is complete, and you'll need to restart the computer in order to use the newly installed Ubuntu operating system. Click the "Restart Now" button.

12) Please remove the CD and press the "Enter" key to reboot. The computer will be restarted. In a few seconds,you should see Windows 7's boot menu with two entires listed – Windows 7 and Ubuntu 12.04 (LTS). Then you may choose to boot into Windows 7 or Ubuntu 12.04 using the UP/Down arrow key.



13) Please select Ubuntu 12.04 (LTS) and press Enter to boot the machine in Ubuntu 12.04 Linux.

14) Here you can see the users on the machine, Click on the user name and enter the password and press Enter key to login.

15) We have successfully install and login to Ubuntu 12.04 LTS.

Ubuntu 12.04 LTS has **better looks than Windows 7**. Ubuntu is a lightweight OS and boots up very faster than Windows 7. Ubuntu offers you 4 different work places while it is yet absent in Windows 7.

LESSON 2

SETTING OF DESKTOP, LIBRARY SERVER AND ITS MAINTENANCE

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STRUCTURE

1.1 Objectives
1.2 Introduction
1.3 System Settings
1.4 Data Backup
1.5 Disk Drive Utilities
1.6 A Graphical User Interface
1.7 Add/Remove applications
1.8 Set up windows for multiple users

1.1 Objectives

The objectives of the lesson are to know about the different functions of computer System Settings, Backup, disk drive utilization, setting up graphical user interface, adding and removing application, and setting up multiuse facilities in Windows operating system. This chapter is only focused users creation in the computer local server, rights management and system parameter setting.

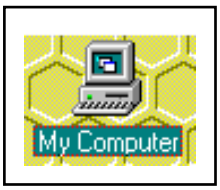
1.2 Introduction

In the previous unit, we have discussed about the features and components of GUIs.Wehave also introduced you tostarting upofapowerfulGUI basedoperatingsystemWindows.Inthis and subsequentunits,wewillbe focusingmainly on the practicalaspects of Windowspackage.Since these unitsare morepractical innature, we willexpectyoutouse these units during your practicalsessions also.

Windows provide a lot of utilities for managing your system. These utilities like Disk utilities help to maintain disksand access the maximum available space on the disk. If multiple users are using the same system, they have theadvantage of setting the system as they like. Different persons can specify their logins on the same system and switchover to their settings.In thisunit our focus will be on systemsettings, backup and disk management utilities.

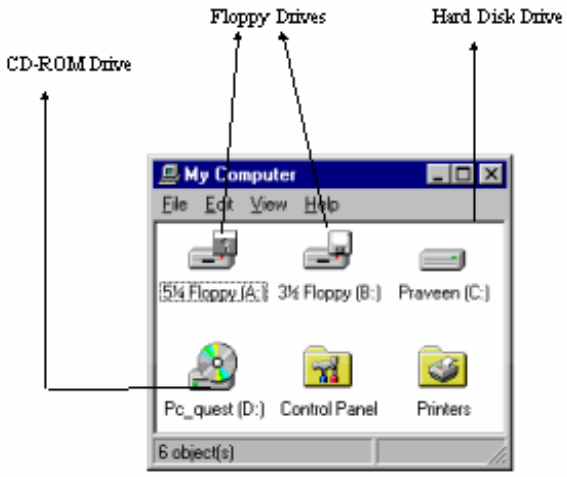
1.2.1 MYCOMPUTER

In Windows ,the thingsyou have oncomputer, likeprograms, documents,and data files,are allaccessible fromoneplace called My Computer. You canfind its icon on the desktop.



Tosee what is onyour computer, follow the stepsgiven below :

Double-clickthe **My Computer** icon. Itopens the window thatlooks like the figure shown below.



1. Double-clickthe iconfor thedrive youwant to look at.

2. Windowsdisplays the filesand folders onthe drive. Folderscan contain files,programs, and evenother folders.

3. Toopen afile or folder,or starta program, double-clickit.

The information can also be displayed about the different drives, Control Panel, and Printer(s) that are installed on yoursystem. When an object (any of the above mentioned things) is selected, the related commands are highlighted in the**File**menu. Selectanydriveand click on Filemenu. The different optionsthatare displayed are:

Open	Opens the selected objectina window.
Explore	Opens theexplorerto seethefile structureofthe drive.
Find	Helps you search for files on the selected drive or anywhere on the filing system.
Sharing	Lets you sharethe selecteddrive with otherusers inyour organization that are connectedonyour computer.

Format	Erasesor formatsthe selected floppydrive.
CreateShortcut	Places ashortcutforthe objectonWindows95Desktop forquickaccess.
Properties	Displaysinformationabouttheselectedobject.
Close	Closesthe open window.

1.3 System Setting

The Systemcan bepersonalized bymakinginteresting anduseful changestoWindowssettings. Forexample, youcan:

I. Adjust the double-click speed for your mouse.Change number, currency, time, and date settings.Changeprinter settings.

II. Change settings for network service.Change background of your desktop.ChangethecapacityoftheRecycleBin.

III. Change the number of colors your monitor displays.Haveyourmonitorautomaticallyturnoff.

IV. Changethescreenresolution.Changedisplayfonts.

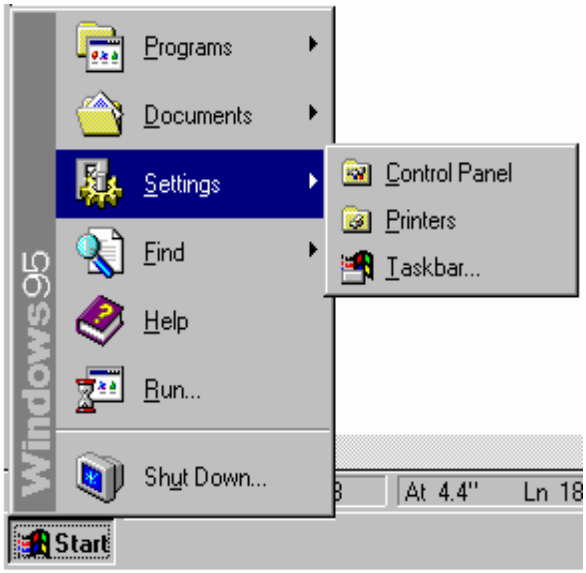
V. Protect your screen by setting-up a screen saver.Configuremultimediadevices.

VI. Enablemultipleuserstopersonalizesettings.

VII. Vieworchangeresourcesettingsforahardwaredevice.

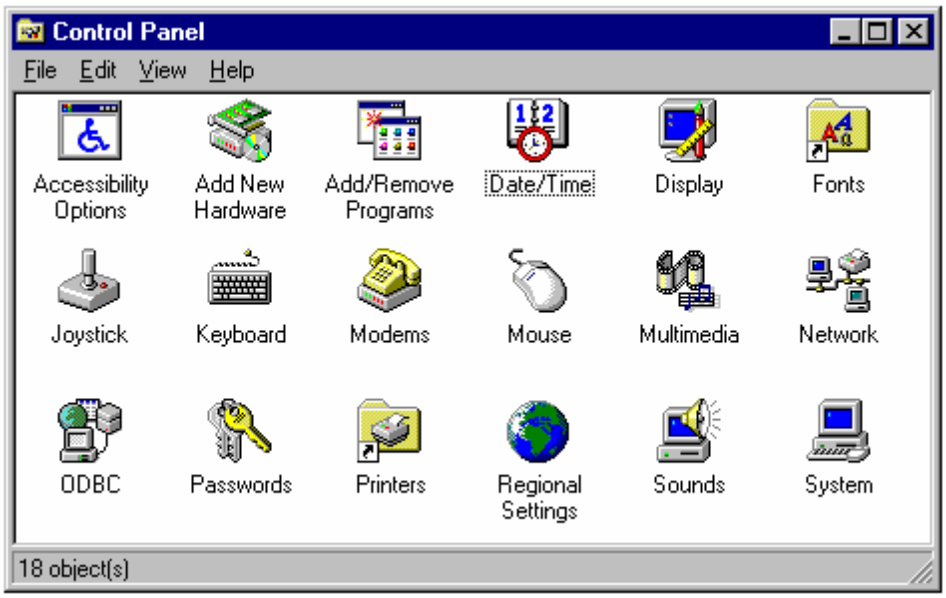
Above mentioned are some of the changes you can make to make your workplace more interesting. Some of them areexplainedbelow, while other things are leftto betried outon yourown (as per your requirement).

You can start with clicking on the **Start** menu and then choose **Settings** option. A cascading menu is displayed asshown below :



1.3.1 ControlPanel

When you click on the option **Control Panel** from the cascading menu of **Settings**, a window is opened that containsthe iconof theutilities forchanginghardware configurationsor customizingtheWindowsgraphical interfaceasshown below :



You canalso accesstheutilities ofControl Panel,ifyou clickon**My Computer**and thenon**Control Panel**icon.

1.3.2 Date&Time

To update date andtime settings ofthe system, followthe steps givenbelow :

1. Select **Date/Time** icon from the displayed icons that will open-up the window displaying the current date andtime.

1.1 OR

Double-clickon theclock onthe right-mostcorner ofthe taskbar.

2. Clickthedown-arrowin themonthfieldto choosethecorrectmonth.
3. Clickthe up or down-arrowinthe year field to choose the currentyear.
4. Click thecurrentday inthecalendar.
5. Setthe newtime-field byclicking theup ordown-arrow

1.2 OR

Clickanywhereinthe text-boxandtype anewnumber.

6. To set the correct time zone, click the **Time Zone** tab and then click your current location on the map of the worldthatis displayed.

1.3.3 Looksof Windows

The looks of Windows include wallpaper and pattern in the background of the desktop, cursor blink rate or item size,color and fonts.

Tochangethebackgroundofyourdesktop

In the **Pattern** or **Wallpaper** list, click the pattern or wallpaper you want to

use.Tocoveryourentirescreenwithasmallwallpaperimage,click**Tile**.

Tocenterawallpaperimage,click**Center**.

Tochange theway theitems on yourdesktop look

If you want to change the appearance of only one screen element, click that element inthe Item list. Then change the settings in the **Item Size** and **Color** and **Font Size andColor**areas.

If you want to change the appearance of all screen elements simultaneously, click anappearancescheme in the **Scheme**list.

To uselargerorsmallerdisplayfonts

In the **Font Size** box, click the size you want your displayed fonts to be.Tocustomisethesizeofdisplayedfonts, click**Custom**.

IftheFontSizeareaisunavailable,makesureyourDesktopAreasettingishigherthan 640 by 480 pixels. If 640 by 480 pixels is the only setting available to you, youcannotchange your display font.

1.3.4 Toadjusttherateatwhichyourcursorblinks

Dragthesliderinthe**CursorBlinkRate**area.

AddNewHardware

1.3.5 Tosetupnewhardware

Clickon the **Add NewHardware** icon (as shown) tostartthe AddNew Hardware wizard.

Simply,followtheinstructionsonyourscreen.

It is recommended that you let Windows detect your new hardware.Make sure you have connected your hardware orinstalledits components inyour computer before running the wizard.

1.3.6 Fonts

There is a collection of fonts with Windows 95. You can use these to format text in documents. The fonts can beviewed,added, or removed fromthe available fontlist.

2 Toviewfontsonyourcomputer

1. Double-clickthe **Fonts**icon toopenthe Fonts folder.

2. Tolook ata sampleof a font,double-click theicon forthe font.

When you install a printer, it may include several printer fonts.These do not appear in the Fonts folder, but they doappear inthe Fontlistof Windows-based programs such as WordPad.

3 Toaddanewfonttoyourcomputer

1. Open the**Fonts**folder.
2. Onthe**File**menu,click**InstallNewFont**.
3. Clickthe driveand folder thatcontain the fontsyou want to add.
4. Double-clickthe icon forthe fontyou wanttoadd.

Toselectmore than one fonttoadd, press and hold down the**CTRL**key, and then click the fonts you want.

To selecta range of fonts inthe list, press and hold down the **SHIFT** keywhile dragging the cursor over the fonts.

4 Todeleteafontfromyourcomputer

1. Open the**Fonts**folder.
2. Clicktheiconfor thefontyouwant to delete.
3. Onthe**File**menu,click**Delete**.

Toselectmore than onefonttodelete, pressand hold down the**CTRL**key, and thenclick the fonts youwant.

4.3.2 Keyboard

Keyboard layouts varyto accommodatethe special charactersand symbolsusedin differentlanguages. Thisaffectswhich characters appear when youpress the keys on yourkeyboard. After you change yourkeyboard layout, thecharacters that appear on your screen may no longer correspond to the characters that are printed on your keyboard’skeys.

4.4 Tochangethekeyboard layout

1. Inthe list,click thelanguage whosekeyboardlayout youwantto change,andthen clickProperties.
2. Selecta differentkeyboard layout.

4.5 Tochangethewayyourkeyboard responds

1. If you want to adjust how much time elapses before a held-down key begins repeating, drag the Repeat Delayslider.

2. Ifyou wantto adjusthow quicklycharacters repeatwhen you hold down a key, drag the RepeatRate slider.

Youcan testthe repeatdelayand repeatrate byclicking the box below thesliders, and then holding down a key.

5 Mouse

The settings for the mouse include the button configuration, double-click speed of the mouse, pointer speed and pointertrail,mouse pointer shapes, and switching over to differentmouse driver.

To change the settings, double-click the Mouse object. The displayed window shows four tabs - Buttons, Pointers,Motion, and General. These tabs are for differentpurpose of settings.

5.3 Toreverseyourmousebuttons

1. Selectthe**Buttons**tab.

2. Inthe**ButtonConfiguration**area,click**Right-Handed**or**Left-Handed**.

5.4 Toadjustthedouble-clickspeedforyourmouse

1. Selectthe**Buttons**tab.

2. Inthe **Double-ClickSpeed**area,drag theslider.

3. Totestthespeed, double-clickthe imageinthe**Test area**.

5.5 Tochangetheappearanceofyourmousepointer

1. Click the**Pointers**tab.

2. Tochangeallyourpointersatone time,selectadifferentschemein the **Scheme**list.

3. To change only one pointer, click it, click **Browse...**, and then double-click the filename of the pointer you want touse.

Bydefault,onlyalimitedsetofmousepointerschemesisinstalledduringWindowsSetup.

5.6 To adjustthespeedofyourmousepointer

1. Selectthe**Motion**tab.
2. In the **Pointer Speed**area, drag the slider.

Changing the speed of your mouse pointer causes the pointer to respond more quickly or slowly to the movements ofthe mouse itself.

5.7 To turnonandadjustthemousepointer trail

1. Click the**Motion**tab.
2. Inthe**Pointer Trail**area,make surethe**ShowPointerTrails** boxis checked.
3. Toadjustthelengthofthepointertrail,dragtheslider.

5.8 To switchovertothedifferentmodeloftheinstalledmouse

1. Click the**General**tab.
2. Selectthetype ofmouse you haveinstalled fromthelistbox.

5.8.2 RegionalSettings

While installing Windows 95, you have to select a country, on which depends the number formats, currency, time anddateformats. These formats are used invarious windows programs.

5.9 Tochangethesettings

1. Selectthe objectRegionalSettings fromthe ControlPanelwindow.
2. The Regional Settings Properties window is opened in which you can select the formats appropriate for yourcountry.
3. ClickontheRegionalSettingstab.
4. Onthemapdisplayed,clicktheregionandWindows95changesitsformatsto matchthatregion.
5. Forspecialadjustments,clicktheNumber,Currency,Time,orDatetabandchangesettings.

5.9.2 System

Using the **System Properties** dialog box can modify the System configuration once set. For this, click on the object**System** from the **Control Panel** window. From this dialog box, you can view or modify your computer's hardwaresettings.

Click on the **General** tab to display the configuration of your computer, the operating system that is being used, andthename of the person and organization to whomthe software is registered.

Click on the tab **Device Manager** to view the devices that are connected to your computer either by their types or bytheir connections.

If you click on the tab **Hardware Profiles**, you are provided with a way to create hardware configurations that you canchoose fromatstartup. Though there are veryfew instances in which there is anyneed tocreate hardwareprofiles.

5.10 AGraphicalUserInterface

Toenableordisablehardwareinahardwareprofile

1. Clickthe plussign nexttothe hardwaretype,and then double-clickthe hardware.
2. In the **Device Usage** area, click to place a check mark next to each hardware profile in which you want to enablethe hardware, or clear the check box todisable the hardware for thathardware profile.
3. Ifyouseeamessage promptingyoutorestartyour computer,click**Yes**.

Click on the **Performance** tab to display the **Performance Status** of your computer system. For example : totalmemory, percentage of free system resources at that instant, File System, virtual memory, information about DiskCompression andPCcards.

Printers

Windows 95 has significantadvances inprinting features. These are :

- It supports bi-directional communication with printers so that printers can provide Windows 95 with informationabouttheir currentstate and attributes.
- The Windows 95 printing system also returns control to users more quickly after a job is sent to the printer due toa new printspooler.
- Mobile and remote users can defer their printing job until later if they are not connected to a printer. Print jobs arestored in a local queue and automatically sent to the printer when they reconnect with the printer or reconnect to anetwork thathas printers.

5.11 Tochangeprintersettings

1. Selectthe object**Printers** fromthe **ControlPanel** window.
2. Fromthe**Printers**window, clicktheiconfor theprinteryouare using.

3. On the **File** menu, click **Properties**.

4. The settings you can change depend on the type of printer you have. Click the different tabs to see all of the options you can set.

Changing the printer properties will change them for all documents you print on this printer. To change these settings for one document, use the **Page Setup** or **Print Setup** command on the **File** menu in your program.

5.12 To setup a new printer

1. Select **Add Printer** icon from the **Printers** window.

2. **Add Printer Wizard** is opened, and follow the instructions on the screen.

3. If you want to print a test page, first make sure your printer is on and ready to print.

If you want to use a shared network printer, you can set it up quickly by browsing for it in **Network Neighborhood**, clicking the printer's icon, and then clicking **Install** on the **File** menu.

1.4 Data Backup

You can use Backup to back up files on your hard disk. You can back up files to floppy disks, a tape drive, or another computer on your network. When you have made a backup file, you can restore it if your original files are damaged or lost.

There are two ways you can backup your files :

- You can backup files on your hard disk to a floppy disk or other media by using simple copy techniques.

- The Microsoft Backup utility can also be used, which compresses files and puts them in an archive. These compressed files can be copied to a floppy drive, tape drive or other backup device.

1.4.1 To start the Backup utility

1. Click **Start** and select **Programs**.

2. Select **Accessories** from the cascading menu, and then click on **System Tools**.

3. Now click on **Backup**.

If this utility is not present in the cascading menu of System Tools, then probably this utility

was not installed whenyousetup the system.

To installtheBackuputility,followthe instructionsgivenbelow:

1. Startthe **Add/RemovePrograms** utility fromthe**ControlPanel** window.
2. Click the**Windows Setup**tab andclick the**Disk Tools**option inthewindow.
3. Thenclick**OK**toinstallthe**Backup**utility,and thenfollowtheinstructionsonthescreen.

While restoringbackupfiles, againtheMicrosoftBackup utilityisused. Restoringthefilesmay poseaproblemif youneed to restorethemona systemthat doesnot havethisutilityor isnotrunningWindows 95.In that case,otherbackupmethod maybe used.

1.5 Disk Drive Utilities

Windows 95includes utilitiestoformat diskettes,Checkdiskettes andhard drives forerrors, defragmentdisks,and doothertypes ofmaintenance.Some of theseutilities are discussedbelow.

1.5.1 Toaccesstheseutilities

1. Open the **Start**menu and select**Programs**.
2. Choose **Accessories** and then **System Tools**. The cascading menu that appears includes the various Disk Driveutilities.

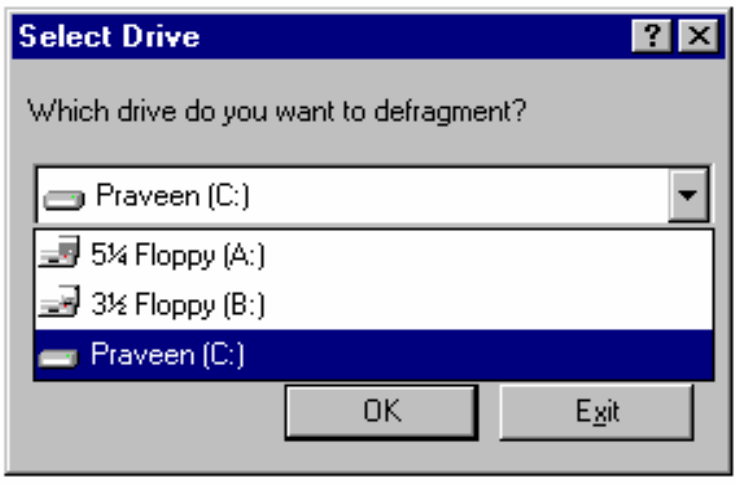
DiskDefragmenter

Disk Defragmenteris usedto rearrangefiles andunusedspaceon thehard diskso

thatprograms runfaster.Tospeed up your hard disk byusing DiskDefragmenter,

follow the instructions given below :

1. From the cascading menu of **System Tools**, select **Disk Defragmenter**. **Select Drive** dialog box is opened toselectthe drive you wanttodefragment.



2. Clickthedrive youwanttodefragment,andthen click**OK**.

3. Ifyou want tochangethe settings thatDisk Defragmenteruses, click**Advanced...**.

4. Click **Start**.

While Windows defragments the selected disk, the computer can safely carry out other tasks. However, the computerwill operate more slowly.To temporarily stop Disk Defragmenter so you can run other programs at full speed, click**Pause**.

1.5.2 CheckforDiskErrors

You can use ScanDisk to check your hard disk forlogicaland physicalerrors, and then repair the damagedareas.

1.5.2.1 To checkyourdisk'ssurface,files,andfoldersforerrors

1. Select theoption**ScanDisk**fromthecascading menuof **System Tools**.

2. Clickthe driveyou wanttocheck.

3. Click**Thorough**. If youwant to changethe settings ScanDiskuses when checkingthe disk's surface,click
Options. If youwant tochange thesettings ScanDisk uses whenchecking files andfolders, click**Advanced**.

4. Click **Start**.

If you want tospecifyhow ScanDisk repairsanyerrors itfinds, make sure thatthe**Automatically Fix Errors**box isnot checked.

The **Standard**type oftest isonly tocheckerrors infiles andfolders, butdoes notcheckthe disksurface.

1.5.2.2 IncreaseDiskSpace

You canuse DriveSpaceto compressboth hardand floppydisks tocreatemorefreespace forfiles. Youcan alsouseDriveSpace to configuredisk drivesthat youhavealreadycompressed byusing DoubleSpaceor DriveSpace.

1.6.3 To determinehowmuchspaceisavailableona disk

1. Double-clickthe **My Computer** icon,and then click thedisk you want to check.
2. On the **File** menu, click **Properties**. A pie chart shows how much free and used space is on the disk.

1.6.4 TocreatemorediskspacebyusingDriveSpace

1. Inthe**DrivesOnThisComputer**list, clickthedriveyou wanttocompress.
2. Onthe **Drive** menu, click**Compress**.
3. Click **Start**.
4. If you have not backed up your files, click **Back Up Files**, and then follow the instructions on your screen. Whenyou are done, proceed to step 6.
5. Click **Compress Now**.
6. IfWindowsprompts youto restartyourcomputer, click**Yes**.
7. If youwant tofree upmore diskspace afteryour computerrestarts, startthe **DiskSpace Troubleshooter**again.

1.6. 5 FormatDisks

Formatting a disk means establishing the tracks and sectors on the disk where files will be stored. Be aware thatformatting a disk removes all information from the disk, you cannot format a disk if there are files open on that disk. Ifthe disk has been compressed, use DriveSpace, or other compression software, to format the disk.

-To formatadisk

1. Ifthe diskyou wantto formatisa floppydisk, insertitinto itsdrive. Otherwise,go tostep 2.

2. Double-click the **My Computer** icon, and then click the icon for the disk you want to format. Be sure not todouble-click thedisk icon,because youcannot formata diskif itis openinMyComputer orWindows Explorer.

3. Onthe**File**menu,click**Format**.

Thevarious optionsfor formattingdisks are:

Capacity	Itcould below-densityor high-density.
FormatType:Quick(erase)	Formatsthe disk withoutchecking for errors.
Format Type:Full	Checks for thedisk errorsand then reformatsit.
Format Type:CopySystemFiles Only	Copies the system files to the formatted disk tomakeit bootable.
Label	Typethelabelnameforthedisk.
No Label	This option is selected if you do not require thelabelname for the diskafter formattingit.
DisplaySummarywhenFinished	To get information about the bad sectors (if any)afterthe disk is formatted.
Copy SystemFiles	Copies the system files during the formattingprocess.

1.7 Add/Remove Application

The Windows 95 components, accessories, or other applications can be added or installed, and removed by using the**Add/Remove Programs** utility from the **Control Panel** window. The advantage of using this utility is that Windows95maintains controloverthe installation processbymaking properentries into theregistry.

To install an application, click on **Install...** button. While installing the application, the wizard helps you to completethe process step-by-step.

Toadd aprogram, selectitfromthe displayedlistof programsand thenclick on**Add/Remove** button.

Toremovetheapplication,again selectitfromthedisplayed listofapplicationsandprograms andclickon **Add/Remove** button.

1.8 Set-Up Windows for Multiple Users

If more than one person usesthe same computer, each onecancustomise the settings according tohis/her needs. Theimportant factis that,eachuser hasto create aprofileso thatwhenhe/shelogson, theirpersonalwindows settingsareused.

1.8.1 Toset-upusers profile

1. Clickthe**Password** objectfromthe **ControlPanel**.
2. Selectthe 2nd option under **User Profiles**. When it is selected, the options under the head **User ProfileSettings are**highlighted.
3. Choosethe options as you require.
4. Click**OK**.

Thisenablesmultipleuserstopersonalisesettings.

1.8.2 To logoffyourcomputer sosomeoneelsecan useit

1. Click the**Start**button,and, then click **ShutDown**.
2. Then click **CloseAllProgramsAndLogOnAs ADifferentUser**.

1.8.3 DOSPROMPT

Attimes,youmayrequireto workin MS-DOSenvironment.

To startan MS-DOSwindow

1. Click the**Start** button, and thenpointto **Programs**.

2. Click **MS-DOS Prompt**.

To switch between a full screen and a window, press **ALT+ENTER**. To quit MS-DOS, click or type **Exit** at thecommandprompt.

1.8.2 Library sever and its maintenance

Library Server maintenance is process of keeping a server software updated and running so that a computer network can operate smoothly and avoid downtime or loss of data. Regular maintenance will keep the Library server running as expected and will help avoid a total or partial network failure. It includes tasks like reviewing the server's performance, ensuring that automated system monitoring utilities are properly installed and configured, identifying potential security risks and backing up data at regular intervals.

If you know how to maintain your server, with just a little time, you can get the most performance for your investment and significantly extend it's life. Servers can be maintained easily to reduce server outages.

1.8.3 How Library Servers Work:

A Library server is a standalone computer that provides data and other services to one or several other computers on a given network. The main benefit to a server is that it allows centralized management and monitoring of network access and network data, and servers can have power, hard drive and processor redundancies that are typically not available in a PC.

1.8.4 Types of Library Servers:

File Server: A central storage for files, which can be accessed by client computers

Domain Controller: A server that responds to security authentication requests (logging in, checking permissions, etc.) within the network. A domain is a concept where a user may be granted access to a number of files, folders, network locations with the use of a single username and password combination and can prevent certain users from accessing other private files.

Remote Desktop (Terminal) Server: A Remote Desktop Server (or Terminal Server) provides secure remote access to office and line of business applications to employees or contractors from one centralized server, instead of having each client computer running software. This makes deploying software and adding more employees very scalable and cost-effective.

Web Server: Stores and shares websites over the Internet; many individuals and small companies rent web server space from other companies, but for large companies that experience a lot of traffic, a dedicated web server makes sense.

1.8.5 Library Server Maintenance Generally Requires The Following:

I. checking server log files
II. assessing hard disk space
III. examining folder permissions

IV. monitoring network temperature applications
V. ensuring adequate redundancy of systems
VI. examining security features
VII. installing security software patches
VIII. reading server logs for security alerts or evidence of computer hacking attempts
IX. updating antivirus software on all computers on the network
X. updating critical service packs and software updates
XI. performing regular comprehensive back-ups to ensure that vital data can be retrieved from storage in the event of a system failure

1.8.6 Library Server Maintenance Steps To Success:

1. Verify your backups are working.
Before making any changes to your server database and system, be sure that you have to take a backup before doing any update and your backups are working fine. Make certain that you have selected the right backup and right location.

2. Check disk usage.
Keep your disk storage clean and don't use your library server system as an archival system. Delete old emails, logs and s/w versions that are not in use. A smaller data footprint means faster recovery. Keep an eye on your disk usages if your partition reaches 100 percent, you server may stop working and database tables and data may be corrupt and lost.

3. Monitor RAID Alarms.
Many dedicated servers run a RAID (Redundant Array of Independent Disks) array. In RAID, multiple hard drives act as one storage device in the event of a single disk failure.Some types of RAID are designed for performance, others for redundancy. In most cases, modern RAID arrays have advanced monitoring tools. A quick glance at your RAID monitoring utility can alert you to potential drive failures. This lets you plan drive replacements and rebuilds in a way that minimizes downtime.

4. Update Your OS.
Always update your system if you are using Linux because such OS release frequently update and staying on top of these updates can be difficult. To overcome this problem, you can use automated patch management tools and have monitoring in place to alert when a system is out of date. If you are updating your server manually (or not at all), you may miss important security updates. If you cannot automate your updates, then create a schedule to update your system. This will prevent your system from hacks.

5. Update your Control Panel.
Control panel software (such as cPanel) must be updated manually. When updating cPanel, only the control panel is updated. You still need to update the applications that it manages, such as Apache and PHP.

6. Check application updates.
Depending on your library server configuration, you may have many different software applications. Some systems have package managers that can automatically update software. For those that don't, create a schedule to review available software updates.

This is especially true for web-based applications, which account for the vast majority of breaches. Keep in mind that some operating systems may specifically require older application versions. In cases where you

must use older software in a production environment, take care to avoid exposing such software to an open network.

7. Check remote management tools.
Check remote management tools including the remote console, remote reboot, and rescue mode. These are especially important if you run a cloud-based virtual server environment, or are managing your library servers remotely. Secure remote access for your employees if remote work is practiced by your organization.

Check in on these utilities regularly to make sure they are functional. Rebooting can solve many problems on its own. A remote console allows you to log in to a server without being physically present. Rescue mode is a Red Hat solution, but most server operating systems have a management or "safe" mode you can remotely boot to make repairs.

8. Check for hardware errors.

Modern library server operating systems maintain logs of hardware errors.

A hardware error could be a SMART error on a failing hard drive, a driver error for a failing device, or random errors that could indicate a memory problem. Checking your error logs can help you pinpoint and resolve a hardware problem before it escalates to a system crash.
Hardware problems are common but create a big issue, so you may review the log for any hardware problems like disk read error, network failure.

9. Check server utilization.
Review your server's disk, CPU, RAM and network utilization.

10. Review user accounts.
If you have had staff changes, client cancellations or other user changes, you will want to remove these users from your system. Storing old sites and users is both a security and legal risk.

11. Change passwords.
Change any passwords every 6 to 12 months, especially if you have given out passwords to others for maintenance.

12. Check system security.
Periodically review your server's security using a remote auditing tool.

LESSON 3

CREATING PRESENTATIONS WITH POWERPOINT

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STRUCTURE

1.1Learning Objectives
1.2 Introduction to PowerPoint
1.3 Creating a PowerPoint slide
1.4 PowerPoint presentation step by step

1.1 Learning Objectives

This unit is the practical application of MS Power Point presentation it includes Dynamically modify shapes, text, and graphics with new tools and effects,Special Effects etc. Microsoft PowerPoint is a professional presentation program that allows the user to create a "presentation slide" that can be displayed on the computer screen through a projector that is plugged into the computer.

1.2 Introduction

In this unit we will get introduced to some of the components of PowerPoint and learnhow to work with these components of PowerPoint and customizing our slide show.PowerPoint is a complete presentation graphics package. It gives you everything youneedtoproduceaprofessional-lookingpresentationliketexthandling,outlining,drawing, graphics, clip art, and so on. It also offers rich speaker support and aids tohelpyoucreatetrulyeffectivepresentations.PowerPointmakesyou,thepresenter,and an independent producer of your own high-quality presentations. To help youabout consistency in design and color use PowerPoint functions are really good, if trythem. If you think you are not very good in designing at this stage, just apply one ofthePowerPointtemplatestoyourpresentationandchoosefromamongthethousandsof colour schemes available. Whether you need quick overheads for a team briefing,slidesforasalesmeeting,ordazzlingeffectsforanon-screenpresentation,PowerPoint wizards, templates, and Auto Layouts help you get right to work; and acomplete set of easy-to-use tools assures you have everything you need to get yourpointacrossand shareinformation with others.

1.3 Creating a PowerPoint Slide

Step1:

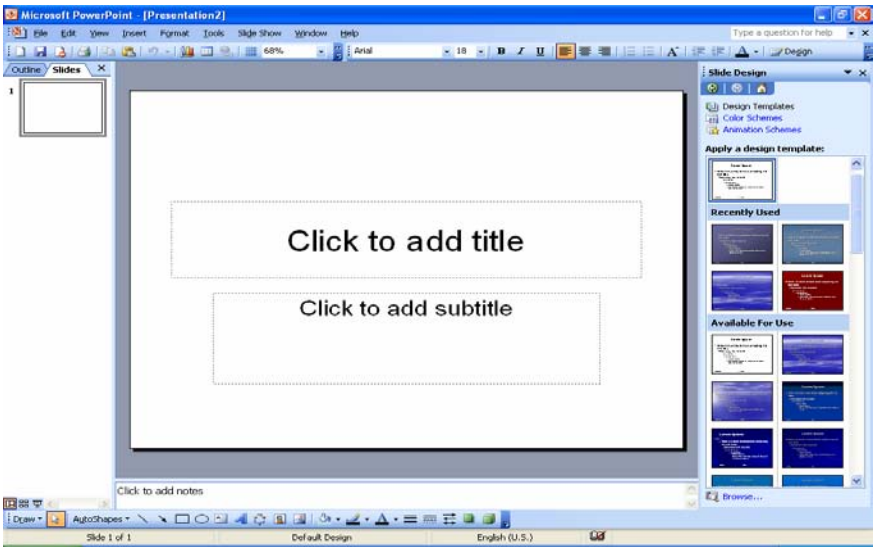
OpenMicrosoftPowerPoint.

Step2:

Go to File at the top of the screen and click New. A box that says "NewPresentation"shouldappearontherightsideofyourscreen.

Step3:

In the "New Presentation" dialog box, click on "From Design Template." Youmaythenscanthroughdesigntemplatesandchooseonethatyoulike.



Step4:SlideDesign

Select a design template by clicking on the template you like. You maychoose a different color for your template by clicking on "Color Schemes" inthe"NewPresentation"dialogbox.

Step5:SlideLayout

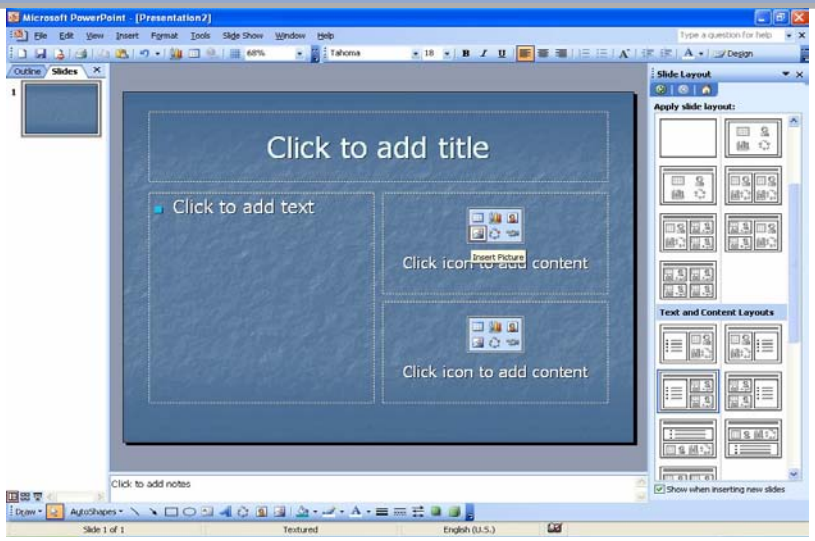
Change the Slide Layout. You may change the slide layout (how informationis presented in the slide) by going to the top of the screen and clicking on"Format" – "Slide Layout." A box will appear on the right side of your screen(where "New Presentation" appeared) labeled "Slide Layout." You may selectadesignbyclickingonit.

Step6:AddingText

Enteryourtextbyclickingand thentypingintheboxtitled"ClicktoAddText"or"ClicktoAddTitle."

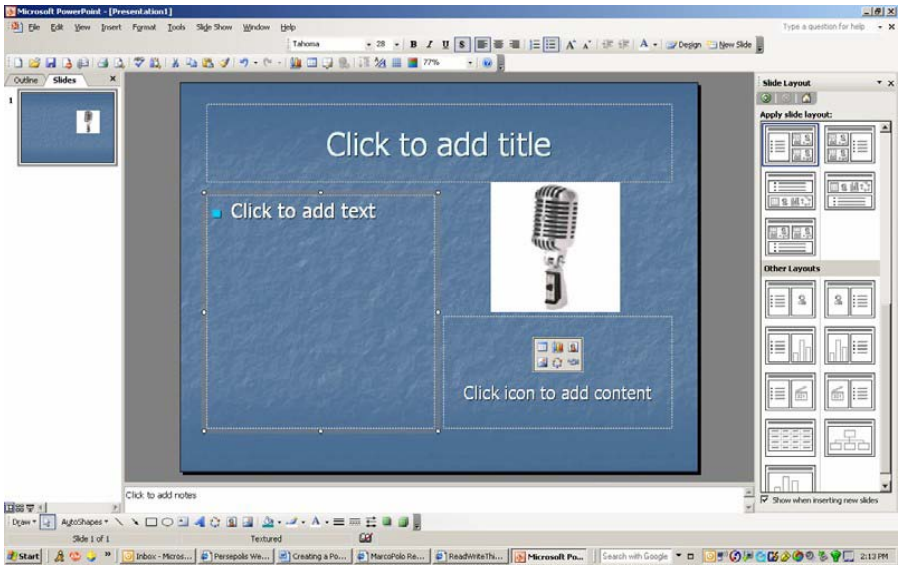
Step7:AddingPictures

You may add pictures by clicking on the box that says "Click to add content."Inside that box, there will be a smaller box with six icons. Click on the iconthatlookslikeaphotographofamountain.Anewwindowwillopen,allowingyouto browseforapictureonyour computer or aCD. Once youfindyour picture, clickonitandthenclick"Insert."



8:ResizingPictures

You may change the size of your picture by clicking on the picture. Thepicturewillthenhaveblacklinesarounditwithsmallbubblesorboxesinthecorners. Place your mouse over the bubbles or boxes and click. Holding themousepointerdown,dragthepicturetothesizeyouwant.



Step 9: You're Done!Wasn't that easy? Now you can do it again to makemore.

1.4 PowerPoint Presentation step by step

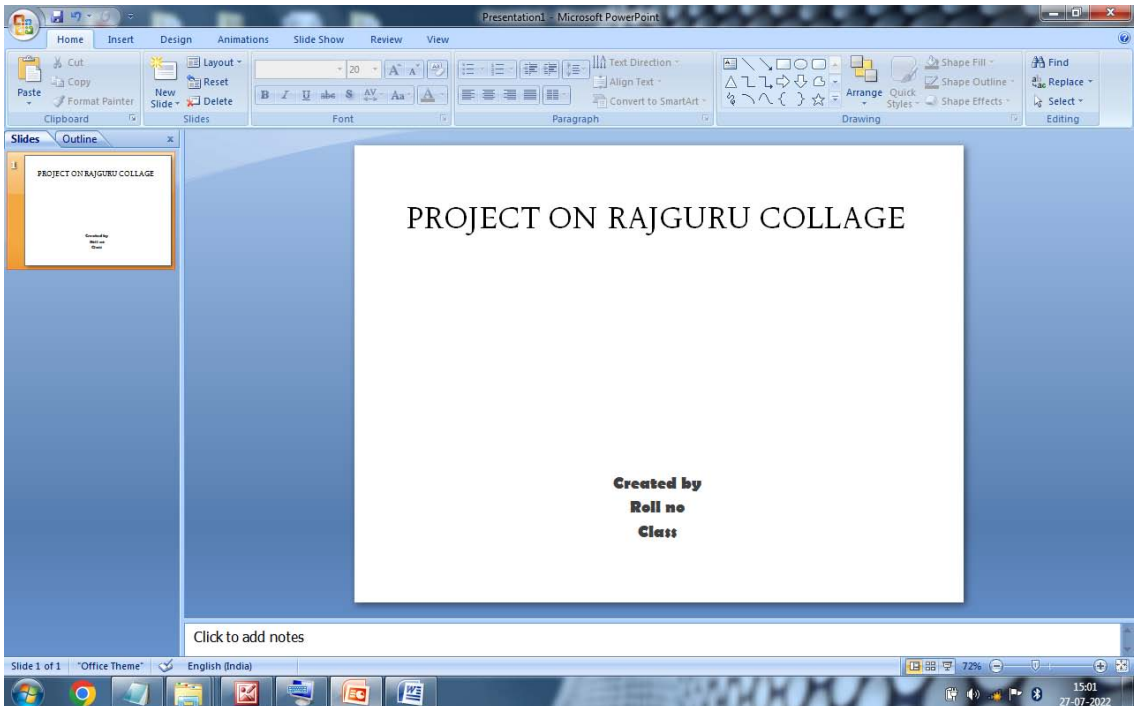
Creating Power point Presentation on Rajguru College using Text, Pictures, Animation and transition effect: -

Step1:OpenMicrosoftPowerpoint

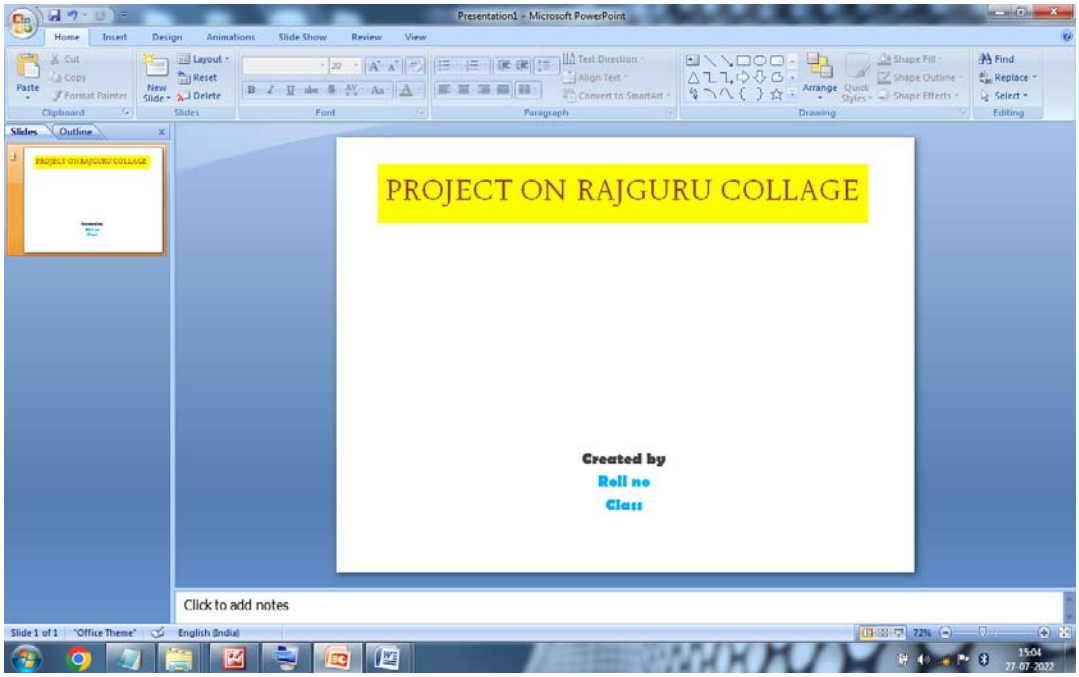
Step2: Go toFileatthetopofthescreenandclick New.Abox thatsays “Blank/NewPresentation” shouldappearontherightsideofyourscreen.

Step 3: Slide Title/ Subtitle

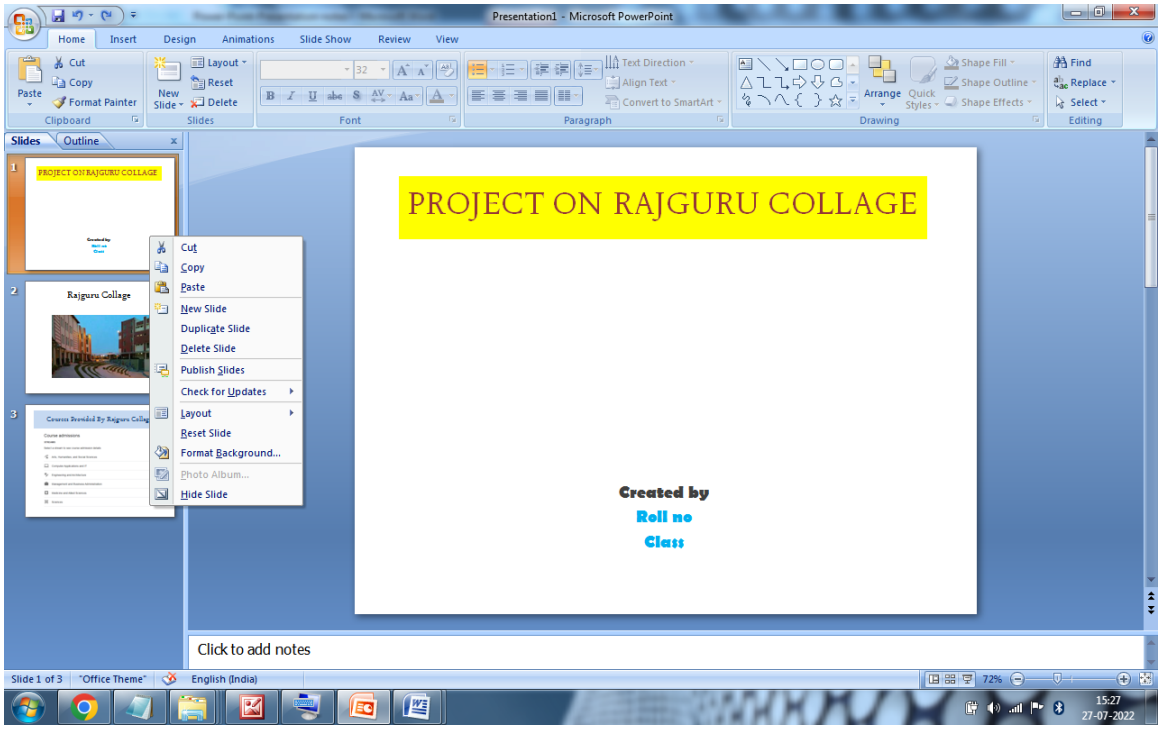
Giveanytitleandsubtitleto yourpptonslide1.

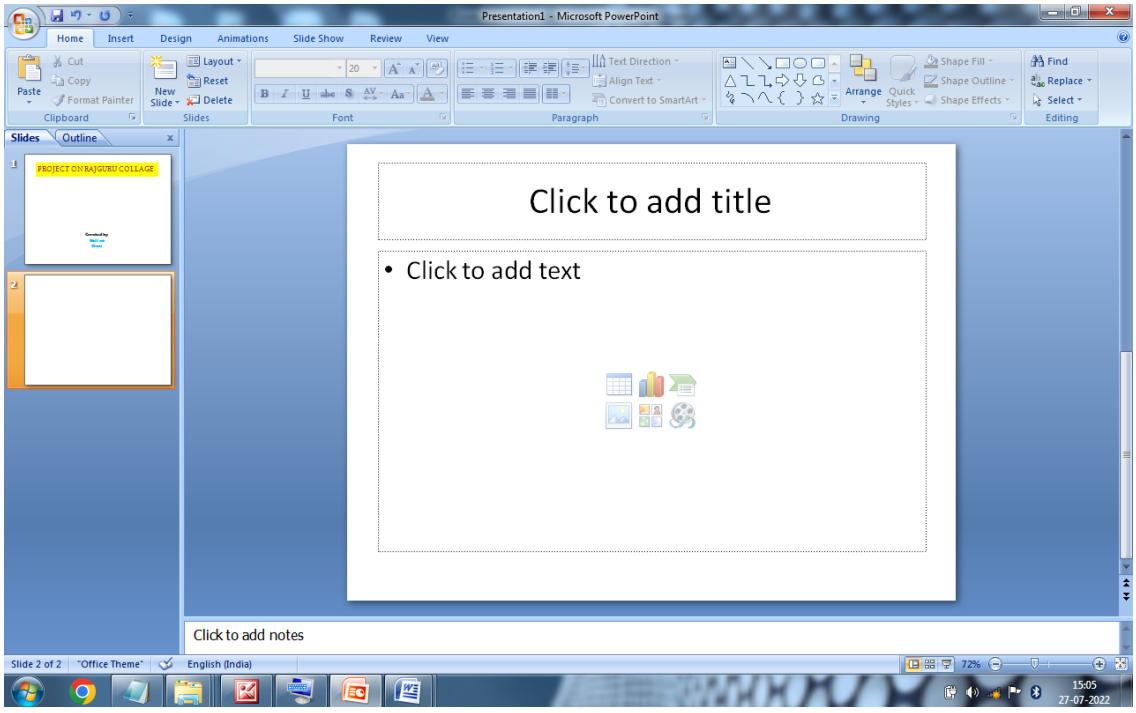


Step4: Asperyourchoiceapplydifferentformattingoptionsto format the textandpictures.



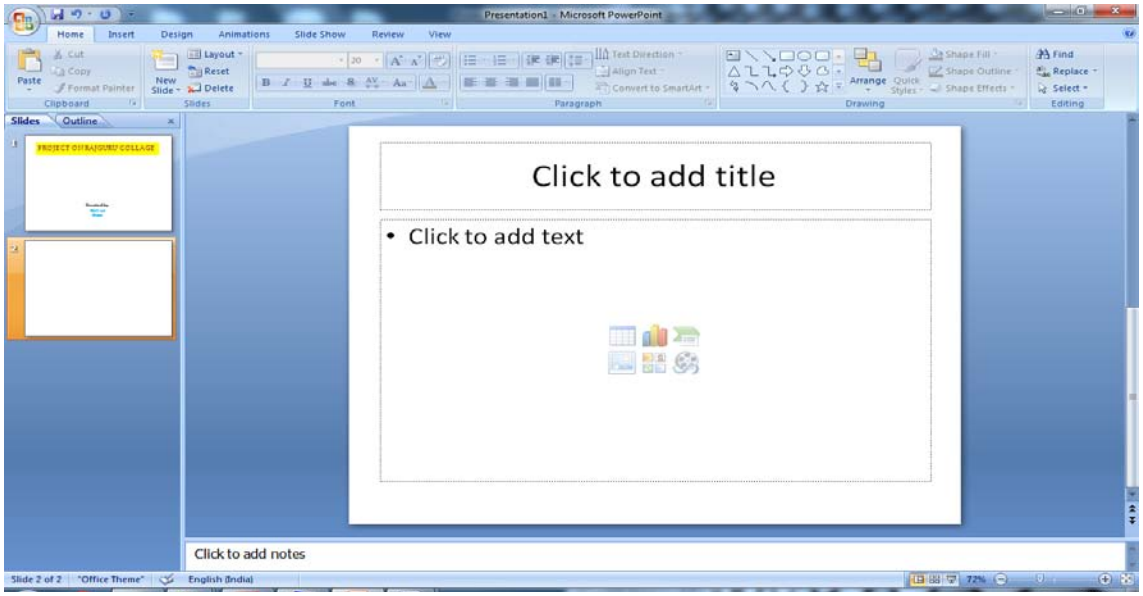
Step 5: Add ***new slide***by clicking on new slide on formatting bar or by right clicking and selectingnewslideoption.





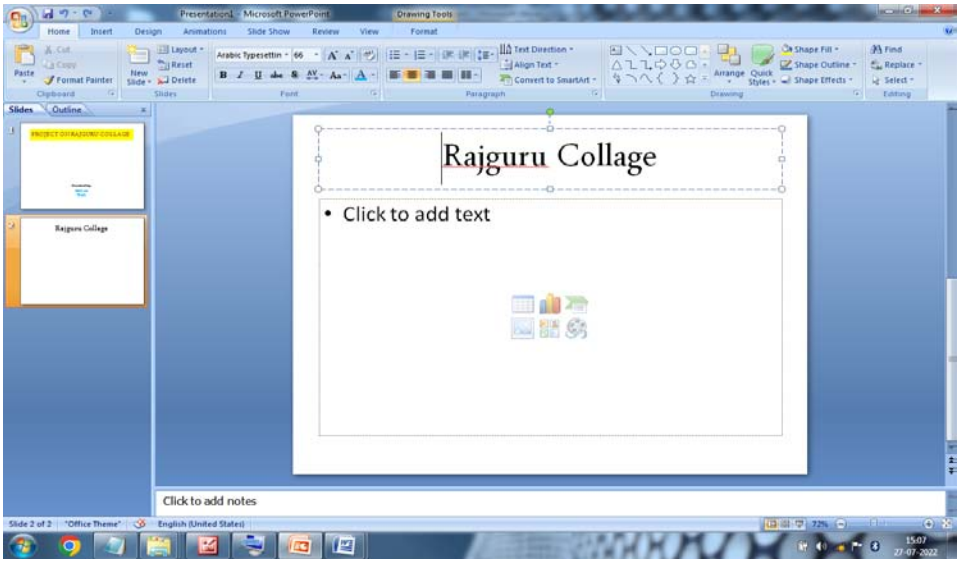
Step 6: Inserting text

Enteryourtext byclickingandthen typinginthe boxtitled“ClicktoAddText”or“ClicktoAddTitle.”



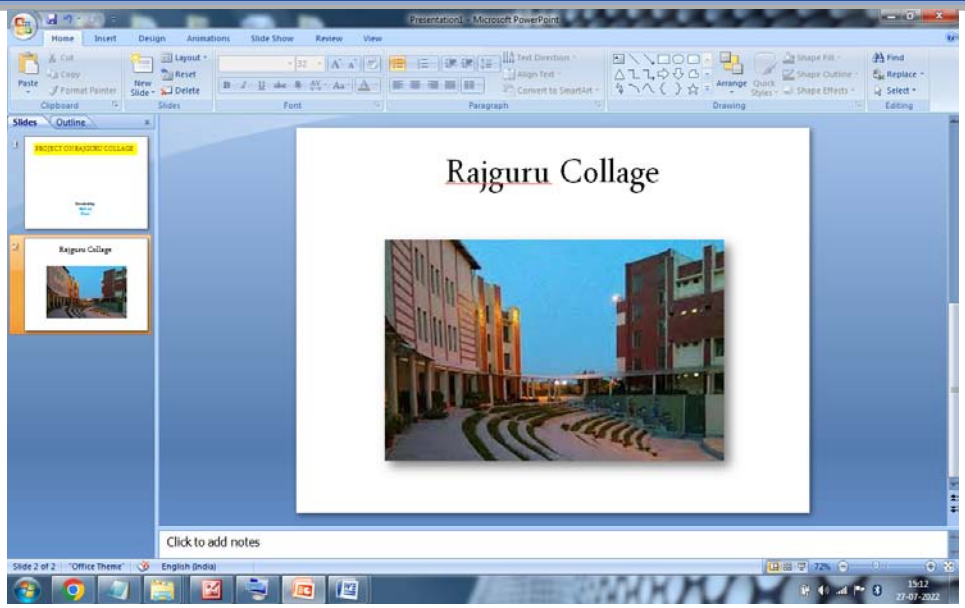
Step 7: Inserting Pictures

You may add pictures by clicking on the box that says “Click to add content.” Inside that box, therewill be a smaller box with **eight icons**. Click on the icon that looks like a photograph of a mountain. Anew window will open, allowing you to browse for a picture on your computer or a CD. Once youfindyour picture, clickonitandthen click“Insert.”

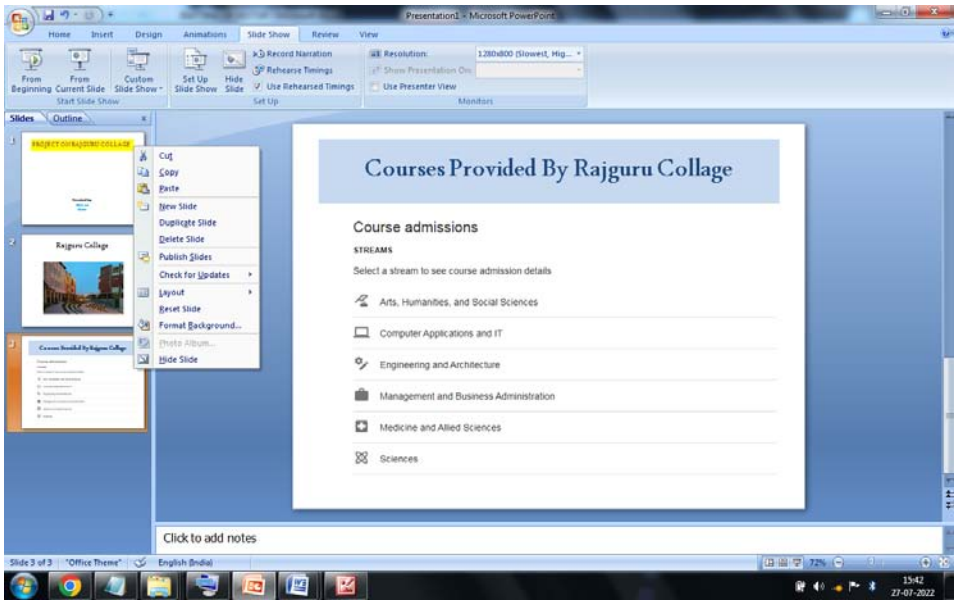


Step 8: Resizing the picture

You may change the size of your picture by clicking on the picture. The picture will then have blacklines around it with small bubbles or boxes in the corners. Place your mouse over the bubbles orboxesandclick. Holdingthemousepointer down,dragthe picture tothe sizeyouwant.



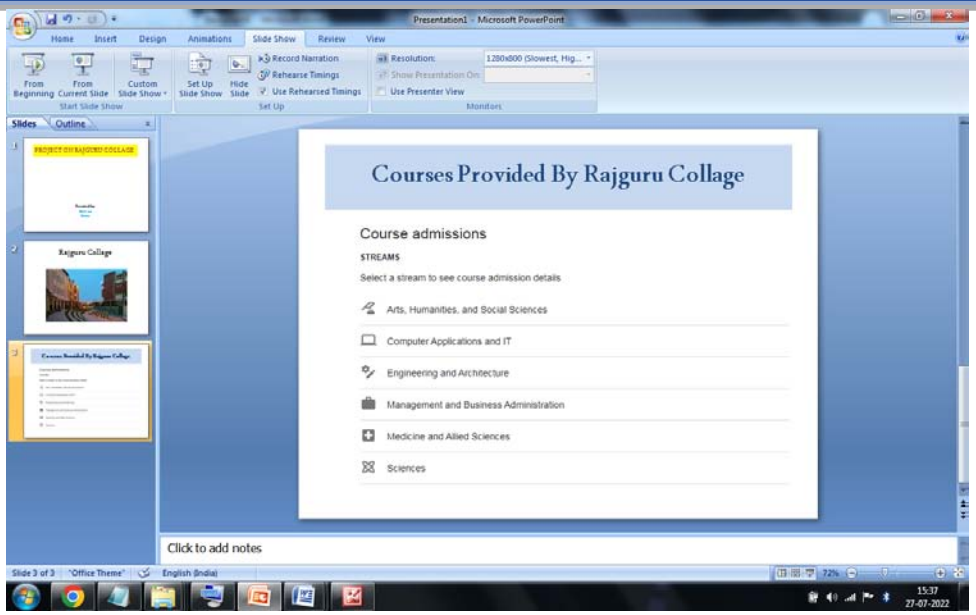
Step 9: Courses Provide By Rajguru Collage



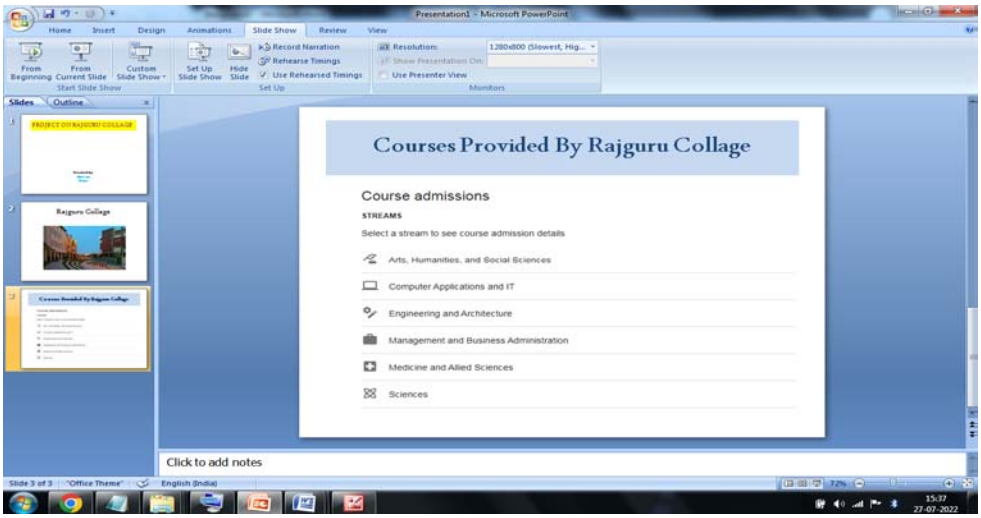
Step10:Applyingtransitionandanimations

Transition: It provides an animated effect to each slide when moving from one slide to the nextduringa slideshow.

Clickon**transitiontab**fromthemenubar(applytoallslides)



For selecting time interval for slide transition you can either choose ***on mouse click***or ***automaticallyafterbox***fromtransitionmenubar.



Animation: It is an effective way to focus on important points, to control the flow of information andto increaseviewerinterestinthepresentation.

- Selecttheobjectthatyouwantto animate
- Clickon**Animationtab** frommenubar
- Chooseanyanimationeffectlike**appear,fade,flyinetc**

Step11:**Presentingaslideshow**

Eitherpress **F5**Keyoruse**slideshowtab**frommenubar.

Lesson- 4

Editing and Formatting Word Documents

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STRUCTURE

1.1 Introduction

1.2 Word 2007

1.3 Main Screen of Microsoft Word 2007

1.4 Page setup and Margin Formatting

1.5 Formatting Font

1.6 Formatting Spacing

1.7 Page Headers

1.8 Hanging Indent

1.9 Centering Text

Introduction

Formatting refers to the layout of a paper and is an important tool for successfulacademicpapers. This section contains requirements for formatting academic papers followingthe*American PsychologicalAssociationPublicationManual*(APA)(5th ed.).

Font

1. Use12-point TimesNew RomanorCourier.
2. Useitalicssparinglyforemphasisinsteadofbold,underlining,orallcapitalletters.
3. Eliminateboldtext.

Margins

1. Use1-inchmarginsthroughoutthepaper(top,bottom,sides).
2. Usearaggedright-hand margin(norightjustification).

Pagination

Use automatic pagination. Be sure to have at least two lines of a paragraph at the bottomof a page or at the top of a page. When headings are used, place at least two lines of text with theheading at the bottom of a page. (Avoid placing a heading at the bottom of the page with nootherlinesoftheparagraph.)

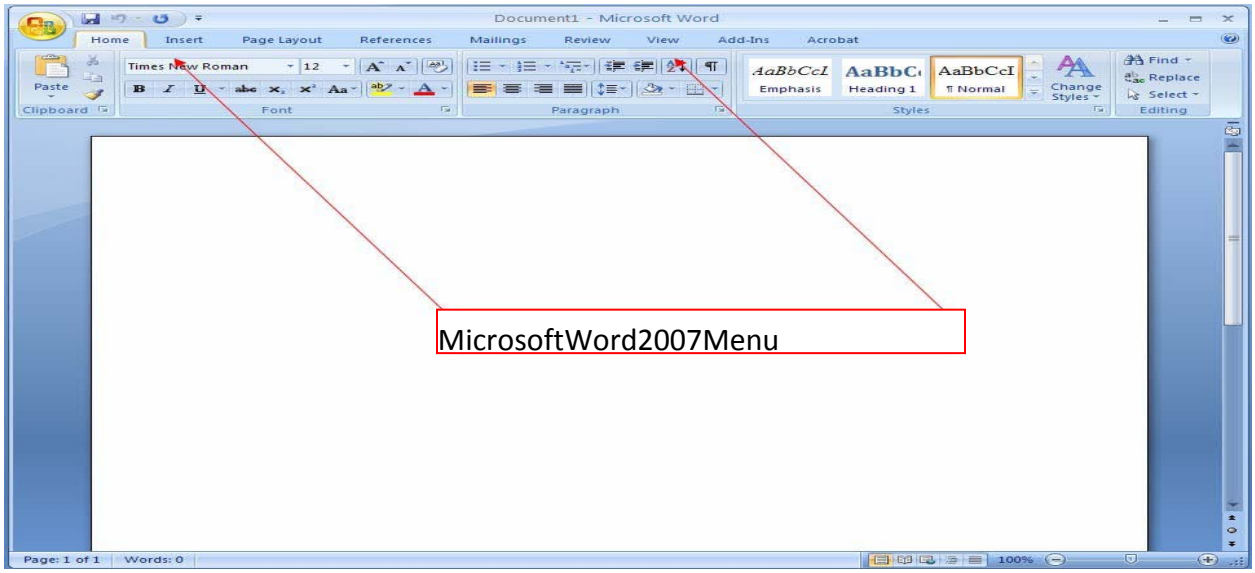
Spacing

1. Use double spacing throughout, including title page, references, and indented quotations.(Note: Word 2007 places extra space between paragraphs. You will need to adjust this byselecting the *Page Layout* menu. Then access *Paragraph* and *Indents and Spacing*. Under the*Spacing*heading,setthespacingoptionto0pt.beforeand0pt.after.Click*OK*.)
2. Useone spaceafter each endpunctuation mark.Be consistentthroughoutthedocument.

1. Word2007

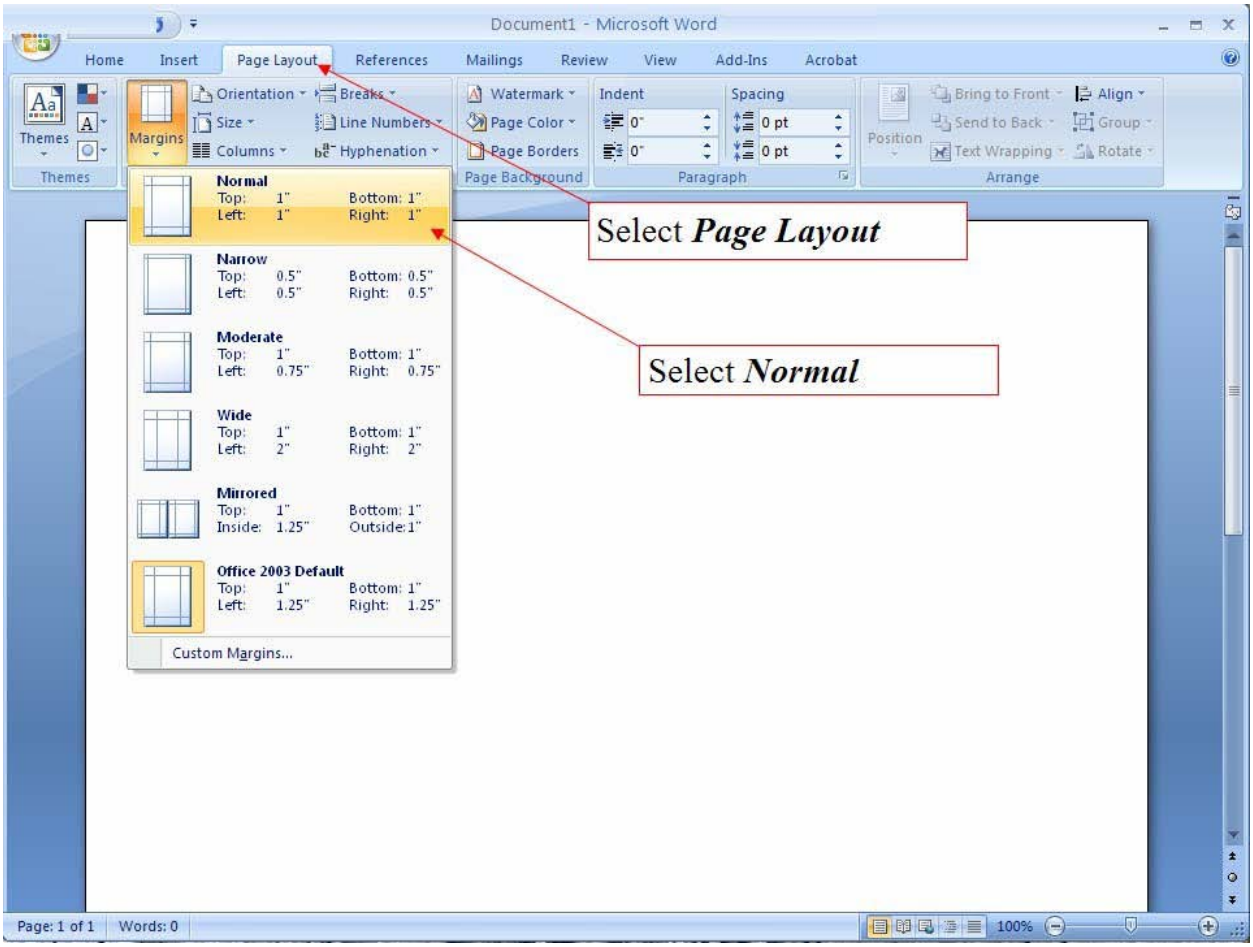
1. MainscreenofaMicrosoftWord2007Document

The screenshot below is the opening screen for Microsoft Word 2007. Through this tutorial, wewill review screenshots and documentation on how to navigate some of the basic menus and thesteps necessary to format a basic paper correctly. Once this tutorial is complete, you can useMicrosoftWord2007withconfidencetoformat and write your paper.



3. PageSetup and Margin Formatting

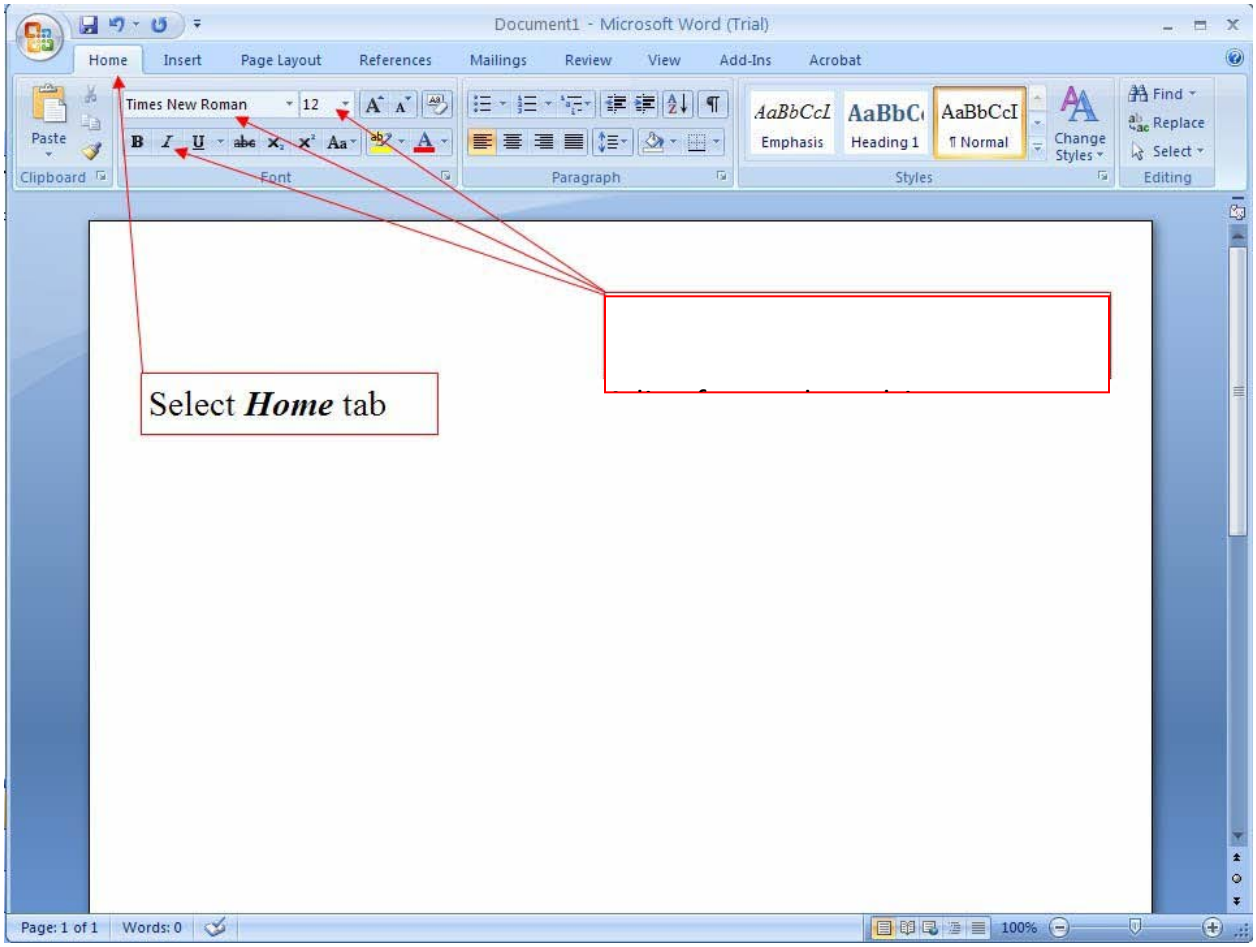
The screenshot below displays the menu path to change the margins in a paper. According toAPA,all margins are set at 1 inch.



1. FromthemenutabatthetopofWord,select *PageLayout*.
2. In the *Page Layout* menu, the margins button will allow you to change the margins to thecorrect format.
3. Select*Normal*tosetallmarginstooneinch.

4. FormattingFont

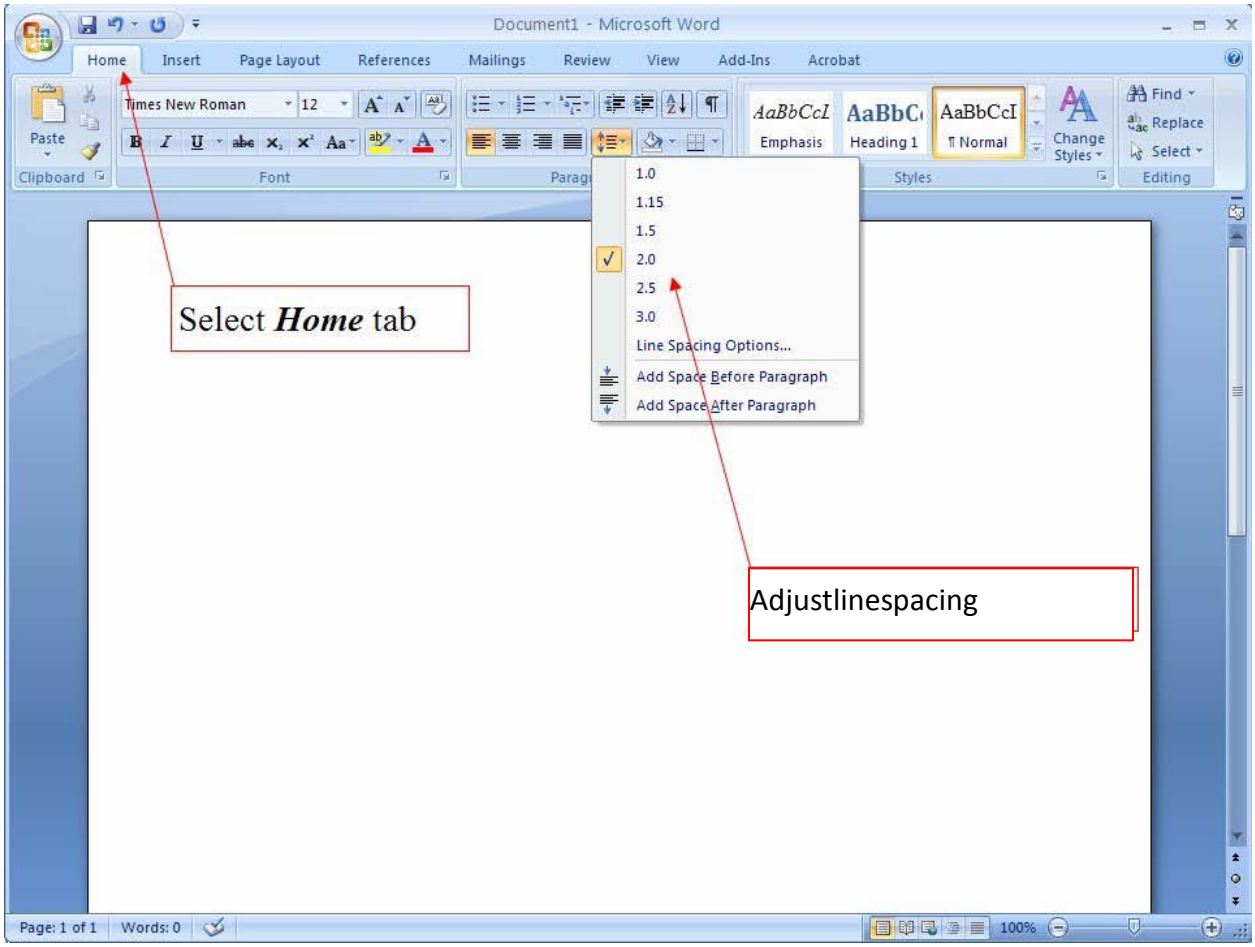
The screenshot below displays the menu path to change the font. Use a traditional font such asTimesNew Roman or Courierin12-pointsize.



1. Selectthe*Home*tab.
2. Fromthe*Font* menu,youmay adjustthe font,style,and sizeto thecorrectformat.

5. FormattingSpacing

The standard spacing format for a paper is double-spacing. Double-space the entire document,includingthereferencepage.Thescreenshotbelowdisplaysthemenupathtochangethespacing format todouble.



1. Selectthe*Home*tab.
2. Fromthe *Paragraph*menu, you mayadjust the linespacing fromthe*Line Spacing* dropdownmenu.

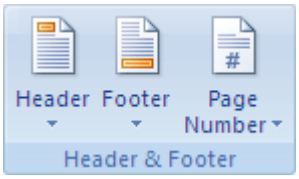
(Note: Word 2007 places extra space between paragraphs. You will need to adjust this byselecting the *Page Layout* menu. Then access *Paragraph* and *Indents and Spacing*. Under the*Spacing*heading,setthespacingoptionto0pt.beforeand0pt.after.Click*OK*.)

6. Page Headers

APA, p. 288, 5.06. Identify each page with the first two or three words of the title and with thepage number placed on the upper right hand corner of the page. Use five spaces between the titleand the page number. Do not use your name to identify each page. Be sure the font type and sizearethe same as that usedin the document.

TocreateacorrectAPAheaderwith a page number in Word2007,usethefollowingguidelines:

1. Clickonthe*Insert*tab.
2. Clickonthe*Header*tab.

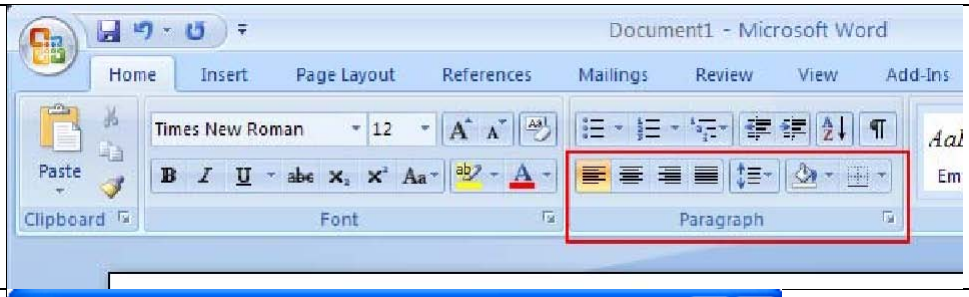


3. Clickonthe*Blank*headertabfromthedrop-downmenu.Thiswillputthecurserinsidethe header.
4. Clickonthe*PageNumber* tab.
5. Placethecurseronthedrop-downmenuover*TopofPage*tobringupanotherdrop-downmenu.
6. Click on *Plain Number 3* on the drop-down menu (the third choice). This will place apagenumberinside the headeratthe rightmargin.
7. Type the portion of the title to go in the header and add five spaces. Your header iscomplete.
8. Click on Close Header and Footer on the far right.

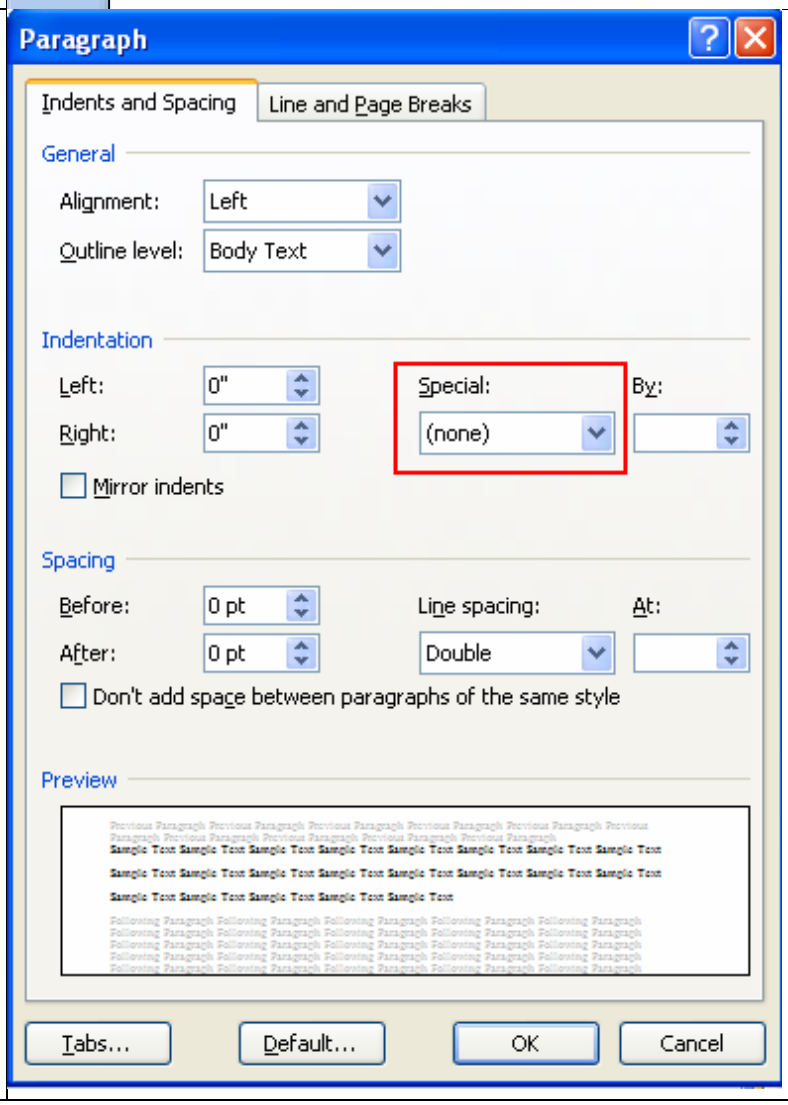
7. HangingIndent

Select the text that requires a hanging indent OR create a hanging indent before typing the text.From the *Home* menu, click on the *Paragraph* command (see Picture One). This will bring upthe *Indents and Spacing* tab (see Picture Two). Under *Indentation* in the *Special* box, click on*Hanging*and *OK*.

PictureOne

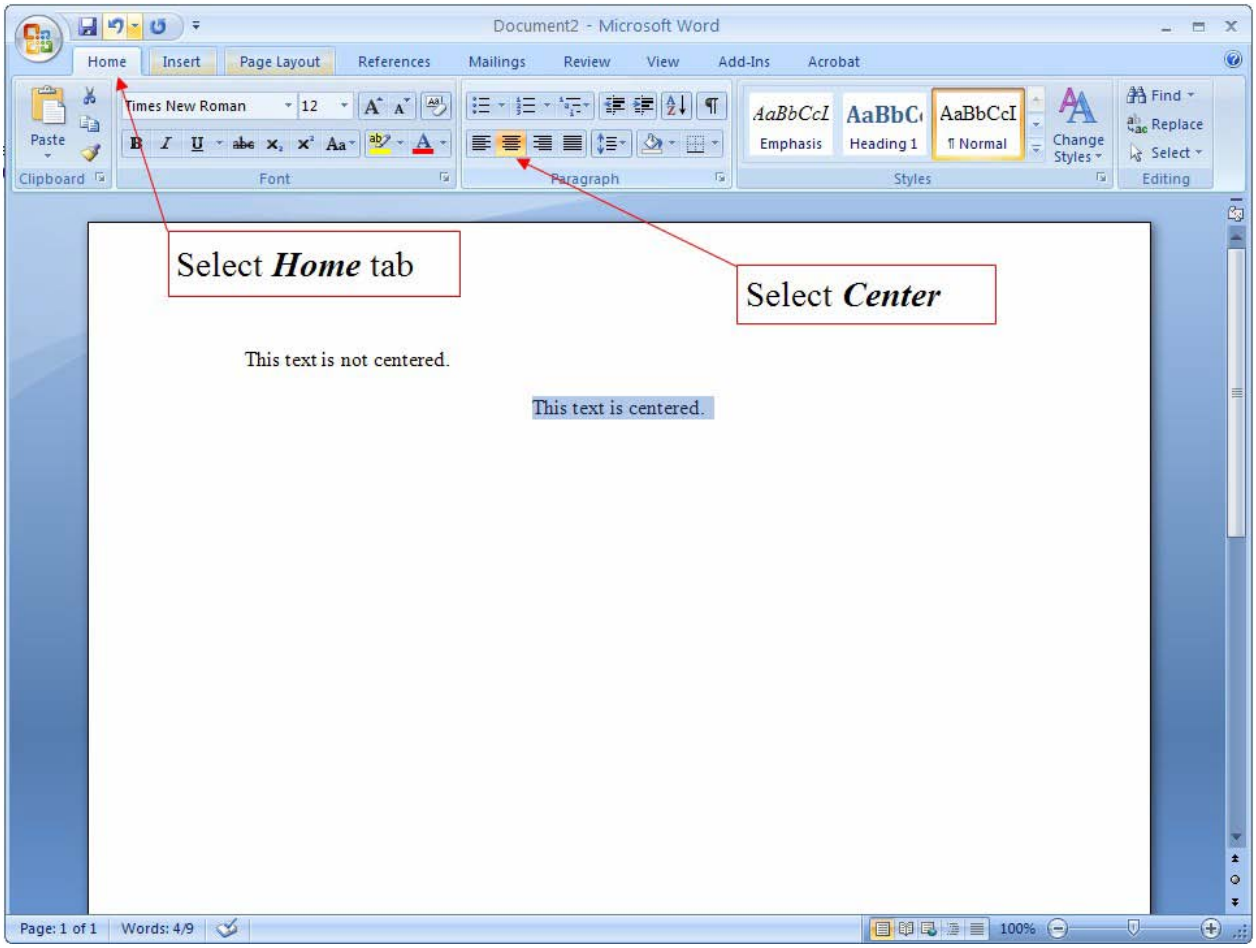


PictureTwo



8. CenteringText

The screenshot below is an example of text that is centered and that is not centered. In order tocenter text highlight the text that requires centering and select the icon in the formatting toolbaras shown.



9. Selectthe*Home*tab.
10. Highlightthetext to be centered.
11. Clickthebuttontocenterthetextonthe*Paragraph*toolbar.

UNIT-II:Database Creation and Library Software

LESSON 1

Installation and Creation of Databases: Import, Export, Hyperlinks and Printing of Records using WINISIS

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 General Overview of CDS/ISISfor Windows
1.4 Record Structure and Record Linking
1.5 The Windows Version
1.6 Availability of CDS/ISIS
1.7 Installation

1.1 Learning Objectives

This lession will guide the students to create database through CDS/ISIS (Computerized Documentation System/Integrated Set of Information System) window version, this software is one of the mosted oldest software in library application. In this software we can create databse , can searc and design library catalogue. This is not a library automation software. This is database managemnet software.

1.1 Introduction

CDS/ISIS for Windows is, as its name implies, a Windows-based system. Windows programs have many distinctive features as a result of the Windows operating system. Microsoft Windows is described as a graphical user environment which gives you more control over the way you work as well as enabling you to use more of the power of the computer

From the early development of the DOS version, CDS/ISIS was developed for bibliographic information, i.e. information about documents such as books, journal articles or conference proceedings. Usually each record in the database contains information about one document.

1.1 General Overview of CDS/ISISfor Windows

A further feature of the package is the flexibility of the screen and printed displays. This is achieved by a sophisticated algebra-like *formatting language*. The formatting language has been criticized for its complexity and unfriendliness but we try to show in chapter 5 that this is not too complex even for the user who is not very computer literate. (We mentioned above that this can be extended by the use of a Pascal language, since a Pascal compiler is contained within the package.) The formatting language serves a number of purposes in addition to its function of providing instructions for screen display and printout.

(i) It is used to specify the rules for the extraction of data from the database records to go into the index.

(ii) It is used for the extraction of data for export to another database or for converting records to a MARC format if data have not been entered precisely according to the rules of that MARC format.

(iii) It is used as the basis of the search language to provide the package with a very powerful free text searching feature, including the searching on values mentioned above.

(iv) It is used in the creation of statements in a validation file for data entry validation. Note that this was introduced into CDS/ISIS for Windows and is not available in the DOS version.

This formatting language gives users of CDS/ISIS a higher level of control over their data than is found probably in any commercial library automation package.

Another important feature, considering that the program is the product of UNESCO, is the *multi-lingual nature* of the package. Text on menus and worksheets can easily be changed by a proficient user. Message files are stored as databases and can be edited in the same way as

1.2 The Windows Version

The At this point we are assuming that CDS/ISIS (Computerized Documentation System/Integrated Set of Information System) for Windows has been loaded on your computer and that the machine has been switched on and Windows is running. Open the CDS/ISIS for Windows program by clicking on the WINISIS icon. This will run the program and display the main menu.

1.3 Installation

If you are in a hurry to start running CDS/ISIS as soon as possible, read Section 3.3. Sections 3.1 and 3.2 are intended for users who want to know what is happening during the installation process. Section 3.4 deals with installation on a network.

Folder structure

The Windows version of CDS/ISIS is normally installed on a hard disk in a folder (directory) called **winisis**. As we have seen in chapter 2, the hard disk is usually referred to as C: so this folder will be **c:\winisis**. It is also possible to install the software on a network – see Section 3.4.

The package comes with over 200 files and these are usually installed into a number of subfolders of **winisis**as shown below.winisis

bg ctl3d data doc menu msg plugin prog work

The **winisis** folder itself contains the main ISIS program, **wisis.exe** and an important parameter file, **syspar.par**, discussed in the next section. It also contains the help file, **isishlp.hlp**, a **readme** file with the latest release notes, and some configuration files.

The **bg** subfolder contains about 30 bitmap (image) files used by the sample database provided. The subfolder called **ctl3d** contains two Dynamic Link Library files (with the filename extension **.dll**) of which more later. The **data** subfolder is intended to hold CDS/ISIS databases, and two are usually provided on the installation disks: CDS, which consists of 150 records from UNESCO's Library database; and THES, which consists of about 20 thesaurus terms to show how a thesaurus system might be implemented in CDS/ISIS. Each database consists of at least 13 files with different file extensions, e.g.:

cds.mst The masterfile for CDS

cds.fdt The Field Definition Table for CDS

cds.pft The default print format for CDS

cds.ifp The inverted file postings for CDS

There are also a few files whose names do not consist of the database name plus a file extension. **acds.fmt** is the first page of the data entry worksheet for CDS. In the DOS version of CDS/ISIS a worksheet could extend over several pages and these were named **acds.fmt, bcds.fmt, ccds.fmt,** etc. The database structure in the Windows version has been kept the same as in the DOS version.

To start with, you can keep all your database files in the **data** subfolder, but if you have several databases they might be better in sub-subfolders, e.g. **c:\winisis\data\cds**. The *Reference Manual* explains how to do this with a **dbn.par** file in the **data** folder.

1.4CREATING A DATABASE

A database is usually constructed to store information about some things or persons. For example, a bibliographic database contains information about documents, such as journal articles or conference proceedings. A personnel database contains information about employees. The database consists of records and there is generally a one-to-one correspondence between the records and the things described. In a bibliographic database one record may correspond to one journal article: in a personnel database one record may correspond to one employee.

In CDS/ISIS terms, a record is made up of a number of *fields*. Each field contains data about some particular aspect or attribute of the thing or person, for example the author, title and date in a bibliographic database, or the name, address and grade in a personnel database. A sample record from a bibliographic database is shown below.

```
ISBN:                   0853658994
Authors:                Gredley, Ellen;  Hopkinson, Alan
Title:                  Exchanging bibliographic data: MARC
                        and other international formats
Imprint:                London: Library Association, 1990
Dewey class no.:        025.3028
```

It is possible that you might need to store more than one value in a field – for example two authors in the record above. As explained in Chapter 1, CDS/ISIS has special provision for this by allowing fields to be defined as *repeatable*: the author field is repeated to contain the second author.

CDS/ISIS also allows you to divide up fields into *subfields*: for instance the author field could be divided into subfields for surname and forenames, or an address could be divided into subfields for street, town, country, etc. Subfields are designated by a single letter and when entering data this letter is prefixed by a circumflex, ^. Thus the name Malee Siengthai might be entered as

```
^aSiengthai^bMalee
```

and an address might be entered:

```
^a12 Ralph Bunche Road^bNairobi^cKenya
```

If data are divided up like this, the user can specify different treatment of different parts of the field. For example, the surname could be made searchable but not the forename, or the town could be printed in capitals and the country omitted in a printout.

Many of the standard bibliographic formats make use of subfields, but if you are a beginner at designing databases it would be advisable not to use them. Either the data in the field can be divided by punctuation such as commas, or separate fields can be used for the different data elements, e.g. one for street, one for town, and one for country if they need to be treated differently.

1.4.1 CHOICE OF TAGGING SCHEME

Before you create a database with CDS/ISIS you need to decide on a format, i.e. what fields will be used and how you will record the data in them. The choice of fields is not final: you can modify them later.

If you are setting up a database for the first time, it is a good idea to use a very simple format to gain some familiarity. For example, with a bibliographic database you could use nothing more than Author, Title and Year.

There are quite a lot of 'standard' bibliographic and other formats existing, such as the national MARC formats, UNIMARC and the Common Communication Format. If you are contemplating exchanging data with other organizations, it would be a good idea to find out what they are using and to agree on a common format. However, if you expect to be quite self-contained you are at liberty to make up your own format to suit your own purposes.

Each field in CDS/ISIS must have a numeric 'tag' to identify it. This is a number between 1 and 999. If you are making up your own format you could number your fields 10, 20, 30, etc., so there is room to slot others in between them later. If you are using a data structure already set up by another CDS/ISIS user, please refer to 3.5.

When you have decided on your format you can start up CDS/ISIS and choose **Database | New**. You are then asked to give the database a name of up to six characters. (This limit is to maintain compatibility with the DOS version.) Then choose OK.

You will be required to complete four forms in setting up the database:

- the Field Definition Table (FDT)
- the Data Entry Worksheet
- the Display Format
- the Field Selection Table (FST).

Fortunately you can summon an *assistant* to help you with some of these – especially if you are new to CDS/ISIS.

1.4.2 FIELD DEFINITION TABLE (FDT)

The FDT defines the fields that may be present in the database and certain parameters for each field. You enter the values in the boxes at the top of the dialog box. In the DOS version, the FDT had little effect – you could repeat a field or enter subfields regardless of what the FDT said. The Windows version is much stricter and you need to be more careful about your definition (although you can always change it later).

The boxes are as follows:

(a) Tag -- see above. You can use the up and down arrows if you like to select the number, or type it in.

(b) Name -- this is to help you identify the field. It can be up to 31 characters long and can contain spaces. When you come to set up the data entry worksheet, this name will be used as the prompt for the field, but you can override it there. It is also used to specify the field in the "Guided Search" form.

(d) Type. Unless you can predict that the field will contain only letters (no spaces or punctuation) or only figures (no symbols or decimal point) it is best to leave this as Alphanumeric. The other possible values are Alphabetic or Numeric. The beginner is strongly advised to use Alphanumeric.

(e) Rep[eatable]. If you want to allow multiple occurrences of this field, e.g. several authors or several descriptors, click this checkbox.

(f) Pattern/subfields. If you are dividing the field into subfields, you should list the subfields here (without punctuation or spaces) e.g.

```
abc
```

If you are not using subfields, press the ™ key to leave this box blank. Pattern fields are not supported in Version 1.4.

When you have entered the data for each field, the focus will be on the **Add** button. Either click the button or press `{Enter}` to add the field to the table (displayed in the large box). If you need to correct the details for any field, just click on that entry in the large box and the details will be copied into the boxes used for editing. If you need to remove an entry, highlight it and click the **Delete Entry** button. You can alter the order of fields by selecting a field and clicking the up-arrow or down-arrow

key: they do not have to be in numeric order, though that is usually clearest. An example of an FDT is shown in Figure 4.1.

Figure 4.1 *Example of a Field Definition Table (FDT)*

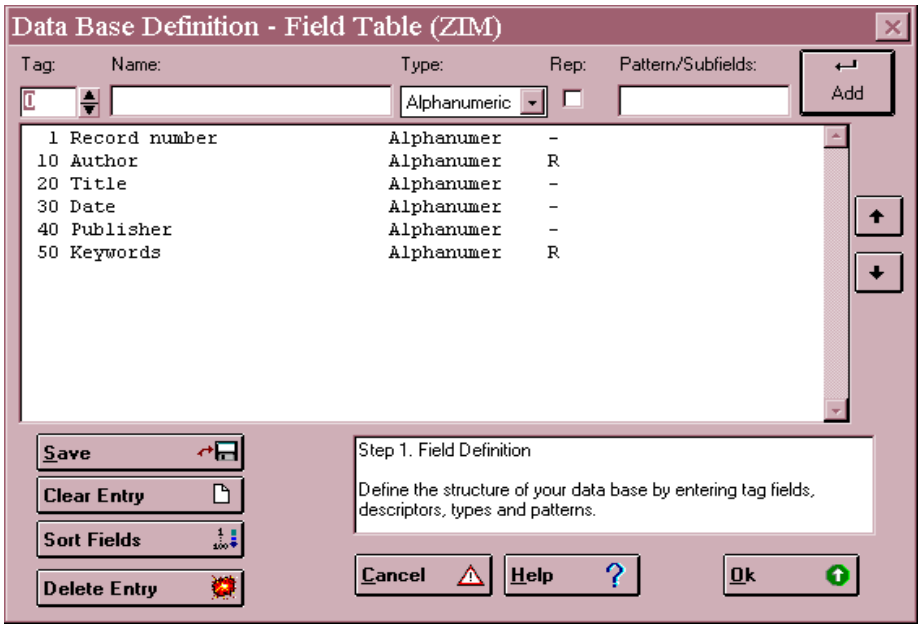
After entering all the fields, click the button with the green arrow to go on.

1.4.3DATA ENTRY WORKSHEET

You will enter data into the database using a worksheet, rather like an input form. Whereas in the DOS version of CDS/ISIS you had to specify a lot about the layout of the form, in the Windows version you need to do very little. The main choice is which fields you want to be on the worksheet. If you only have one worksheet then normally you will want them all, and you need only to click the button with the double arrow to effect this. If you want to be

more choosy, or to change the order of fields on the worksheet, you can select fields one at a time and either double-click the field or click the button with the single arrow. The order does not have to be by ascending tag number.

You can make the worksheet do more by highlighting one of the Data Entry Fields (when you have moved some onto the worksheet) and clicking the button showing a pencil and paper. This brings up a dialog box with some further options:



Description. This allows you to use a different name on the worksheet from the name you have used in the FDT.

In an integrated database of books and research projects you might have a field for corporate name, used for the corporate author of a book or the host institution of a project. You could have two worksheets, one describing the field as “Corporate author” and the other describing it as “Host institution”.

Default value. If the field will nearly always contain the same value, e.g. 'eng' for language 'English', you can put this in as a default value. It will then already be filled when you use the worksheet, but you can alter the value when it does not apply.

Help. You may enter a 'Help' message for this field that will be displayed at the bottom of the data entry window when the user is entering data in that field. It is often useful to give an example, e.g.

```
Enter surname, comma, initials, e.g. Walton, C.J.
```

Validation format. You can put in a rule to check the format of the data entered, e.g. the length must be a certain number of characters, or the field may only be present if another field is absent. The rule is written using the formatting language described in Chapter 5 and an example that might be used in the specification for field 110 is shown below:

```
if p(v100) and p(v110) then 'You cannot have two main entries' fi
```

The *if* expression p(v100) tests for field 100 being present *and* field 110 being present. It will cause a message box to appear after the user tries to enter data in field 110 if there is already a field 100 present. Data entry cannot proceed until the data are removed from field 110.

Another easy kind of validation is to test that the contents of a field are the right length, e.g.

```
if size(v8) > 40 then 'Field 8 is too long' fi
```

However, if you make a mistake in writing a validation rule it may be impossible ever to satisfy it and you will never be able to get beyond this field in data entry. It is therefore not recommended for beginners.

Pick-list definition. A pick-list enables the user to display a list giving a choice of values for a particular field during data entry. In the pick-list definition box you enter **choice** followed by *two colons* and a format that will produce the list. The first line produced by the format will appear as the title of the listbox during data entry. For example:

```
choice::'Languages'/'English'/'French'/'German'/'Spanish'
```

The values here are all unconditional literals. ‘Languages’ will be taken as the title and ‘English’, ‘French’, ‘German’, and ‘Spanish’ will be the choices displayed as shown in Figure 4.2.

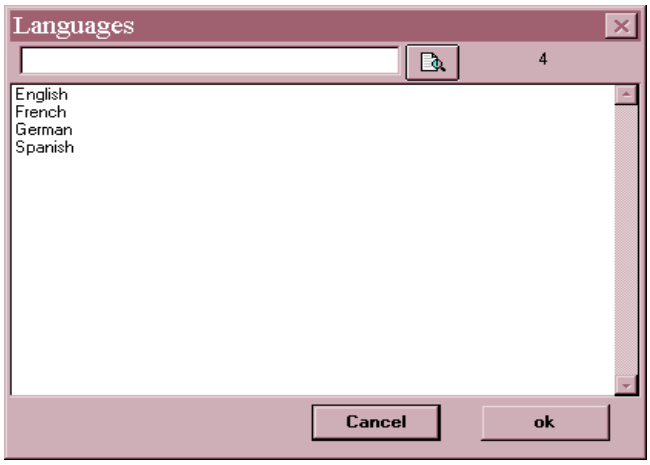


Figure 4.2 Example *of a pick-list*

The first box below the title is to allow the person doing data entry to search for a desired value: he/she can enter the term or the beginning of the term and click the button with the magnifying glass.

You can allow the user to select more than one item from the list by using the *multi* keyword and *repeat* puts each value into a separate occurrence of the field:

```
choice:multi:repeat::'Languages'/'English'/'French'/ 'German'/'Spanish'
```

Unfortunately at the time of writing there is a small bug in this part of the program and you may have to enter the data twice during data entry to get the desired result. An alternative is to specify that each value is enclosed in angle brackets:

```
choice:multi:<>::'Languages'/'English'/'French'/'German'/ 'Spanish'
```

You will then need to index the field with Indexing Technique 2.

If you follow a standard format for bibliographic records, you may wish to hold the language as a code but display the full name in the pick-list. This can be done using the *firstdescribe*keyword: each entry consists of its name followed by its code:

```
choice:firstdescribe::'Languages'/'French'/'fre'/
'Portuguese'/'por'/'Spanish'/'spa'
```

There are other more sophisticated possibilities in creating pick-lists, thanks to the list being generated by the CDS/ISIS formatting language. However, we will mention one final one: you can keep the list in a separate text file and give the file name here. Each line in the text file is treated as an entry in the list.

```
choice:files::'Languages'/'langs.txt'
```

The possibilities described here can be combined, i.e. you can use several keywords separated by colons and the order does not matter, but remember to put *two* colons before the list values or file name.

Pick-lists are not recommended for long lists (hundreds or thousands of terms) because of the processing time and memory limitations: a better solution is to develop a plug-in application using ISIS_DLL.

OK. Click the **OK** button to go back to the Worksheet definition screen.

If you have entered any Data Entry Fields by mistake, you can remove them using the button with the left-pointing arrow. You can alter the order of fields on the worksheet by selecting the field to be moved and clicking the ↑or ↓ button. A validation rule applying to the record, rather than an individual field, can be entered by clicking the **Record Validation** button. For example in Format you could have:

```
if a(v200) then 'Record must contain a title.' fi
```

This will generate an error message if the user has entered a record without any data in field 200 and then tries to save it. Again caution is advised: a badly written rule may mean that you can never save the record. The use of **Begin code** and **End code** allows editing to be done automatically on the record when it is opened or closed in the worksheet, e.g. today's date could be entered in one of the fields, but it is beyond the scope of this Handbook.

When you have set up the worksheet, click the button with the green arrow pointing right.

1.4.4 DEFAULT DISPLAY FORMAT

The display format means the way that the records will appear when you use browse the database or display search results. Display formats can also be used in producing printed output. There must be at least one display format for the database and that must have the same filename as the database. You can always create more formats, or modify existing ones, later.

A message box appears asking "Do you want Winisis to launch the Print Format Assistant?" and you can choose **Yes** or **No**. If you are new to CDS/ISIS, or if you just want an off-the-peg format to save time, click **Yes**. You are then given the choice of five pre-defined formats. The order of fields will be the same as in the Field Definition Table.

Normal style. This uses font 2 (normally Times Roman) and colour 4 (normally blue) and gives a display with the field names in one column and the data in the next.

CDS/ISIS DOS compatible format. This is similar to the Normal style but it uses only black text and Courier font, and features which are within the capabilities of the DOS version of CDS/ISIS.

Decorated format. Three fonts and various colours feature in the format. The record number (MFN) and the name of the database appear in a box and the field names appear in italics.

HTML normal. This is a format using very basic HTML (HyperText Markup Language), the language used to create pages for the World Wide Web. No HTML tags are included to separate the contents of one record from the next.

HTML table with headers. This again incorporates HTML tags and displays field names and their contents in the form of a table.

Once the format has been created, it will be displayed in case you wish to edit it. The next chapter describes the formatting language in some detail, but just to give you a taste:

(a) Fields are specified by using v (for variable) in front of the tag: thusv10 means display the contents of field 10.

(b) Text between single or double inverted commas forms a *literal* and will appear in the display just as it is written.

(c) The slash (/) means start a new line here.

A simple format for a database containing fields 10, 20 and 30 could be:

```
v10,v20,v30
```

This would display field 10, immediately followed by field 20, immediately followed by field 30, e.g.

```
Walton, C.Good office management practice1990
```

To display the fields on different lines, they should be separated by slashes, e.g.

```
v10/v20/v30
```

This would display the above example as:

```
Walton, C.
Good office management practice
1990
```

Unlike in the DOS version of CDS/ISIS, you can use carriage returns in the format to make it easier to read, e.g.

```
'Author: ' v10/
'Title: ' v20/
'Date: '  v30
```

Do not worry about getting your display format right first time. It is best to try the format out when you have entered a few records and then edit it as necessary. When you have used the services of the Assistant, or you have written your own format, click the green arrow to go on.

1.4.5 Field Selection Table (FST)

This is perhaps the most difficult of the four forms to understand.

CDS/ISIS has two ways of finding information in the database, which can be compared with the two ways of finding information in a book. Suppose we have a book on architecture and we want to find any mention of cathedrals. One method is to start at page 1 and scan each page in turn to see whether 'cathedrals' occurs on that page. This is known as a 'serial' or 'sequential' search, because we are searching through the pages in sequence. It would be quite a reliable method (provided we could keep up the concentration) but it would take a long time if the book had several hundred pages.

A much quicker method is to make use of the index (provided that the book has one). We look under C, find 'cathedrals', and then see an entry something like:

```
cathedrals    30, 212, 360
```

Now we can go straight to those page numbers and read what is said about cathedrals. This method might not be quite so reliable, since it depends on the skills of the indexer. He or she might have considered some mentions of 'cathedrals' to be too insignificant to index.

CDS/ISIS allows both these approaches to information retrieval. The first method, scanning through the records sequentially examining the text contained in the record is known as free-text searching. It is likely to be a slow process when the database contains more than a few hundred records. The second method, using an index, is the normal way of searching. CDS/ISIS allows you to set up the index automatically and refers to it as the index or inverted file. (The list of terms in the index without the details of their occurrences is also referred to as the terms dictionary.)

The selection of terms from the database records to go on to the index file is controlled by the Field Selection Table. It is not possible for the computer to select terms according to their significance. Instead the selection depends upon three rules:

i. Which fields from the record are to be indexed (e.g. you probably want authors indexed but not the publisher or the number of pages).

ii. How the index terms are to be constructed from the data in these fields (called the *indexing technique*). For example, do you want the title 'Good secretarial practice' as a whole

field under 'G', or do you want it split up into separate words so that 'secretarial' can be searched under 's'?

iii. You can specify a list of stopwords which are not to be used on their own as index terms, e.g. 'in', 'of' and 'the'.

CDS/ISIS allows much flexibility in specifying each of these three rules. It is important to consider them carefully, since they determine what searches will be possible on the database. For instance, if you index authors as separate words, then 'Walpole, Horace' will appear under 'Horace' and under 'Walpole': you cannot search him as 'Walpole, Horace'. If you index titles as whole fields, then 'The Concise Oxford Dictionary of Quotations' cannot be searched under 'Dictionary' or under 'Quotations'. It is, in fact, possible in CDS/ISIS to index the same field in more than one way.

If you have divided the field into subfields, you can index different subfields by different techniques (or some subfields but not others).

Each line of the Field Selection Table comprises three elements: the Tag or Name, the Technique and the Format. You need to make an entry in the table for each field you want to index (i.e. to make searchable) and if the same field is indexed in two ways you need two entries for it.

Again if you are unsure about writing FSTs it would be a good idea to engage the services of the Dictionary Assistant. This will give you a dialog box like the one in Figure 4.3.

Figure 4.3 *Dictionary Assistant dialog box*

All you need do is to choose which technique to apply and which fields to index. The listbox on the right shows the techniques available. The two most commonly used are 0 – by line and 4 – by word.

`0` means that the whole field contents will be indexed as a single term.

`1` means index each subfield separately and so is relevant only if the field is divided into subfields.

2 means index only words or phrases which have been entered between angle brackets, e.g.<inflation rate>. This technique can be used to select particular terms from a lengthy piece of text such as an abstract. Some CDS/ISIS users like to enter descriptors this way and use technique 2 to index them.

3is similar to 2 but indexes terms entered between slashes, e.g. /Windward Islands/

4 signifies that each word in the field will be indexed separately (except stopwords – see Section 4.7). If the field is divided into subfields, you must specify mode mhl or mdlin the extraction format – see Section 5.2.

Other values are also available and are explained in the *Reference manual*. If you choose one of the values 5 to 8 you will have to edit the format manually to put in the required prefix. For help on choosing the right technique please see Section 4.8.

Now click the check boxes against the fields you want to be indexed (i.e. searchable) and finally click **OK**. The FST is then displayed and you can edit it if necessary. Using the Dictionary Assistant, all the fields selected are indexed by the same technique: if you want to apply different techniques to different fields, you will need to make changes here.

Each entry in the FST has three parts. In the top part of the dialog box the entry being edited is shown in three separate boxes. In the Entries box each entry is shown on one line with spaces between the three parts.

The first value, which was called the ID in the DOS version of CDS/ISIS, is normally the same as the tag of the field from which the terms come. (It does not have to be, but this usually makes searching easier.) It can be used to specify the type of term when searching, as we shall see in chapter 7. If you choose a number that corresponds to a field tag, Winisis will show the field name in the Tag/Name box when you are editing it. If you choose a number that does not correspond to a field tag, it will be shown as the number followed by “FST Tag”.

The second value, the indexing technique, specifies how the index terms are to be extracted as explained above.

The third column, the format, shows which field in the record the terms are to come from. As in the display format, fields are specified with *v* in front of their tags.

So, if the title field has a tag 200 and we want to index each individual word, the entries would be:

Tag/Name: 200 Title Technique: 4 Format:v200

and if the author field is 100 and we want to index the author name as a whole:

Tag/Name: 100 Author Technique: 0 Format:v100

If we want to index only subfield a of field 100 we could specify

Tag/Name: 100 Author Technique: 0 Format:v100^a

This dialog box works in a similar way to the one for the FDT. When you have entered the data for each field, the focus will be on the **Add** button. Either click on the button or press **{Enter}** to add the field to the table (displayed in the Entries box). If you need to correct the details for any entry, just click on that entry in the Entries box and the details will be copied into the boxes used for editing. If you need to remove an entry, highlight it and click the **Delete** button. An example of an FST is shown in Figure 4.4.

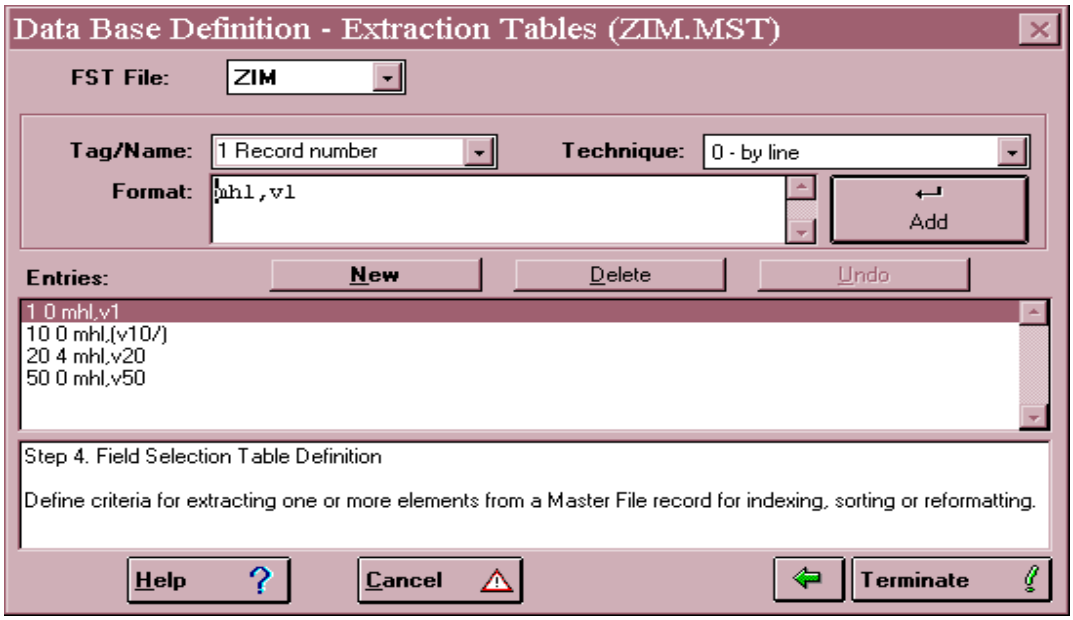


Figure 4.4*Example of Field Selection Table (FST)*

For more information on writing the data extraction format, please see Chapter 5, especially Section 5.2 for dealing with subfield markers and Section 5.5 for dealing with repeated fields.

Again, do not be too concerned to get the Field Selection Table right first time. It is best to try it out on a few sample records and look at the index terms produced. If they are not what you want, edit the FST and then regenerate the inverted file.

When you have completed your entries in the Field Selection Table, click the **Terminate** button. You are then asked to confirm that you want the database to be created. Click **Yes**and your wish should be granted. You are then invited to select a database to work on: you can choose the one you have just created or a previous one.

LESSON 2

Installation, Configuration and Application of SOUL

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 SOUL 3.0: Catalogue Module
1.4 SOUL 3.0: Circulation Module
1.3 SOUL 3.0: Acquisition Module
1.4 SOUL 3.0: Serials Control Module

1.1 Learning Objectives

In this lession studenmts will learn practical application of integrated library automation software and its different funcationality. This lesson also explore step by step installation and implentation of library automation software. Its include The SOUL 3.0 consists of the following modules: Acquisition, Catalogue, Circulation, OPAC, Serial Control and Administration.

1.2 Introduction

Software for University Libraries (SOUL) is a state-of-the-artintegrated library management software designed and developed bythe INFLIBNET Centre based on requirements of college anduniversity libraries. It is a user-friendly software developed to workunder client-server environment. The software is compliant tointernational standards for bibliographic formats, networking andcirculation protocols. After a comprehensive study, discussions anddeliberations with the senior library professionals of the country, thesoftware was designed to automate all housekeeping operations in alibrary. The software is suitable not only for the academic libraries, butalso for all types and sizes of libraries, even school libraries,

1.4 Installation

To Install the SOUL Library automation software, one can download the zip installtion file from https://soul.inflibnet.ac.in/downloads.php, after that one has to follow the steps given below:

Step-1

Go to the webpage http://www.inflibnet.ac.in/soul to download the

SOUL 2.0 Demo Version.

OR

Insert the CD in the CD-Drive that contains the Installation Package

for the SOUL 2.0 Demo Version.

Step-2

Extract the SOUL 2.0.rar file to a path to which you have access.

Open the folder and double-click on the 'splash' HTML Application File to

get started.

OR

If you are installing the SOUL 2.0 from the CD. Then the screen will

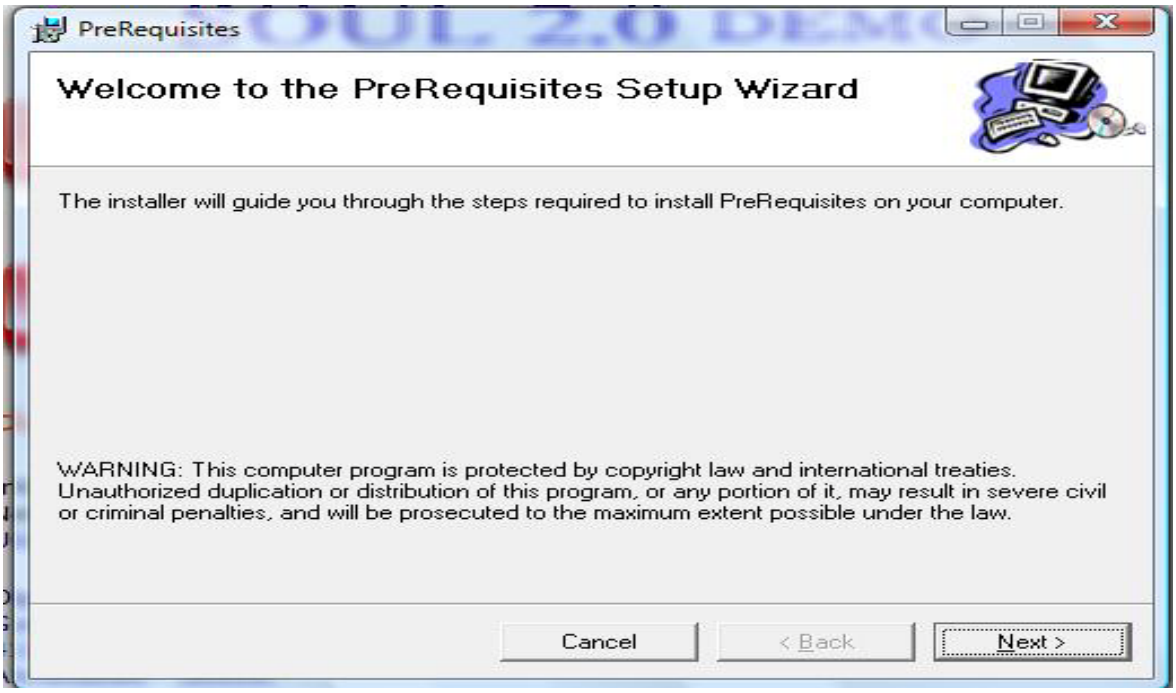
automatically appear as soon as you have installed the CD

Step-3

Step -4

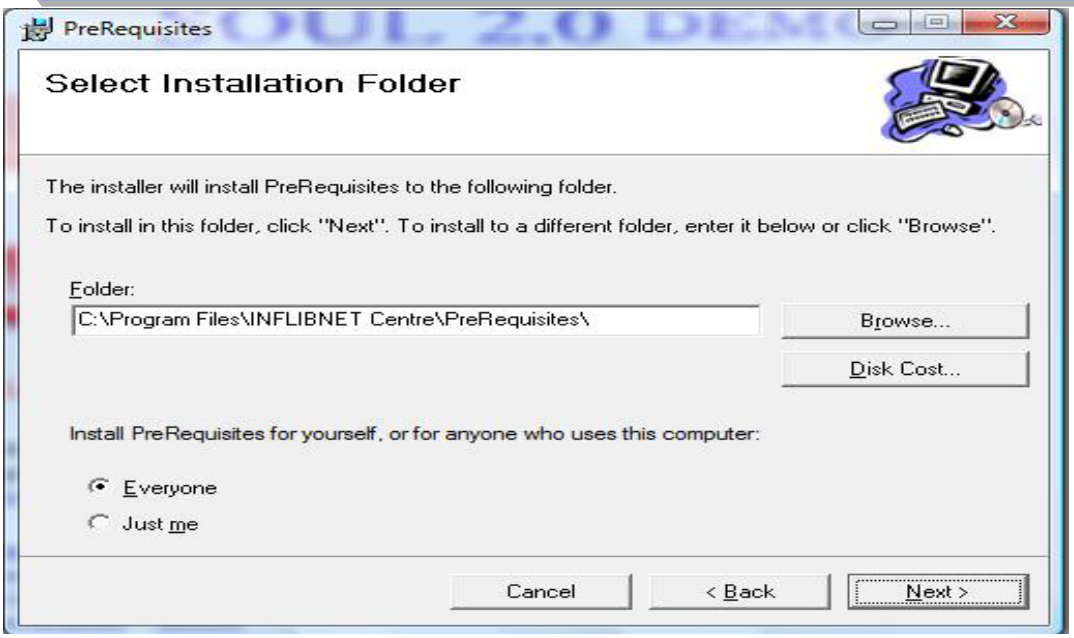
Click here to install the pre-requisites

Step-5



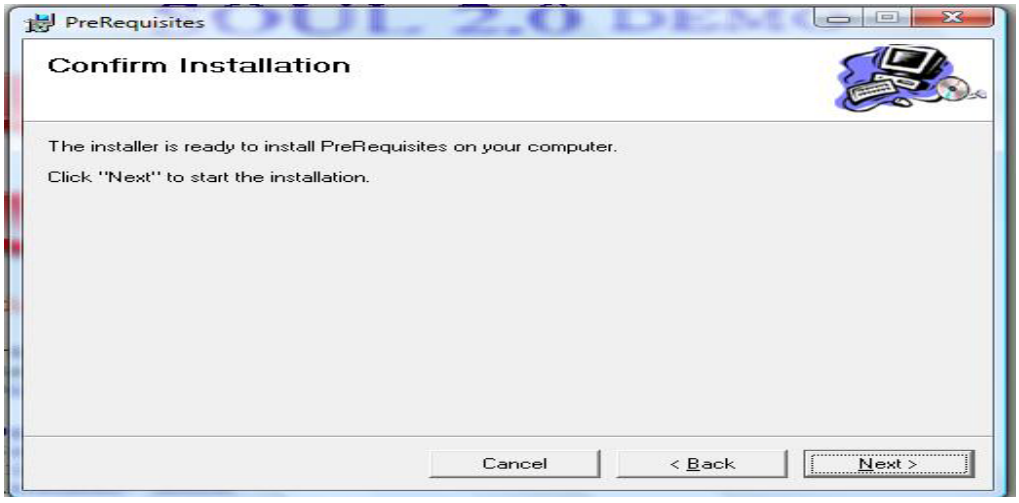
Click the next.

Step-6



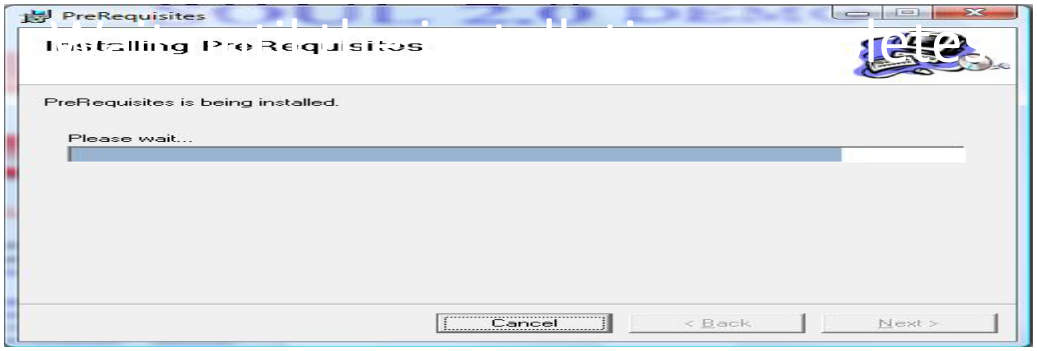
Click the Next

Step-7



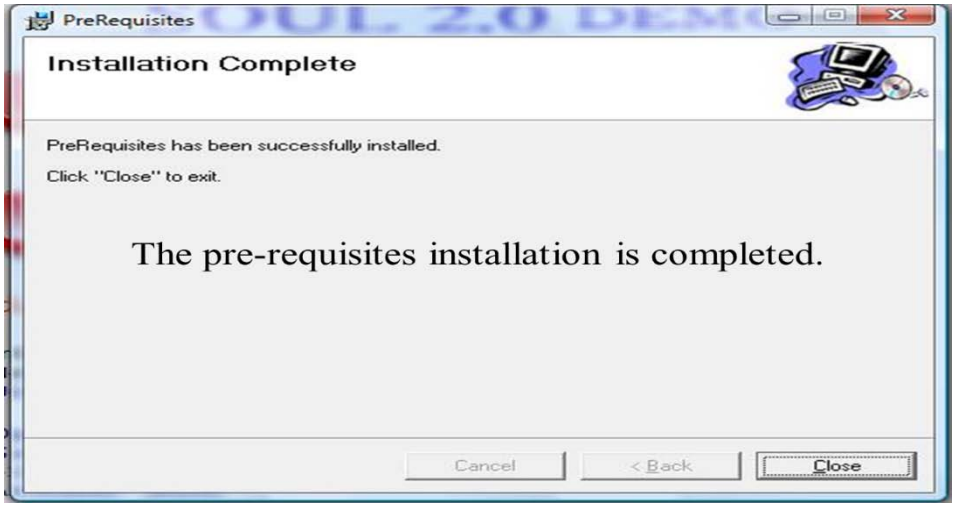
Click the Next

Step-8



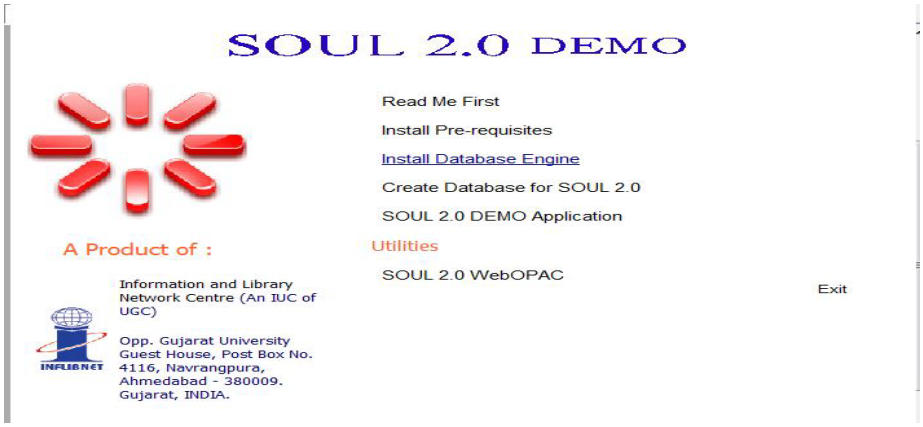
Wait until the installation completes

Step-9



Press Close button .

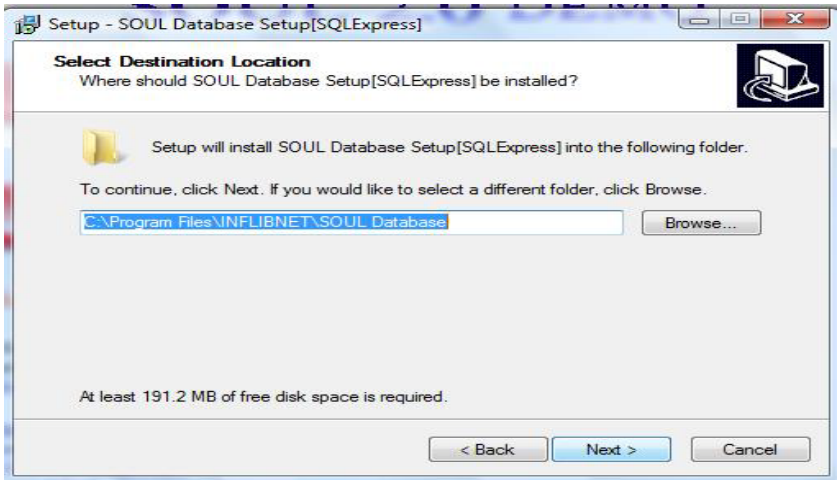
Step-11



Step-12

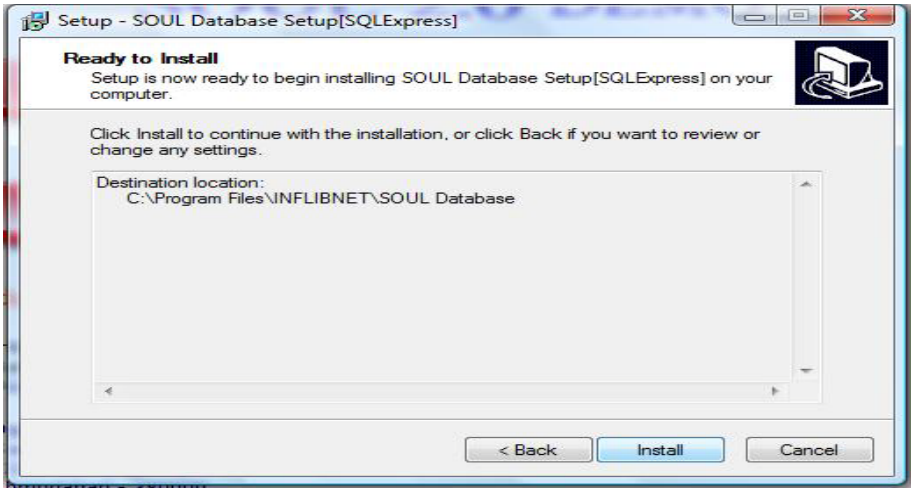
Click next

Step-13



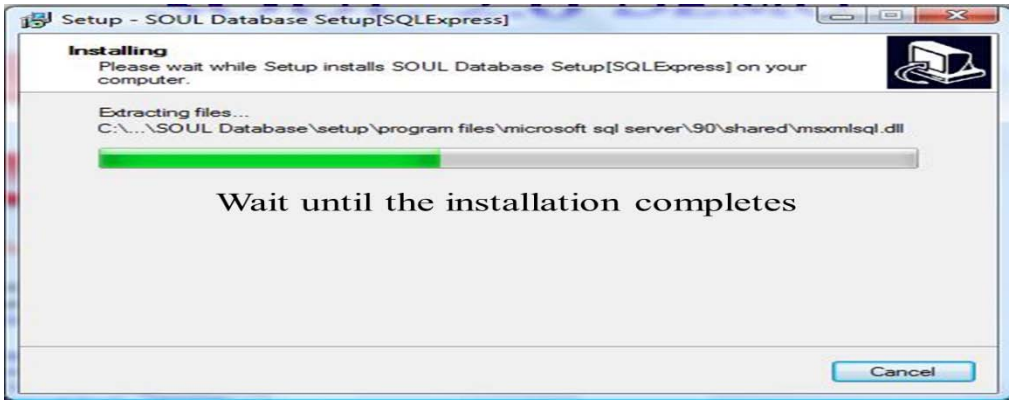
Click next

Step-14



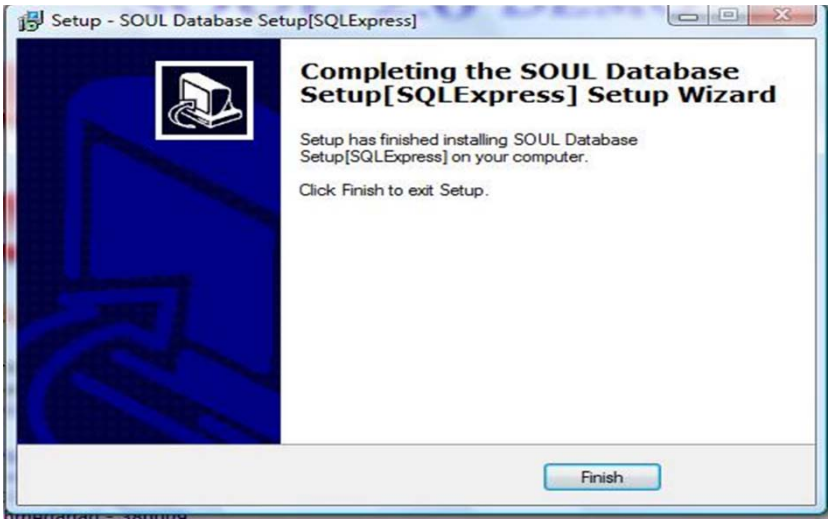
Click Install

Step-15



Wait untill the installation complete

Step-16



Click finish

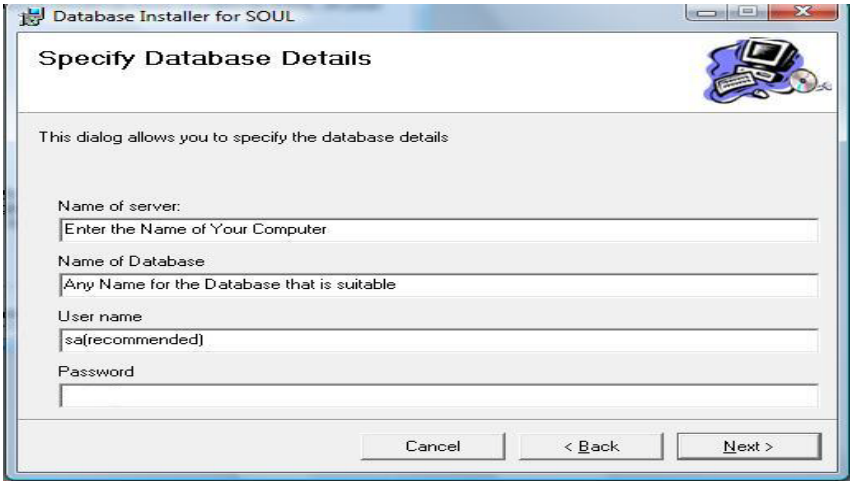
Step- 17

Click " Create Database for SOUL 2.0"

Step-18

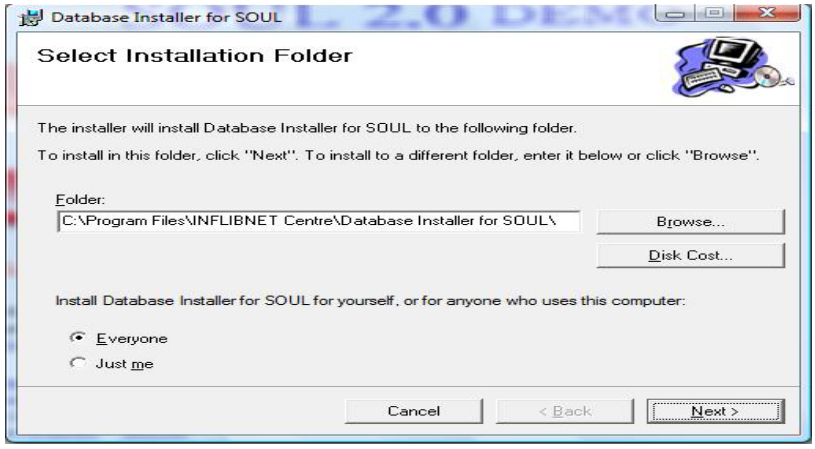
Click next

Step-19



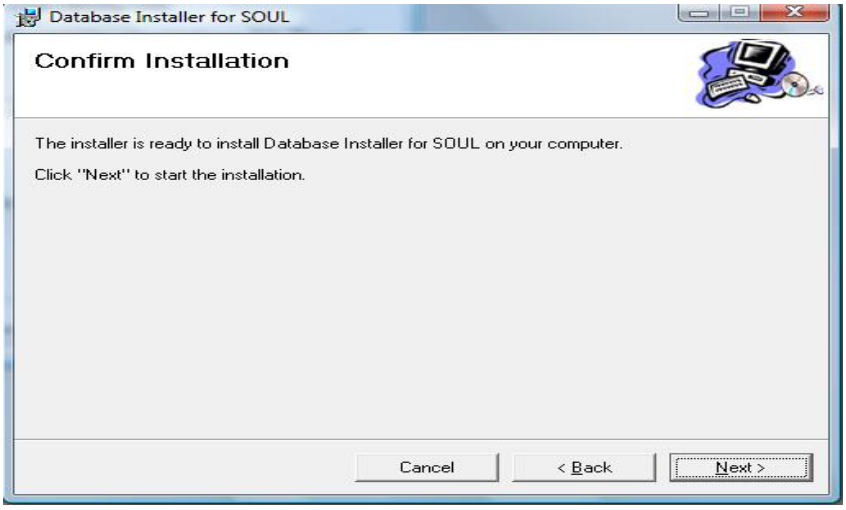
Write in the box all the above and Click Next

Step-20



Click Next

Step-21

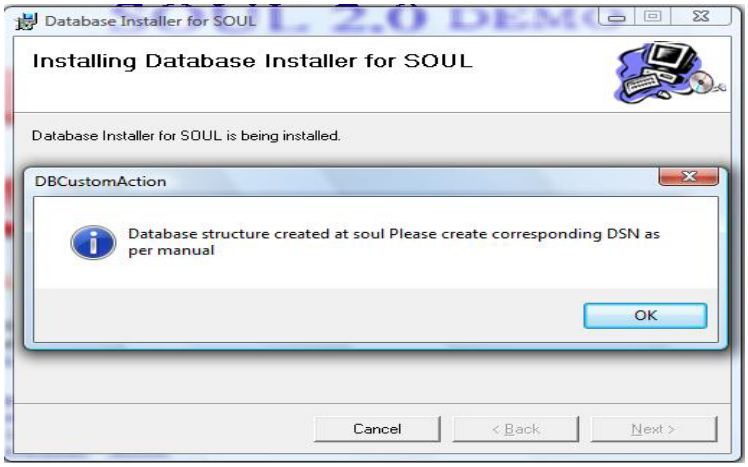


Click Next

Step-22

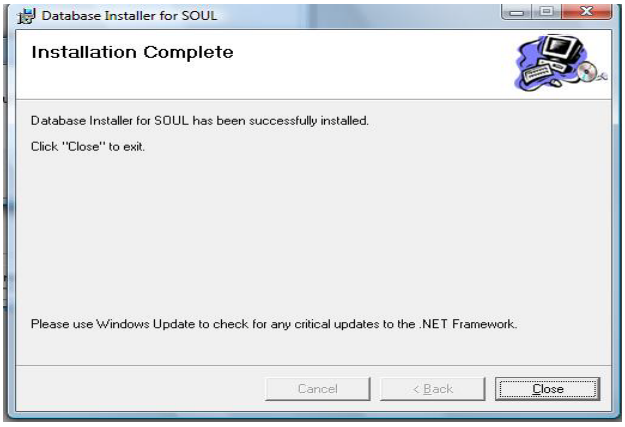
Please wait untill the installation complete

Step-23



Press O.K.

Step-24

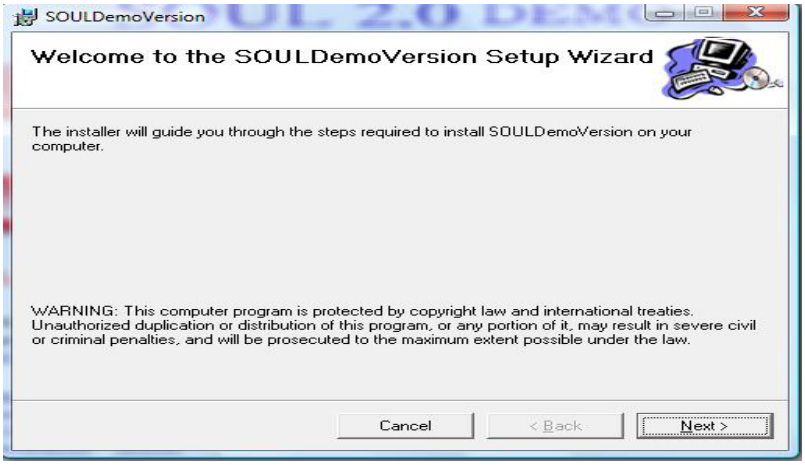


Please prsee “Close”

Step-25

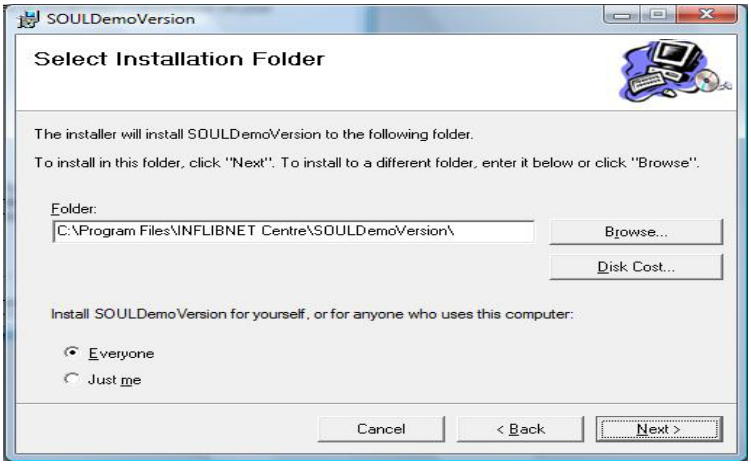
Click " SOUL 2.0 DEMO Application"

Step-26



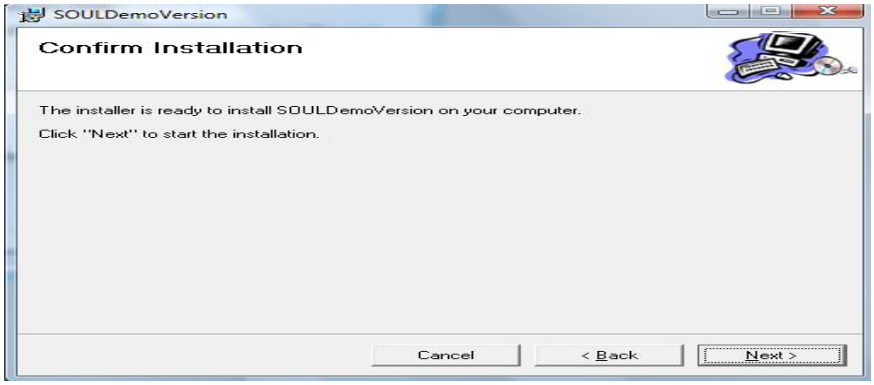
Click Next

Step-27



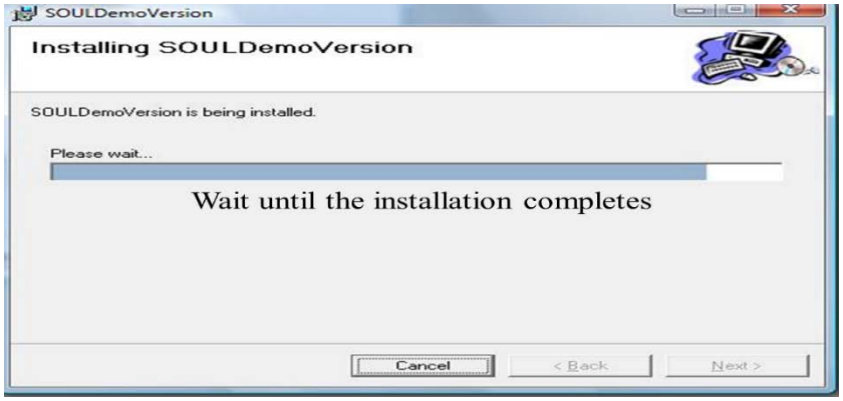
Click Next

Step-28



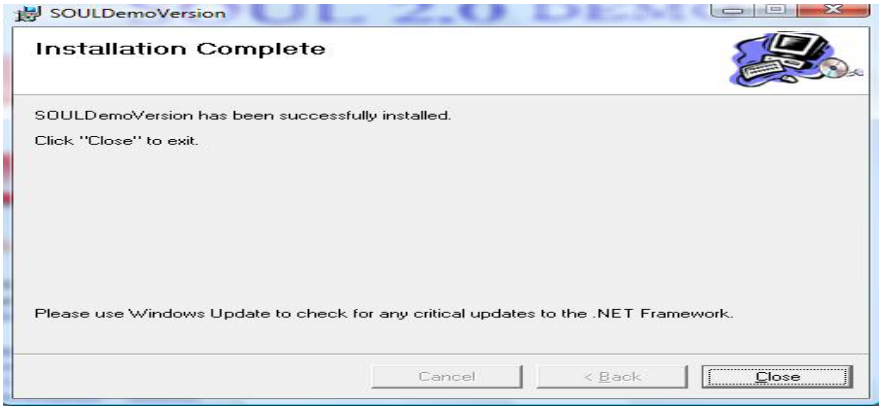
Click Next

Step-29



Please wait " Until the installation completes

Step-30

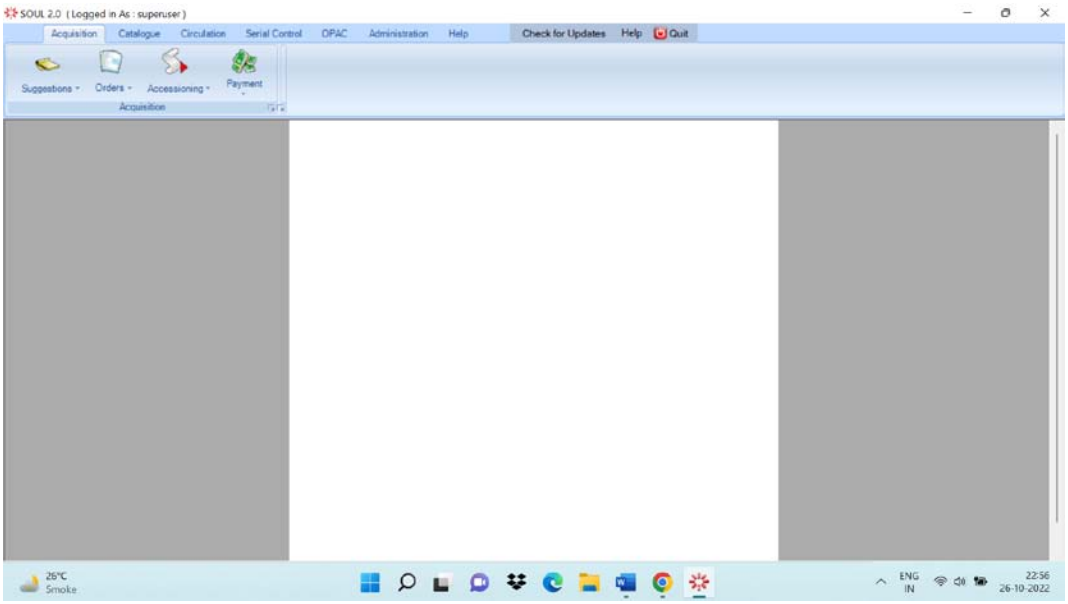


Now the demo version of SOUL 2.0 Library automation sofatware has sucessfully installed, this is recommended, for further enquery or detail study, please visit https://soul.inflibnet.ac.in/downloads.php, where you will get all the complete information regarding the software. The above contenet has teken from PPT presentation of installation of SOUL availabel in the same website, you will also get users manual of SOUL 2.0 and SOUL 3.0.

1.3 SOUL 2.0 Login/Password

After installation we can log in the SOUL software with user Id: superuser and Password: su. After log in the main menue of the software will be appear.

Login to SOUL 2.0



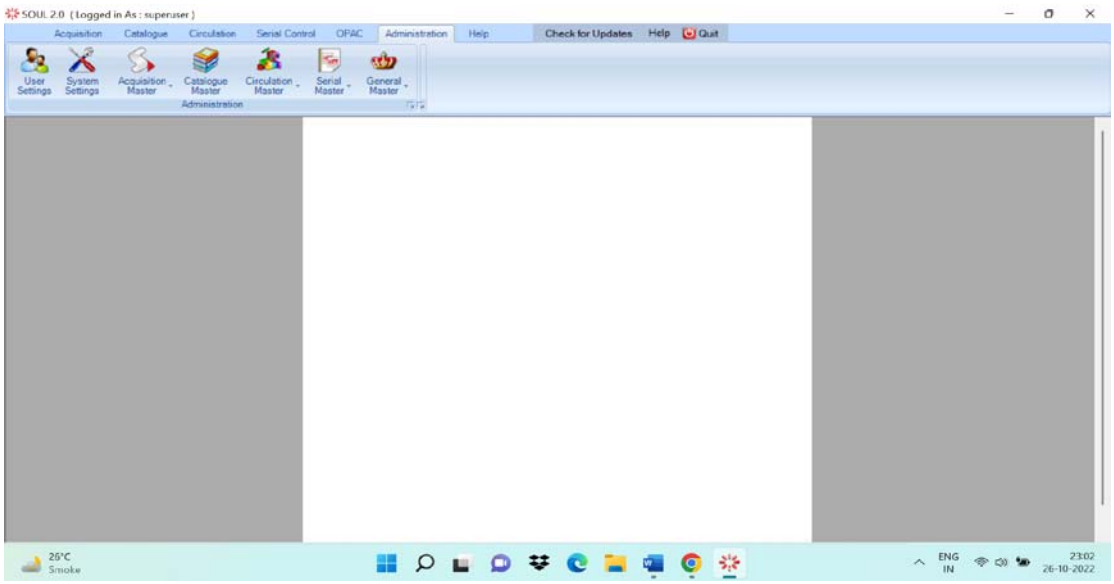
Main screen of the SOUL 2.0

Administration

The SOUL software needs to start with the Administration, it includes Institution and library setup, Budget Allocation, Department Creation, Subject Creation, the module has been divided into three major sub modules for accommodating the new features.These three sub-modules are User Management, System Parameters and Masters.

The Administration module provides the following:

- Grouping of users based on the policy
- Transactional rights over the systems
- Transaction level security to users
- Various configuration settings such as labels, e-mail and other parameters related to the software use
- Common master databases being used in modules.



Administration

Acquisition

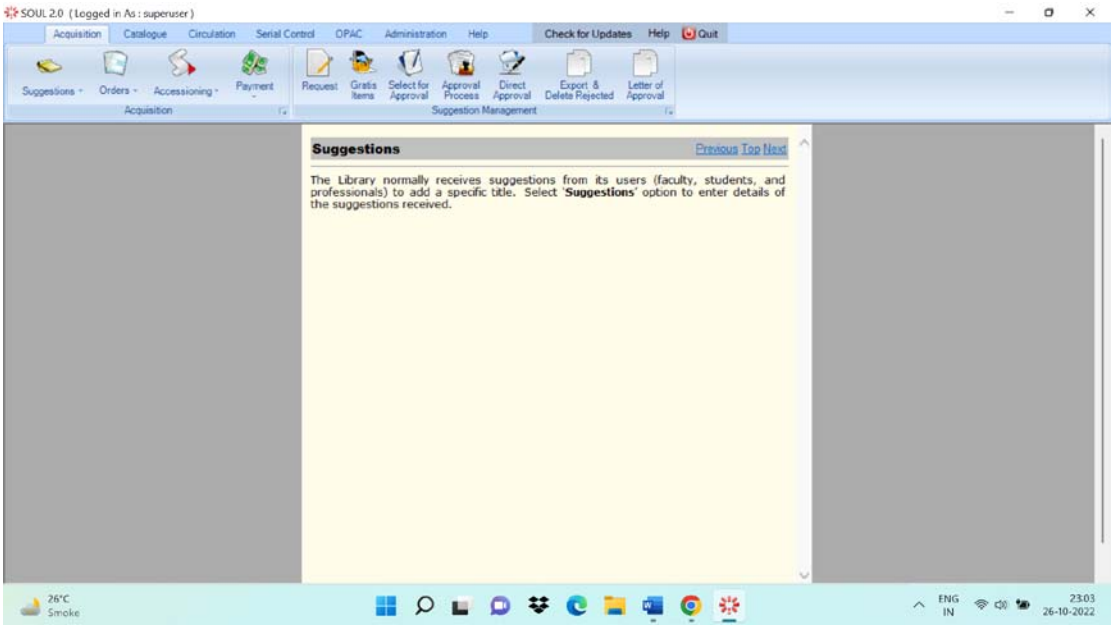
The Library Acquires esources based on suggestions/recommendations made by its users faculty/library commitee members/students.

Main task of the LIS staff is to input the suggestions/recommendations reeived,into the system along with the name of the person who has requested for.This help the librarian to inform the requester as soon as the suggested item is added in the library or its current status.

Functionalities of Acquisition Module:

- Request
- Gratis Item
- Select For Approval

- Approval Process
- Direct Approval
- Letter Of Approval



Acquisition

Cataloguing

Cataloguing is the most important module of the LMS from the point of view of retrieval of information. Retrieval of accurate/correct information depends upon how much care was taken while feeding accurate bibliographic data. Please ensure you follow international standards (like AACR) for field values and selection of keywords, subject-headings etc. SOUL uses MARC21 format to create records for the resources. MARC format will help us exchange information to and from other databases. MARC format supports several data field. Depending upon the size of the library and user-needs, you may choose selected important fields for your database. SOUL allows you to import data in MARC21 format too. This will also help you in saving data-entry effort and maintain accuracy (MARC records can be downloaded from LC (Library of Congress), IndCat (INFLIBNET Centre's Union database) or other OPACs for most of the foreign publications) – the mechanism is discussed later in this section.

Functionalities of Catalogue Module:

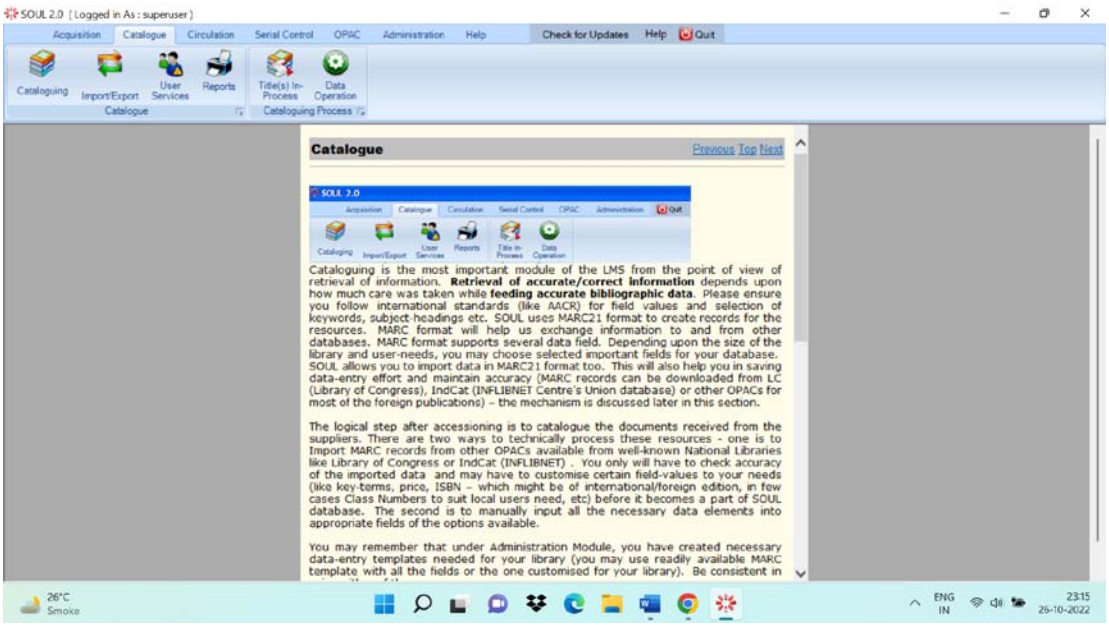
1. Cataloguing

- Title in Progress
- Data Operation

2. Import/Export

- Import from MARC

- Export to MARC
- CCF to MARC
- Export to MARC
- Add Accession No. To Imported Data
- MARCXML to SOUL



Cataloguing

Circulation

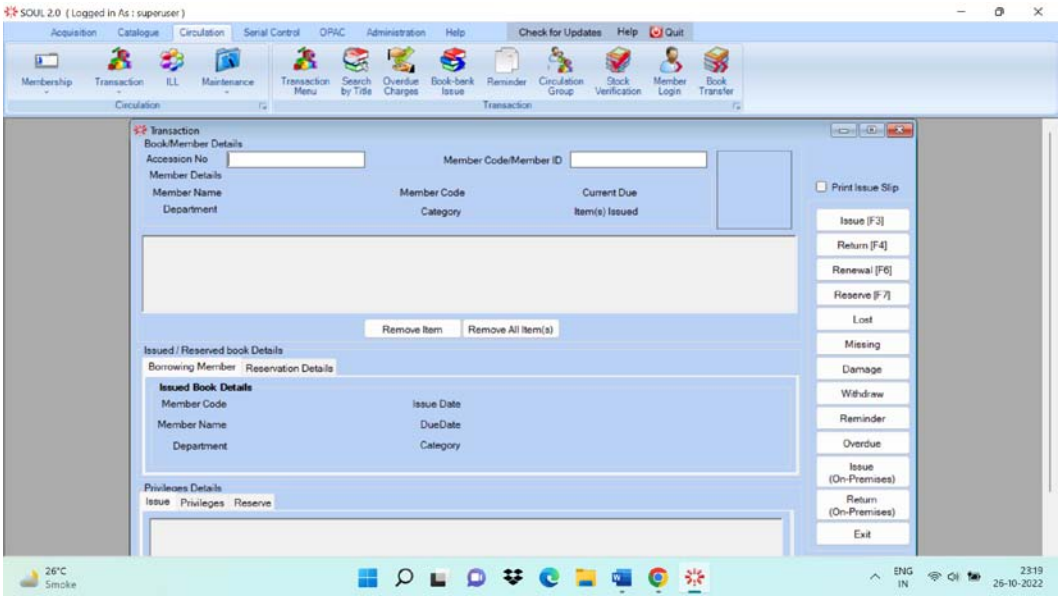
The Circulation module allows us to to create/edit/delete/search User records,renew membership and also establish relationship between the user and resources by creating transaction records (Issue/Return/Renew),Reserve the item(s),issue the item on ILL,Book bank transaction facility and get number of routine reports and some management reports.

The module deals with all operation related to library members i.e. creation,deletion and modification of members.Apart from these users may copy an existing membership record update it with a new membership code.User can search membership records by using the option search member by using different searching parameter such as code,name,department,designation,entry date,category and if user want to delete any memberthat there are two options to delete membership record, either single member or Group member deletion.

Functionalities of Circulation Module:

- Transaction process of material
- Book Bank Issue/Return
- Group Issue/Return
- Member login/logout facilty
- Stock verification

- Inter Library Loan (ILL)



Circulation

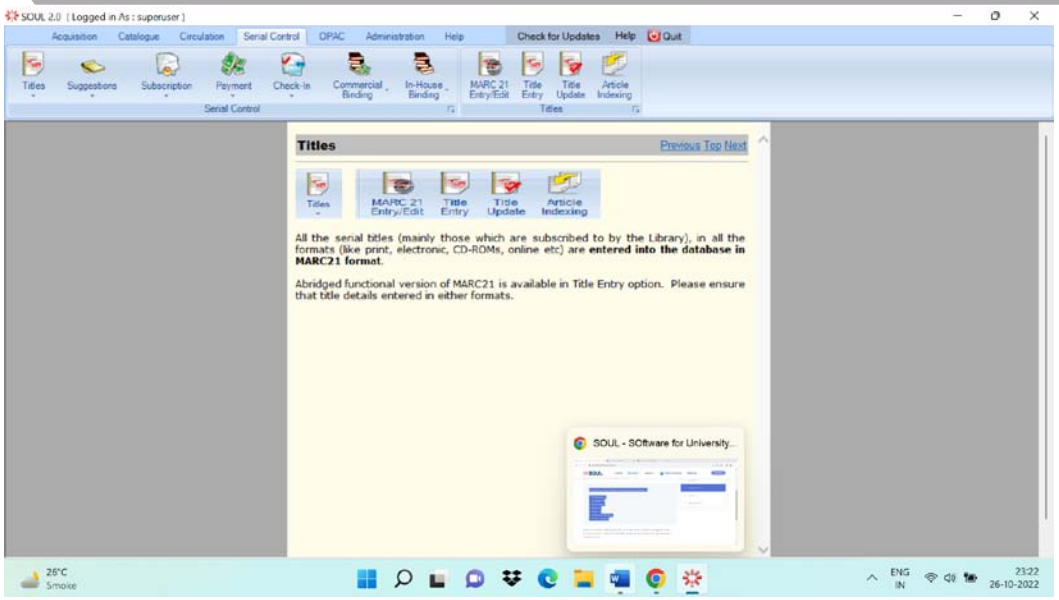
Serial Control

All the serial titles (mainly those which are subscribed to by the Library), in all the formats (like print, electronic, CD-ROMs, online etc) are entered into the database in MARC21 format.

Abridged functional version of MARC21 is available in Title Entry option. Please ensure that title details entered in either format. It offers easy creation and maintenance of Article indexing database and thereby help in providing the services according to the user's need.

The Serials Control module has following sub modules.

- Titles(Serials)
- Suggestions
- Subscription
- Payment
- Check-in
- Commercial Binding
- In-House Binding



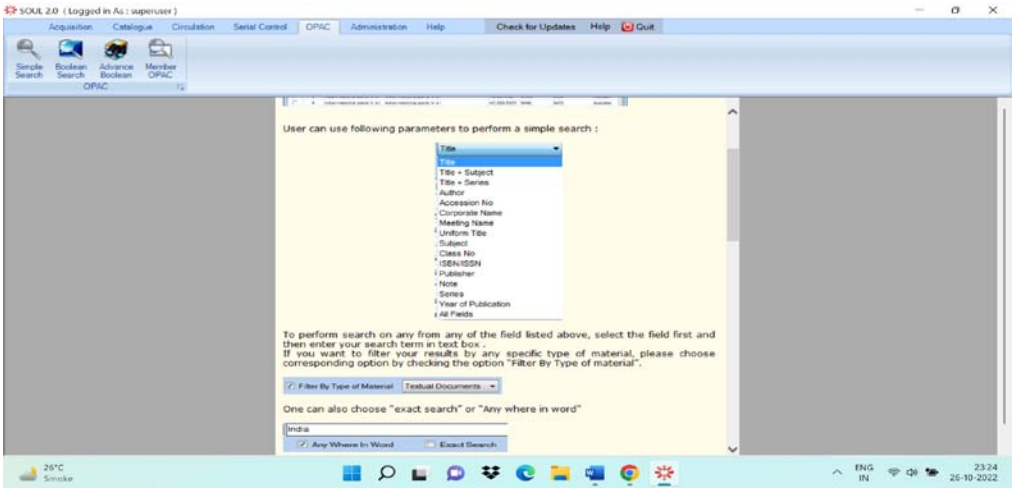
Serial Control

OPAC:

The OPAC has simple and advanced search facility with the minimum information for each item including author, title, corporate body, conference name, subject headings, keywords, class number, series name, accession number or combination of any of two or more information regarding the item.

Major Functions provided in the OPAC module are:

- Simple Search
- Boolean Search
- Advaced Boolean Search
- Displayind and Downloading of records in MS Excel,PDF or MARCXML
- Search support for the items that are in the acquisition process in the library.



OPAC

UNIT – III: Database Web Interface

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STRUCTURE

1.1 Introduction
1.2 Installation of Apache web server
1.3 Installation of GenISIS
1.4 Starting Apache Web server
1.5 Starting GenISIS
1.6 Web Interface to WINISIS using GENISIS

1.1 INTRODUCTION

GENISIS is an authoring software (for Win32) for visually producing web forms to query CDS/ISIS databases. There are two versions of the tool: GenisisWeb, for web publishing and GenisisCD for developing CDRom interfaces for CDS/ISIS databases. CDS/ISIS is an advanced non-numerical information storage and retrieval software developed by UNESCO since 1985 to satisfy the need expressed by many institutions, especially in developing countries, to be able to streamline their information processing activities by using modern (and relatively inexpensive) technologies.

Genisis was originally developed by the former IBISCUS Association (France) for UNESCO and it is now available free of charge on the UNESCO FTP site. The software is written in Microsoft Visual Basic. Its source code is also freely available. A new release of GENISIS, the authoring software for visually producing search interfaces for CDS/ISIS databases, is now distributed on UNESCO's CDS/ISIS webpage.

http://www.unesco.org/isis/files/winisis/genisis/web/genisisweb.exehttp://www.unesco.org/isis/files/winisis/genisis/cdrom/genisiscd.exe ftp://ftp.unesco.org/pub/winisis/genisis/web/

GenisisWeb now supports CSS (Cascading Style Sheets) and has an improved CDS/ISIS print format wizard that makes it easier to link records to each others. GenisisCD works also over HTML pages but includes its own search engine and may produce a fully fledged CD, including: installation program, autorun, HTML help, totally customizable interface logos etc. GenisisCD will prepare the CD that will

then possible to burn using your favorite CD writer software. Available interface languages: English and French.

Genisis, basically implements the following steps:

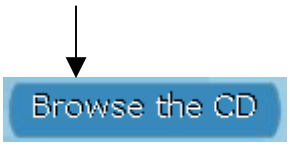
1. **the web query form (with field selection and index access);**
2. **the display of query results;**
3. **the display of a particular record's details;**
4. **test the application;**

For testing the generated application with GenisisWeb, will require the use of a local web server such as Apache web server.

Finally, depending on which version of GENISIS you are using, it is possible to export the generated application to a real internet/intranet server (Windows, Unix, Linux) or to prepare the structure of the CDRom for the copy. GENISIS is based on the Web CDS/ISIS interface WWWISIS by BIREME.

1.2 INSTALLATION OF APACHE WEB SERVER

ApachewebserverisdistributedwiththeCDS/ISISofficialCDin.Toinstall Apache insert the CD when you get the auto run screen (Fig. 01) click on this icon and go to folder cds-isis\internet\genisis\websrv.



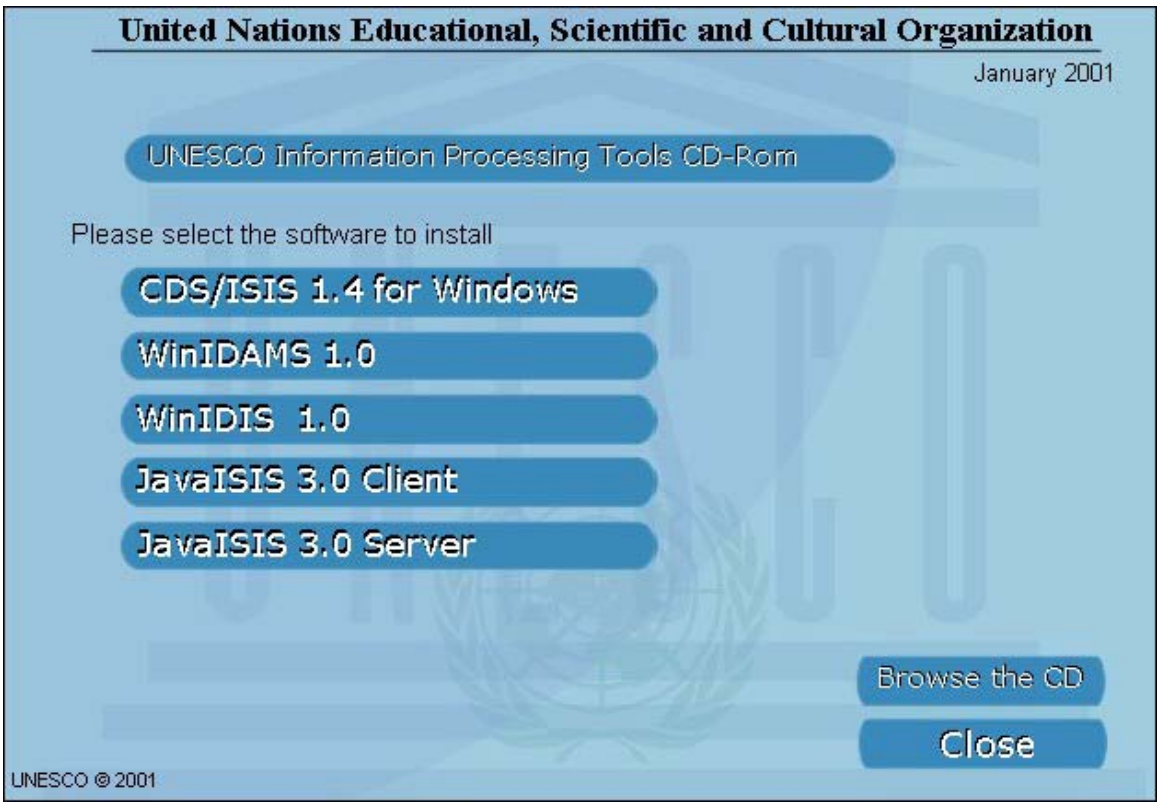
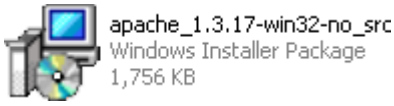


Fig.01

Then double click on 

andinstallationofApache will start.

Clickonnextbutton 

untilyougetthisscreen(Fig.02).

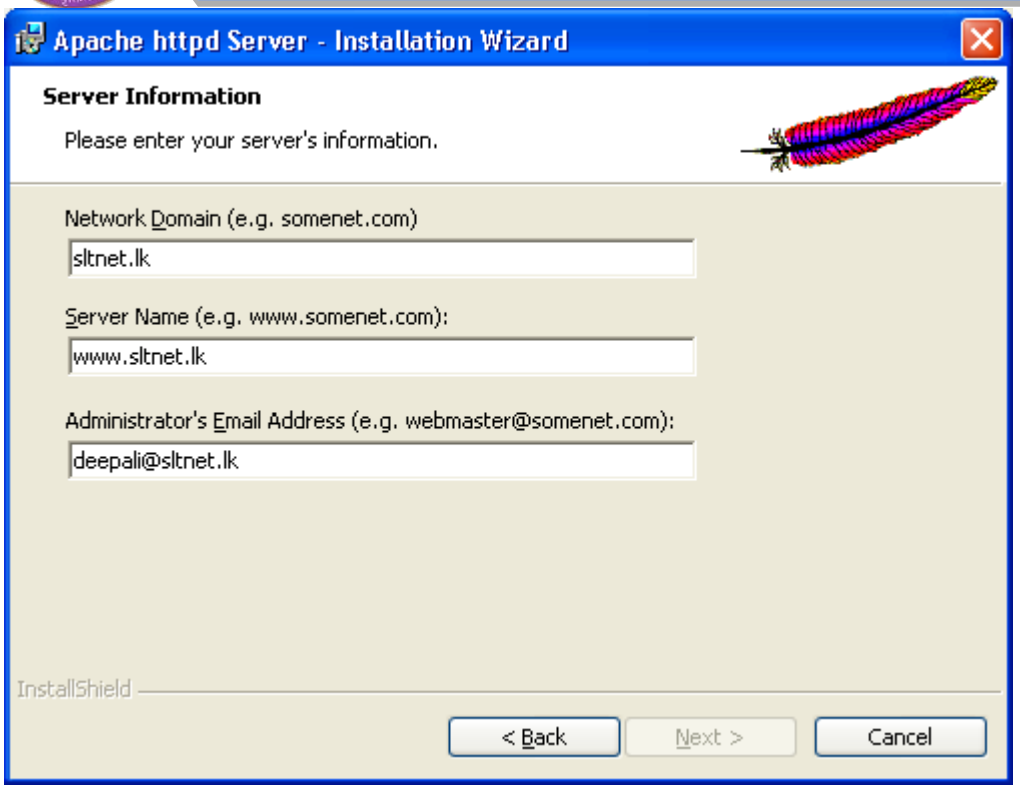


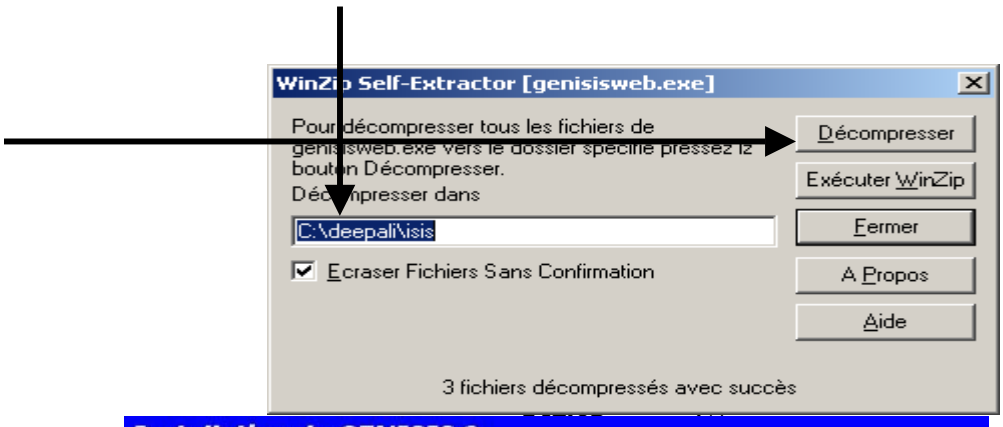
Fig.02

1.3 InstallationofGenISIS

WhenyoudownloadtheGenISISwebfilefromtheUNESCOwebsiteyou have to unzip this file.

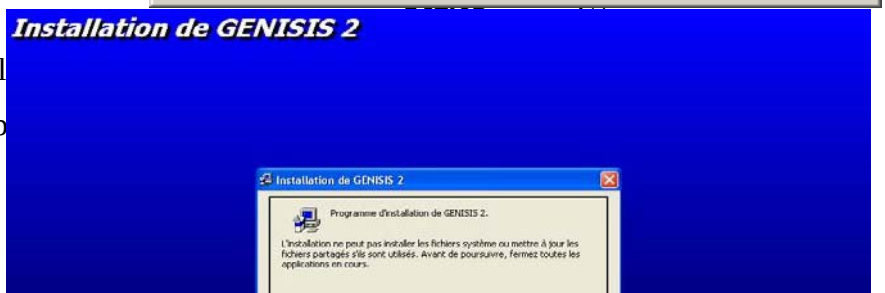
Doubleclickonitandgivethepathhere(fig.03)whereyouwanttocopy the files so that the file will be decompressed.

Click on the button "Decompresser"



Then you will get these three fil

ThentheinstallationforGenISISp



nGenISISstarts installation the first screenyouwillseeis this (Fig. 05).

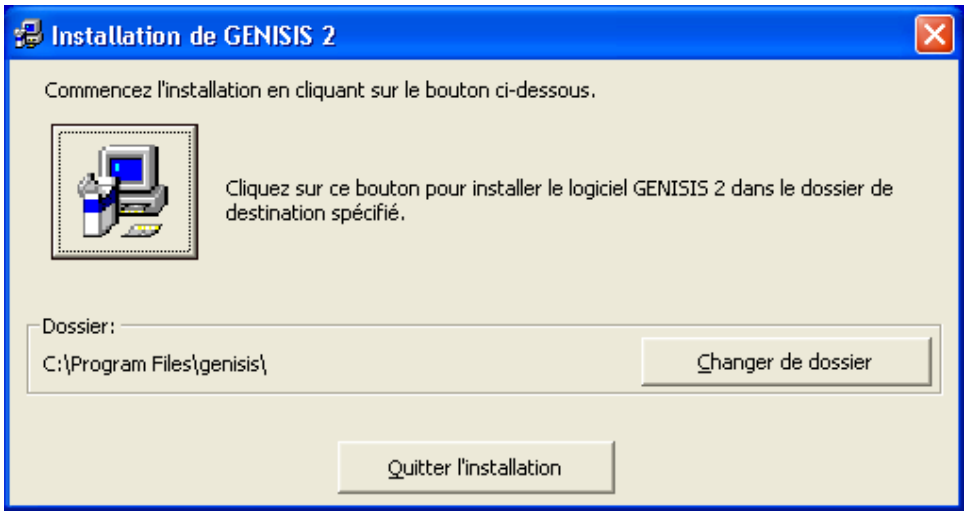
ClickonOK button

Fig

Fig.05

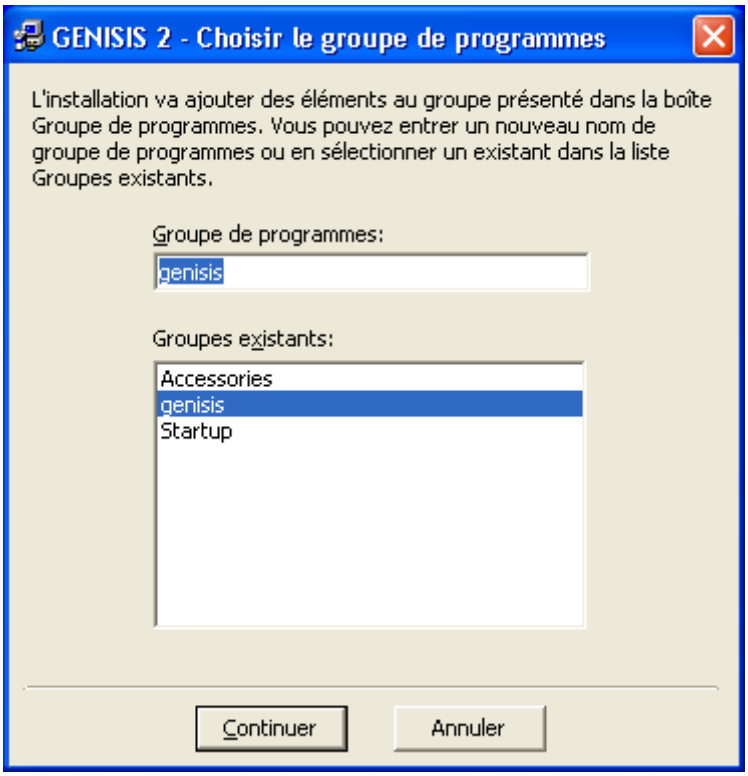
Then You will getthisscreen (Fig. 06).

Clickonthis button 



.

Then you will get this screen(Fig,07)Clickon the button 

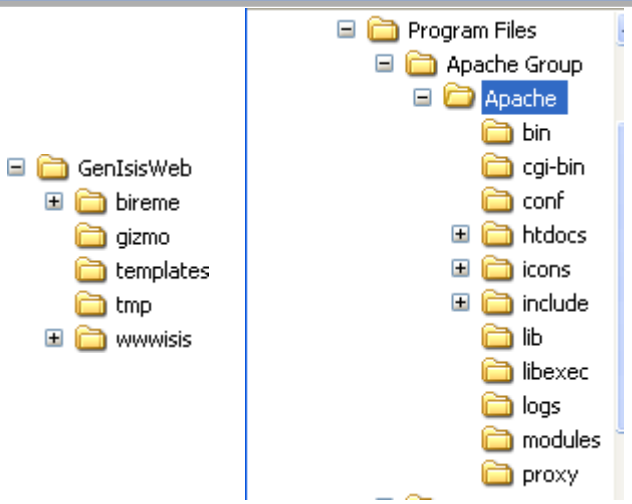


Finally you will get this.

Thenclickon**OK**button.

Atthispointyouhaveinstalled the web serve Apache and the GenISIS web interface.

ThefilestructuresofApache and GenISIS will be like this (**Fig.08**)



Beforeyoustart using theGenISISprogrammecopythefollowing files.

Copy the “wwwisis” folder in GenISIS to “htdocs” folder in “Apache”.

Copyallfilesinthe“bireme”folderin“GenISIS”tothe“cgi-bin”folderin Apache

1.4 STARTING APACHE WEB SERVER

Befor you start GenISIS you have to run the Apache web server.To start Apache Followthestepsshownbelow (Fig. 09).

ClickonSTART

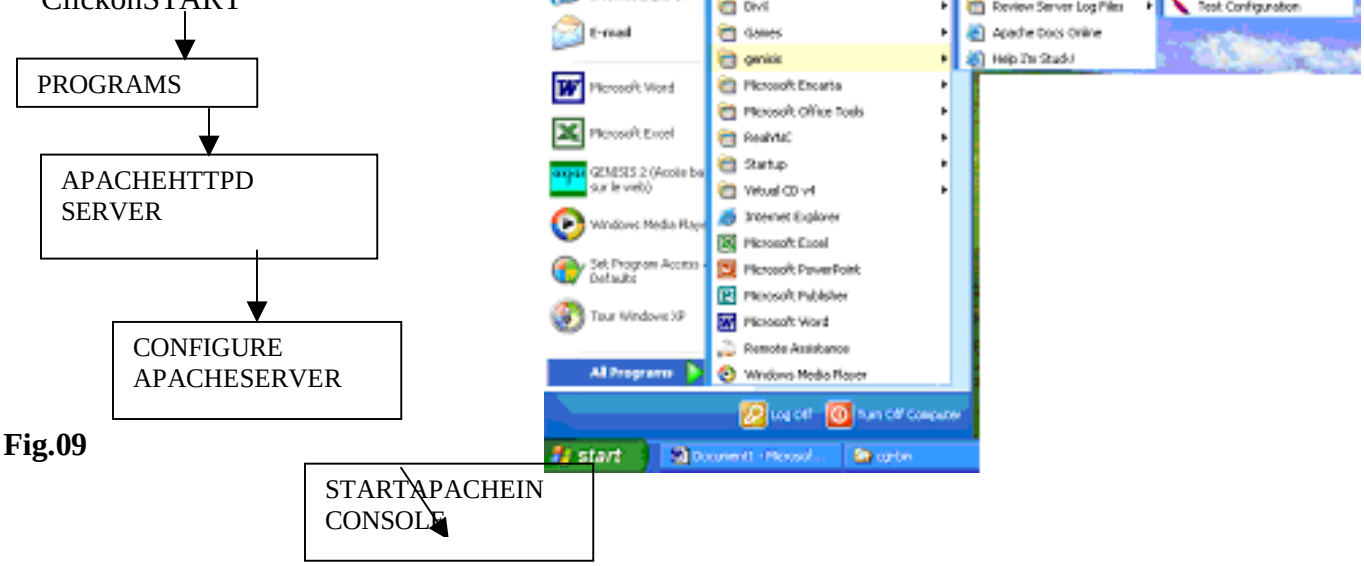
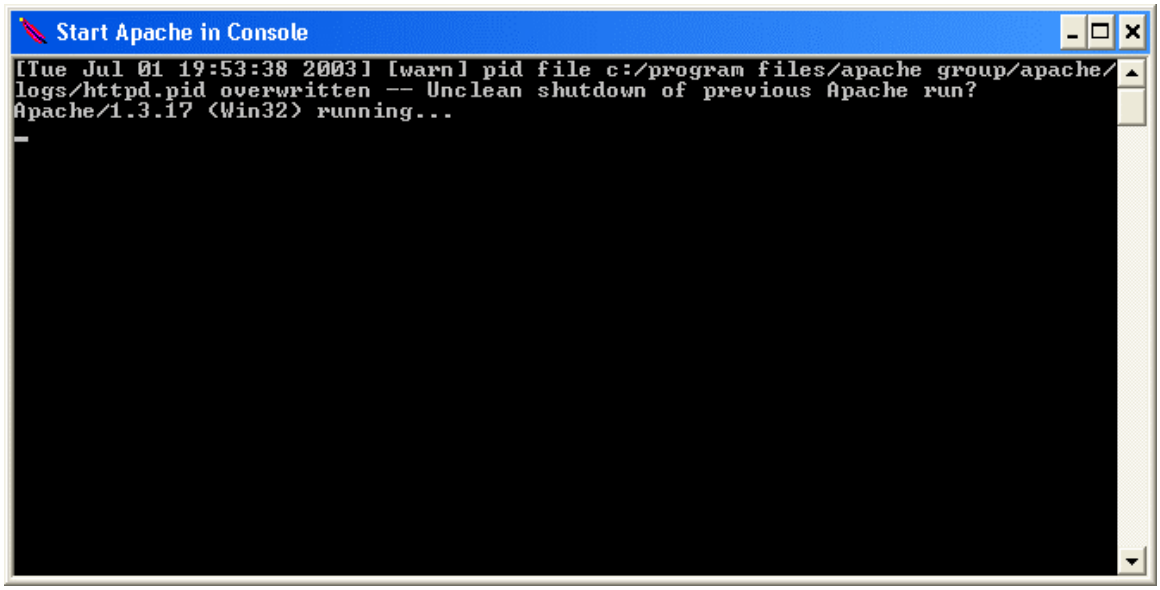


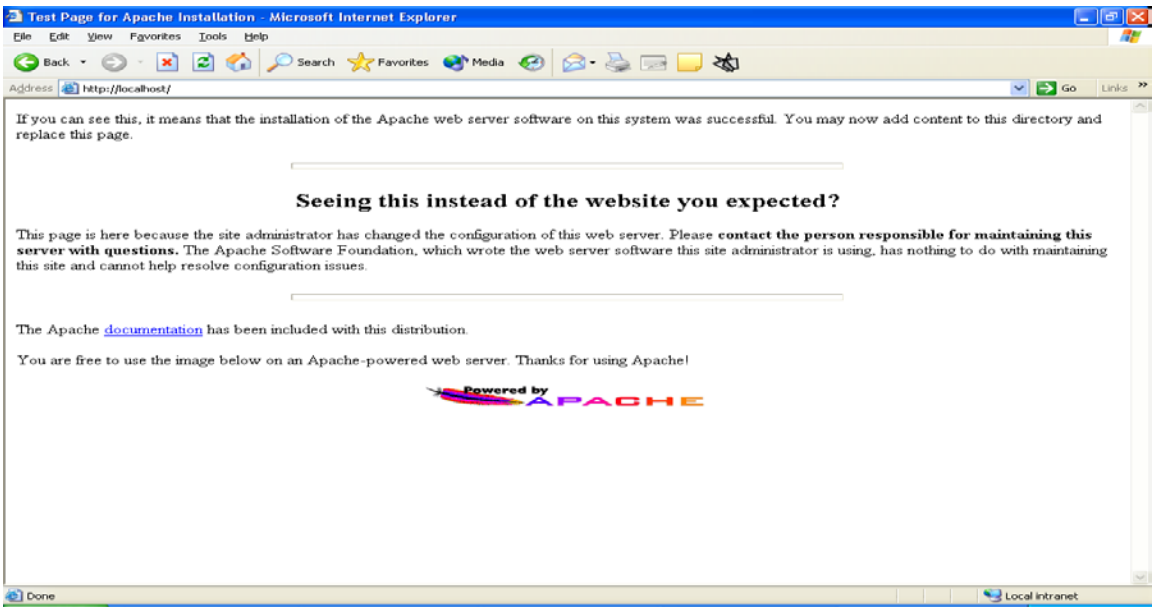
Fig.09

Whenapachestartsrunningyouwillgetthiswindow(Fig.10)Thenclickon the minimize button.



2 Fig.10

Then you can test to see if apache is running properly by opening any web browser.Open the web browser (Internet explorer/ Netscape) and type at theaddressbar“localhost”andyoushouldgetthefollowingscreen(Fig.11)



3 Fig.11

Nowyouarereadytodesignyourweb interface.

1.5 STARTING GenISIS

TostartGenISISfollowthestepsgivenbelow(Fig.12)oryoucanalso create a shortcut on the desktop.

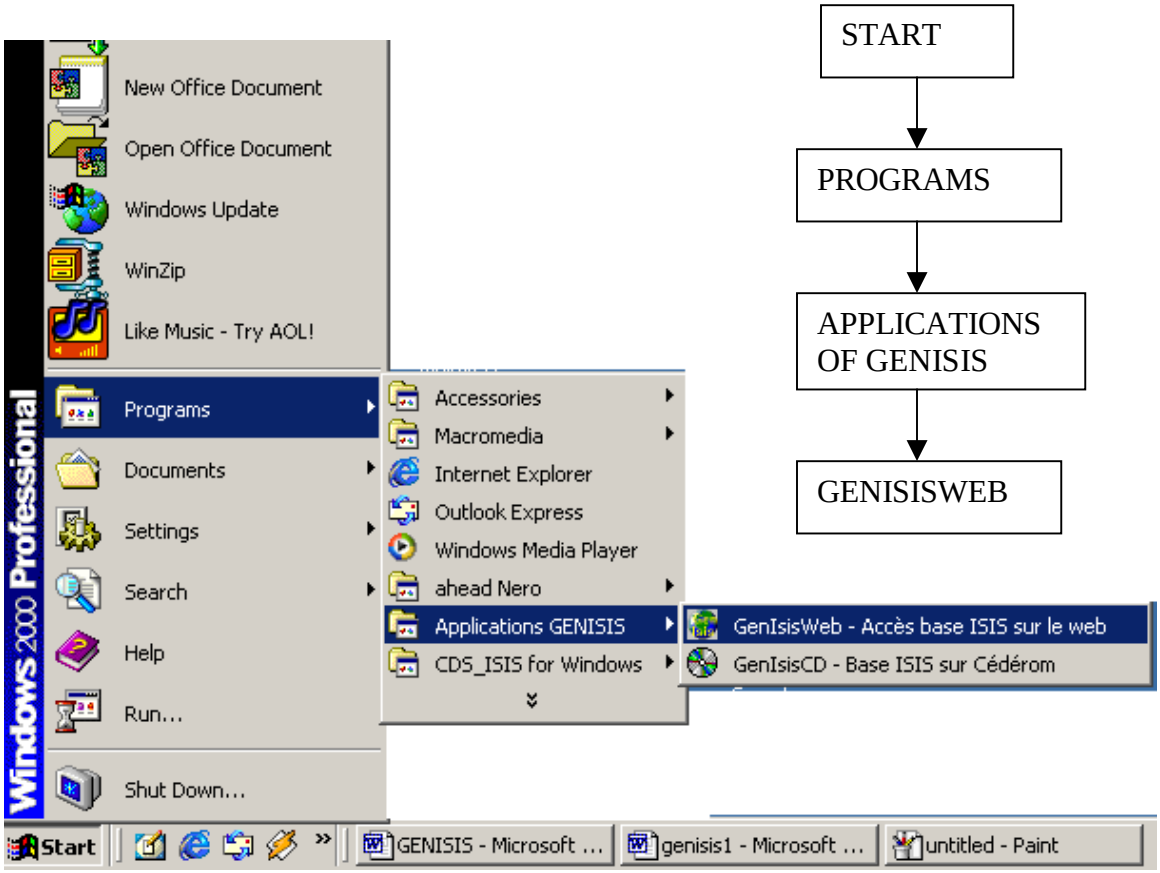


Fig.12

Thenyouwillgetthefollowingscreen(Fig.13).Selectthe option

Subfolder"wwwisis"in"DocumentRoot"

Clickhereto select the language

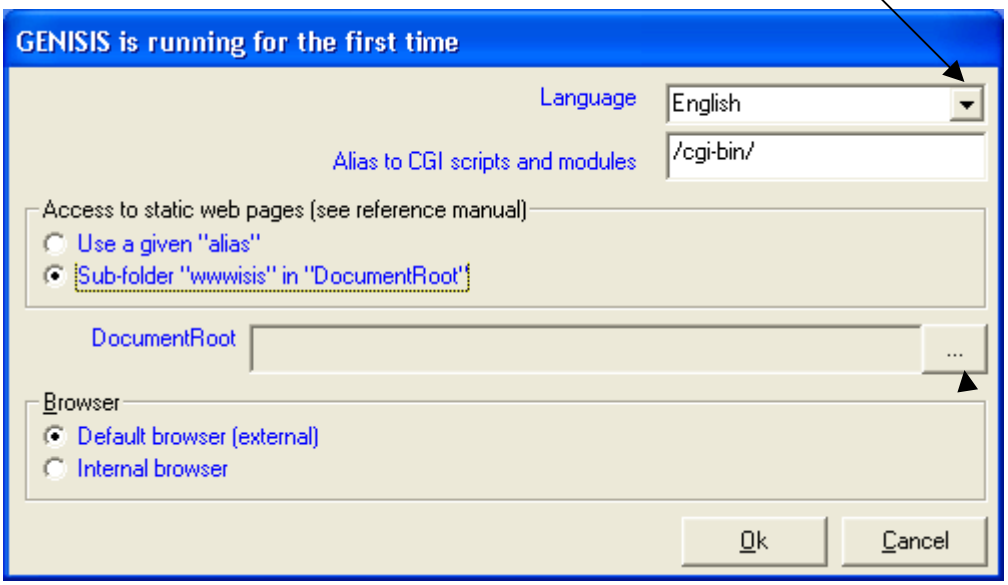


Fig13

WhenyouClickhereyou will get the dialogue box (Fig14)

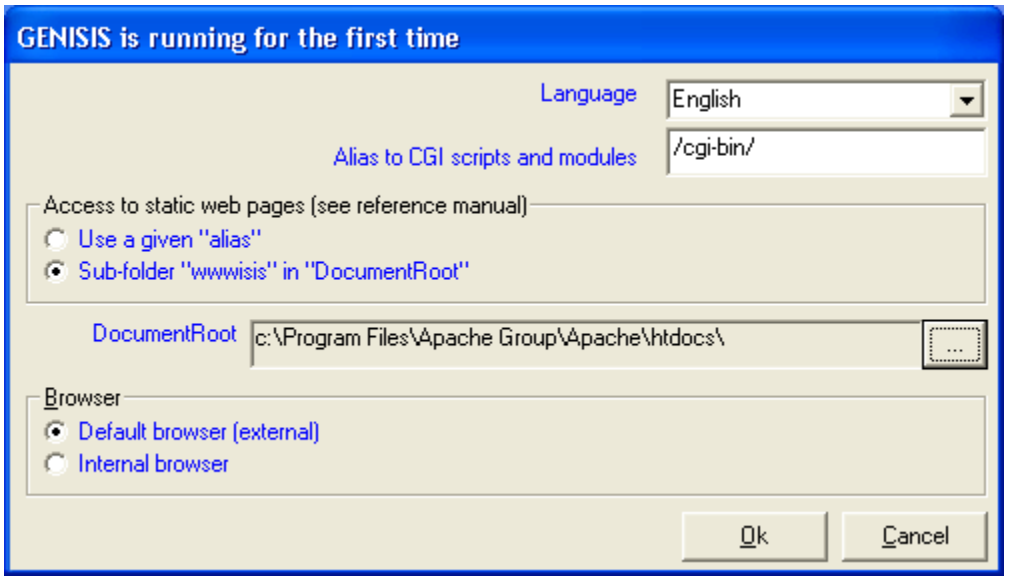
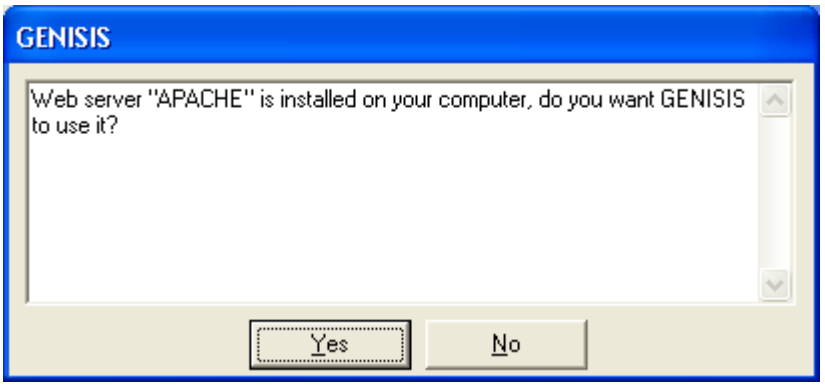


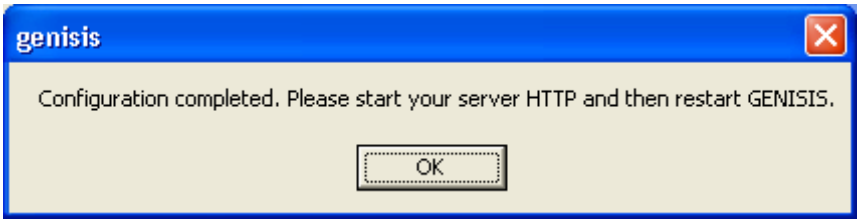
Fig14

Thenyouwillgetthismessage(Fig.15)



4 Fig15

ClickonYESandyouwillgetthemessage(Fig.16)



5 Fig.16

Thenclickon**OK**andyouwillgetthismessage(Fig.17)andclickon**OK** .

Fig.17

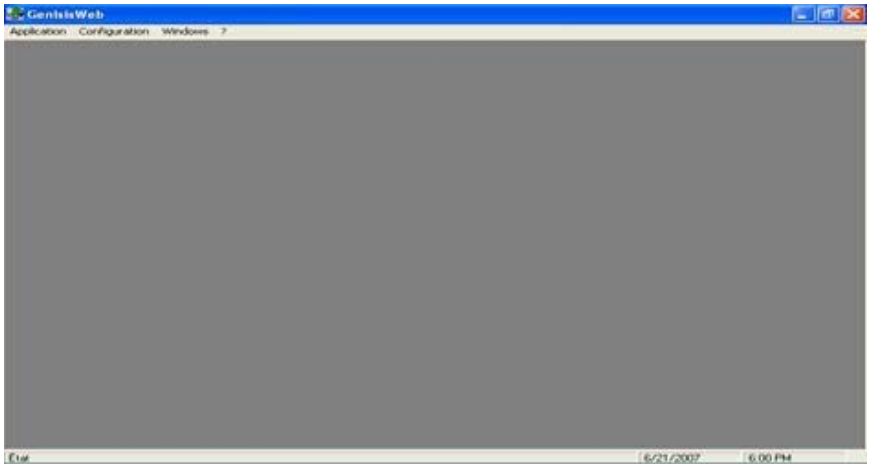


Figure7:GenIsis WebFirstPage

Click on the tab "**APPLICATION"** and you will getadropdownmenu.

On the dropdown menu click on **NEW** and you willget the below dialog box where you have to select anexistingWinIsis database.

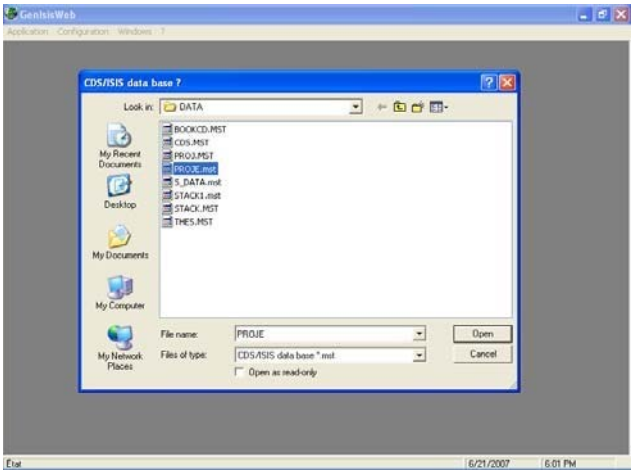


Figure8:Databaseselection

Selectthedatabasei.e.(PROJE.MST)andclickOPEN button, you will get the following message"Please assign a name to the application CDS.01:"here you have to give a name for your application.Heregaveourinstitutenamesuchas"BIMSLIBRARYPROJECTREPORTS"andclickOK button.Thenyouwillviewthewindowwiththreeforms,theyare

- Queryform
- FormatListing
- Formatdetails

Queryform:allowsyoutodesignthequeryforwithfieldselectionandaccess toIndexes.

***Format 'listing'**: allows you to design a short displayformatfromwhichtheuserscanselectforthedetaileddisplay.*

Format'details':allowsyoutodesignadetaileddisplayformat.

Designing the query form

To design the query form you have to add fields. Click on "ADD" button at the bottom of the query form (Fig. 19). Then you will get this window (Fig.) titled 'ITEMS ON THE QUERY FORM'. The items you see on the left panel are those indexed in your database, i.e. which are included in the FST and one field including all fields.

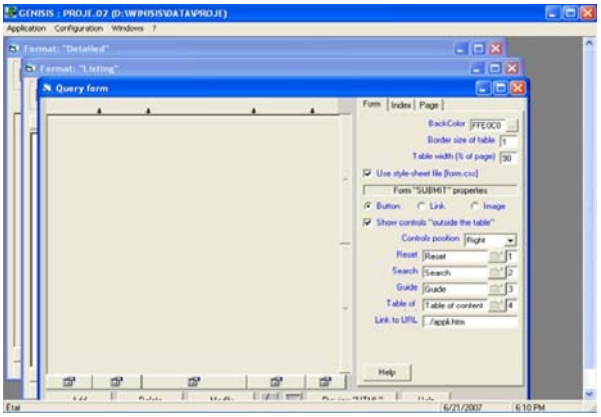


Figure9:QueryForm

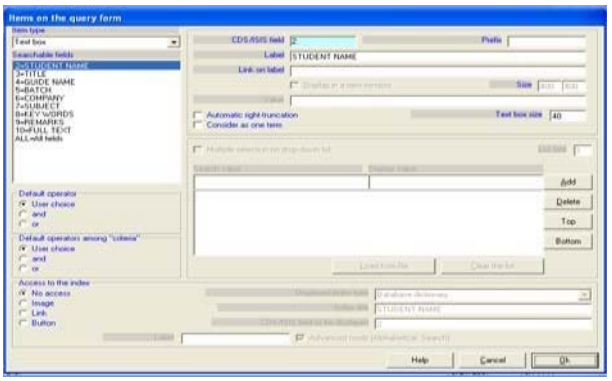
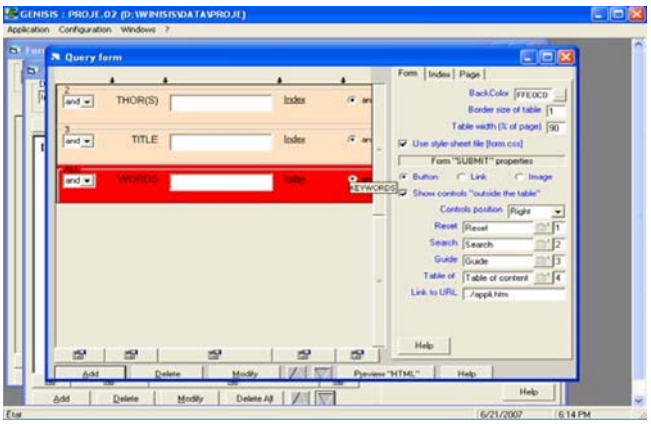


Figure10:Designingthequeryform

On the left panel below you are given options to select the operators and the access to index. Here you can select three different ways of displaying the link to index.

On the right side also you can select whatever options you would like to have. Here you can select "AUTOMATIC TRUNCATION" without using the $ sign.

Once you select these options click on "OK" button and you will get this window (Fig.11).



F*igure11:QueryForm*

There are three tabs on the right side of this window they are FORM, INDEX AND PAGE. By licking on any of these it will allow you to format these pages. If you click on "PAGE" tab the right side ofthe window will change as given below. Here you can select how many records to be displayedafter

searching. You can also select the background colors. And you can give the name that youwant to appear in the front page of the display window. Once you finish designing the query form ou can test it.

Click on APPLICATION on the menu bar and click on save on the dropdown menu. Then you willget this message "APPLICATION CDS.O4 SAVED" then click on OK.Again click on "APPLICATION"on the menu bar and click on "CREATE APPLICATION" on the dropdown menu. You will get the GENISIS screen, in that screen.

Click on 'yes' and your web browser will open automatically and the query form will open it is shown in the following figure

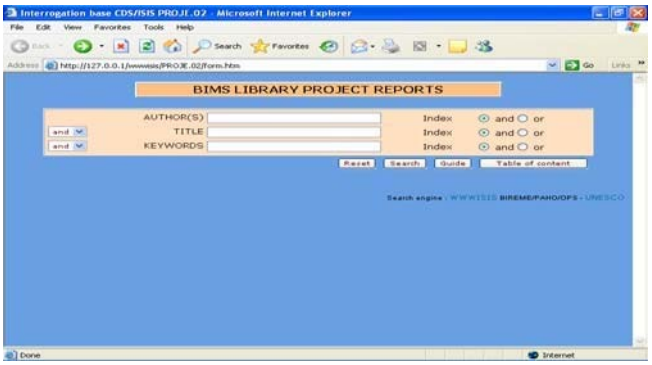


Figure 12: Display of Query Form

Now you can open the index by clicking on the link to index and you select terms from the index and click on "SEARCH" button. You will get the search results as shown in the figure

Figure13:SearchResults

7 Designing the display formats

First you have to design the short display, which will allow the users to select records for detailed display. Click on the "Format listing" window. Then you will get the default form Click on "ADD" button at the bottom and you will get a form similar to a worksheet in WinIsis (Fig.14)

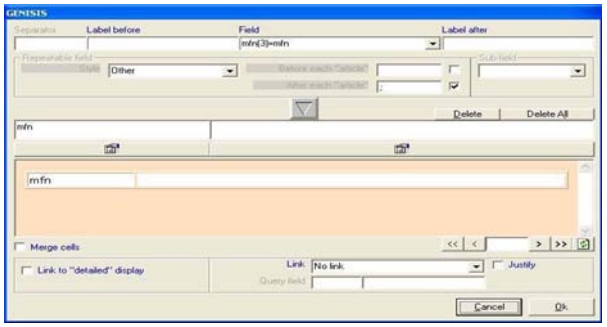


Figure 14: Designing the display formats

Here you can select two or three fields to be displayed in the short display and one filed should be linked to the detailed display, so that the users can see the detailed display of each record by clicking on this link.

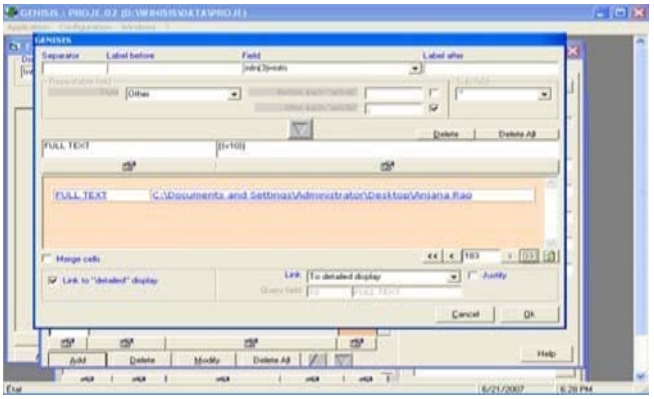


Figure:15-ShortDisplay

After entering the field for short display. Click on OK button, here I have selected FULL TEXT field for short display of Project Reports.

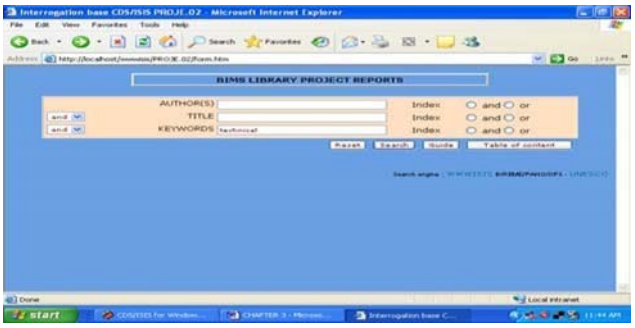


Figure16:Webqueryform

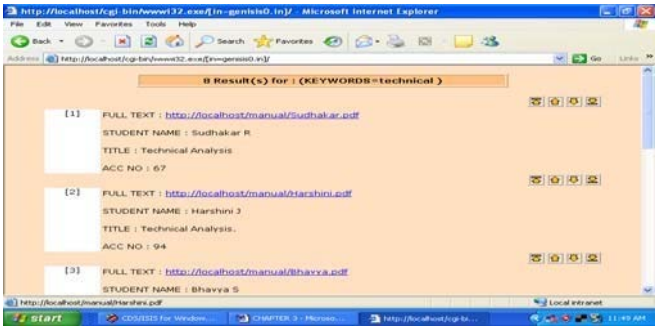


Figure17:Shortdisplayontheweb

After you design this if you are on an intranet you can allow the others to search on the database by providing your IP address. You also can export this database and web interface to a server on

another computer.So, in this way we can use the GenIsisWeb software to access the digital archives stored in the WINISIS bibliographical database.

UNIT-IV-ONLINE AND OFFLINE SEARCHING

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STRUCTURE

1.1 Web Searching
1.2 Quality of Web search engines
1.3 Advanced Internet Searching
1.4 Search through Meta Search Engines
1.5 Internet and E-mail

1.1 Web Searching

The purpose of a search engine is to extract requested information from the huge database of resources available on the internet. Search engines become an important day to day tool for finding the required information without knowing where exactly it is stored. Internet usage has been tremendously increased in recent days with the easy to use search engines like Google, Bing and Yahoo! There are different types of search engines to get the information you are looking for. In this article, we will explain different types of search engines and purpose of them.

Search engines are part of daily life for two types of people.Users who search and get informationSite owners who try to optimize their websites for getting top rank in the search results.User do more than billions of searches only on Google to find relevant information. This opens out a huge scope for businesses and online content publishers to attract people to their website for free. Search engines follow guidelines and have their own algorithm to decide the ranking of websites in search results. Optimizing websites for Google and other search engines is an essential part of any website owner for reaching out the large audience. The visitors can generate revenue for site owners either through advertisements displayed on the site or though purchasing products.

Types of Search Engines

Search engines are classified into the following three categories based on how it works.

- Crawler based search engines
- Human powered directories
- Hybrid search engines
- Other special search engines

1. Crawler Based Search Engines

All crawler-based search engines use a crawler or bot or spider for crawling and indexing new content to the search database. There are four basic steps, all crawler-based search engines follow before displaying any sites in the search results.

- Crawling
- Indexing
- Calculating Relevancy
- Retrieving the Result

1.1. Crawling

Search engines crawl the whole web to fetch the web pages available. A piece of software called crawler or bot or spider, performs the crawling of the entire web. The crawling frequency depends on the search engine and it may take few days between crawls. This is the reason sometimes you can see your old or deleted page content is showing in the

search results. The search results will show the new updated content, once the search engines crawl your site again.

1.2. Indexing

Indexing is next step after crawling which is a process of identifying the words and expressions that best describe the page. The identified words are referred as keywords and the page is assigned to the identified keywords. Sometimes when the crawler does not understand the meaning of your page, your site may rank lower on the search results. Here you need to optimize your pages for search engine crawlers to make sure the content is easily understandable. Once the crawlers pickup correct keywords your page will be assigned to those keywords and rank high on search results.

1.3. Calculating Relevancy

Search engine compares the search string in the search request with the indexed pages from the database. Since it is likely that more than one page contains the search string, search engine starts calculating the relevancy of each of the pages in its index with the search string.

There are various algorithms to calculate relevancy. Each of these algorithms has different relative weights for common factors like keyword density, links, or meta tags. That is why different search engines give different search results pages for the same search string. It is a known fact that all major search engines periodically change their algorithms. If you want to keep your site at the top, you also need to adapt your pages to the latest changes. This is one reason to devote permanent efforts to SEO, if you like to be at the top.

1.4. Retrieving Results

The last step in search engines' activity is retrieving the results. Basically, it is simply displaying them in the browser in an order. Search engines sort the endless pages of search results in the order of most relevant to the least relevant sites.

Examples of Crawler Based Search Engines

Most of the popular search engines are crawler based search engines and use the above technology to display search results. Example of crawler based search engines:

Google

Bing

Yahoo!

Baidu

Yandex

Besides these popular search engines there are many other crawler based search engines available like DuckDuckGo, AOL and Ask.

2. Human Powered Directories

Human powered directories also referred as open directory system depends on human based activities for listings. Below is how the indexing in human powered directories work:

Site owner submits a short description of the site to the directory along with category it is to be listed.

Submitted site is then manually reviewed and added in the appropriate category or rejected for listing.

Keywords entered in a search box will be matched with the description of the sites. This means the changes made to the content of a web pages are not taken into consideration as it is only the description that matters.

A good site with good content is more likely to be reviewed for free compared to a site with poor content.

Yahoo! Directory and DMOZ were perfect examples of human powered directories. Unfortunately, automated search engines like Google, wiped out all those human powered directory style search engines out of the web.

3. Hybrid Search Engines

Hybrid Search Engines use both crawler based and manual indexing for listing the sites in search results. Most of the crawler based search engines like Google basically uses crawlers as a primary mechanism and human powered directories as secondary mechanism. For example, Google may take the description of a webpage from human powered directories and show in the search results. As human powered directories are disappearing, hybrid types are becoming more and more crawler based search engines.

But still there are manual filtering of search result happens to remove the copied and spammy sites. When a site is being identified for spammy activities, the website owner needs to take corrective action and resubmit the site to search engines. The experts do manual review of the submitted site before including it again in the search results. In this

manner though the crawlers control the processes, the control is manual to monitor and show the search results naturally.

4. Other Types of Search Engines

Besides the above three major types, search engines can be classified into many other categories depending upon the usage. Below are some of the examples:

Search engines have different types of bots for exclusively displaying images, videos, news, products and local listings. For example, Google News page can be used to search only news from different newspapers.

Some of the search engines like Dogpile collects meta information of the pages from other search engines and directories to display in the search results. This type of search engines are called metasearch engines.

Semantic search engines like Swoogle provide accurate search results on specific area by understanding the contextual meaning of the search queries.

1.2 Quality of Web Search Engine

It was shown that there are many factors that together determine the quality of a Websearch engine. But usually, the quality of information retrieval systems in general and search enginesin particular is measured only with retrieval tests. These take into account standard measures like recalland precision but omit other factors that are not relevant in traditional information retrieval.

To consider the specific characteristics of Web information retrieval, apart from the standard measures,tests should also take into account the index quality, the search features (which vary strongly, the retrieval system and the user behaviour.The index quality of a certain search engine is a combination of the size of the database, its up-to-dateness, the indexing depth, and hopefully low indexing bias, e.g. bias in the coverage of documentsfrom different countries. It should also be kept in mind that search engines offer additionaldatabases, e.g. for pictures, audio files, and special news databases [19]. These special collections arevaluable additions to the Web document.Advanced search features are often regarded as not so important because only a relatively low fractionof users avail them. But for the professional use of the search engines, they are indispensableand should therefore be taken into account when discussing the quality of search engines.Surely, the retrieval system as the core of each engine should be tested in studies discussing quality. Inaddition to traditional retrieval measures, extended measures specifically for search engines should be developed and used.

And last, the user behaviour should be the centre of attention of search engine quality studies. Although there have been some studies on this topic, research should be extended, becausealthough we know a lot about the general user, we do not know much about certain

user groups, such ashow information professionals or members of a certain occupational group use – or would like to use –search engines.

Use of the below listed Seach for the Websearch engines

basic online retrieval

feature, advanced online retrieval feature and unique online retrieval feature. The details

are given below.

Basic Web Search

1. Easy Entering a search;

2. Navigation within the results list;

3. Link to “related Internet site and links”;

4. Finding the relevance rating for each article;

Calculate the relevance and precision of a single web search engines.

1.3 ADVANCE INTERNET SEARCHING

The techniques explained in this page will help you become the fast, effective searcher you really need to be as a distance learning student relying on online information sources. Not all the techniques covered here will be supported by all databases - you are advised to look at the help pages as you learn to use a new database since that will save you a lot of time and frustration.

Boolean Searching

What is Boolean Searching?

Most searches will return too many or too few records. It takes a long time to look at hundreds of records. By putting a little effort into constructing search strings (what you type into the search box) you can save a lot of time. The database can do a lot of work for you if you take the trouble to add a little sophistication to your search strings.

To do this with databases you need to know about the Boolean system. By the use of a few simple linking words, called operators, you can make your searches much more precise.

Narrowing Searches

If your search returns too many records, you can narrow your search by adding more search terms. To make sure that all the records your search finds contain all the search terms, link them with the and operator. For example, let's say you were interested in only red cars. To avoid having to sift through records on blue cars, green cars and so on, you would use the following search string:

'red and cars'

If you do not wish to see records containing a certain term, you can exclude these by using the not operator. Be careful when using this, you may miss records that contain useful information because you have excluded too many records. With many databases you will need to use and not rather than not, check the help pages of the database if you are not sure. If you were interested in cars of any colour as long as they are not blue, you would use the following search string:

'cars not blue'

Broadening Searches

If your search returns few or no records, you might have more success if you can think of alternative search terms. This can include:

other terms related to your topic

synonyms (words with the same meaning)

different word endings (singular and plural forms, for example)

different spellings (UK versus US spelling, for example)

To search for records that return one or more of your search terms, link them together with the or operator. For example, cars are also known as automobiles and so to catch as many relevant records in your search as possible, you would use:

'cars or automobiles'

Proximity, Truncation and Wild Cards

The power of Boolean searching can be extended further by proximity, truncation and wild card operators. Proximity searching allows you to specify that records found by your search contain one search term near another. If, for example, you are interested in red cars, a search string such as

'red and cars'

may return irrelevant records because red is a very general adjective and could describe many other things in a record. The near operator requires that a record has terms close together in the text, making it more likely that there is a meaningful link between the terms in the record. Therefore one would use the search string:

'red near cars'

The syntax used for truncation varies amongst databases; e.g. sometimes next is used rather then near - you should check the databases' help pages to find out if and how proximity can be used.

Truncation allows you to search for all the variants of a word without having to specify them all in your search string. It is very useful to take into account plural and singular forms of a noun. For example,

'car*'

asks the computer to search for both car and cars, or any word beginning with car such as carriage or carburettor. So, as with the not operator you have to be careful when using this operator or you may get a lot of irrelevant records. Think about how many words might start with a root such as car before using truncation. If you simply wish to include both the singular and the plural forms of a noun in your search you might be better off using the or operator:

'car or cars'

As for proximity, the syntax used for truncation varies amongst databases- you should check the databases' help pages to find out if and how truncation can be used.

Wildcards are rather like truncation, but rather than allowing for variation at the end of a word, it allows for variation in a character in the middle of a word. Wild cards are especially useful for taking into account variations in spelling. For example, many words can be spelt with an s or a z, e.g. realise/realize. You could use the or operator to get around this, but wild cards are much neater:

'reali*e'

In the example above, any character can appear between the i and e. Again, syntax can vary between databases, sometimes ? is used - check the help pages!

Putting it all together

Using Boolean operators it is possible to construct complex strings of search terms. To make sure the computer does exactly what you want it to, you need to use brackets (parenthesis) to make the structure of your search string clear. Let us continue with our example. We have decided that it would be best to use "car or cars" rather than to use truncation (car*). We also want to specify that the word red occurs near car or cars. You could use the search string:

'red near car or cars'

There is a danger that the database will return records that contain the terms red and car near one another, or contain the term cars - the link between red and cars we want might

be lost. Parenthesis avoids this. To make sure the database does exactly what we want, you would use the string:

'red near (car or cars)'

Whilst parenthesis is a powerful tool you have to take care in the order of terms in search strings. Lets say we are interested in red cars or red automobiles. You might construct the search string:

'automobile and (red or car)'

Unfortunately this will contain records containing the terms automobile and red, or the terms automobile and car, which is not quite what we want. The correct search string would be:

'red and (automobile or car)'

An incorrect search string is quite obvious when combining an adjective with nouns but with combinations purely of nouns you have to be more careful.

You can also use the below listed features for searching the web.

1. Boolean logic
2. Field specific searches
3. Have rules of precedence with nested queries
4. Limit field searches.
5. Matching of exact words/phrases
6. Phases Searching
7. Proximity search
8. Range searching
9. Save search
10. Search history
11. Stemming
12. Subject search
13. Truncation
14. Use of thesaurus or permuted index for searching
15. Wildcard

1.4 Search through Meta Search Engines

The Metasearch Engine is a search engine that combines the results of various search engines into one and gives one result. It can also be stated as an online information retrieval tool.

The Metasearch Engine was developed because individual search engines were prone to spams due to people trying to raise their website ranks online. The Search engine visits several websites and creates a database of these sites. This is also known as indexing. Any search engine answers several queries every second.

The metasearch engines run the queries on most other search engines and in turn reflect the result in the form of the summarization of such sites.

It was developed by Daniel Dreilinger at Colorado State University. He developed Search Savvy that searched 20 websites to give back one result.

MetaCrawler was developed by a student at the University of Washington named Erik Selberg. It was an advanced and updated version of the Search Savvy. It was not as good as the individual search engines.

In the year 1996, HotBot was created which was faster than its predecessors and could search within their engines' search results. It was later simplified to serve as a search interface built on the official site of Lycos.

The year 2000 saw HumHaiIndia.com which was India's first meta search engine that was developed by Sumeet Lamba. It was later called Taaza.com

Meta search Engine:Types

1. "Real" Meta search Engine

2. "Pseudo" Meta search Engine type I

3. "Pseudo" Meta search Engine type II

4. Search Utilities

"Real" Meta Search Engine

These "real" MSEs simultaneously search the major search engines, aggregate the results, eliminate the duplicates and return the most relevant matches.

a. Ez2Find (formerly ez2www) [http://Ez2Find.com/]

Searches the best SEs - AlltheWeb, Google, AltaVista, Teoma, Wisenut - and directories - Yahoo and Open Directory. Through its "Advanced Search" function it also searches a small part of the Invisible (Deep) Web. It also searches news, newsgroups, MP3, images and many, many more. Provides excellent results in a very neat interface.

b. Vivísimo [http://www.vivisimo.com/]

Uses the clustering technology, meaning matches are organized in folders. Don't like the frames? Just modify the size of both the upper and the left frames. This MSE was created by researchers at Carnegie-Mellon University. Advanced searching options available: exact phrase, Boolean operators, fields searching (domain, host, title, URL, etc.) and more..

c. InfoGrid [http://www.infogrid.com/]

Provides excellent results in an easy to read layout, despite a very confusing Home Page crowded and with frames. This MSE searches the 'big ones' including Google, AlltheWeb, Yahoo! and Open Directory. It also searches newswires, auctions, discussion forums, MP3, FTP files and more.

d. Infonetware [http://www.infonetware.com/]

Searches the Web and provides relevant results, organized in topics, in a very clean interface. This MSE is based in Edinburgh, Scotland .

e. IBoogie [http://www.iboogie.com/]

Uses a minimalist design. This MSE "performs intelligent clustering of results". It searches the Web, the Invisible (Deep) Web, images, video and audio files.

f. Metaseek [http://www.pcdigest.net/metasearch/en/main.shtml]

Excellent MSE from Ukraine. Searches major international and local search engines. Besides the Web you can search images, MP3, FTP files, news and more. You can use "Phrase" (""), "natural language" processing, Boolean logic and field searching (by URL, title, site/domain or link). .

g. Fazzle [http://www.fazzle.com/]

Uses an excellent selection of search engines and directories. This MSE provides relevant results in a relatively crowded interface. For each result you can see the search engine where the hit was found, and its ranking.

h. Query Server [http://www.queryserver.com/web.htm]

Searches an impressive list of 11 SEs - everything important except Google. But don't worry: Query Server searches Yahoo!, Netscape and AOL, all partially powered by Google. This is another example of the clustering technology. Highly customizable metasearch tool.

i. Vinden.NL [http://www.vinden.nl/]

Searches "the best," providing very good results in a clean interface.

j. Meta Bear [http://www.metabear.com/]

Provides relevant results from both international and Russian sites.

k. Web Scout [http://www.webscout.com/]

Searches the Web, news, newsgroups, auctions, MP3 files and jobs.

l. Experts Avenue [http://www.expertsavenue.com/]

Searches different search engines simultaneously for Web pages, auctions, jobs and forums and provides very relevant results in a neat interface. Enables online language translation of Web pages.

m. Suchspider. de [http://www.suchspider.de/meta-suchmaschinen/]

Searches a whopping 100 (!) international SEs and WDs. Google, AlltheWeb, Open Directory, you name it. You can sort the results by relevance, source or - much better - grouped by domain name.

n. EmailPinoy [http://www.emailpinoy.com/]

Sends your query to 15 search engines. Don't use Kanoodle, ah_ha.com and GoClick pay-per-click search engines, because you'll get irrelevant results. For better results enclose phrases in quotation marks. .

o. 1 SECOND [http://www.1second.com/]

Searches a good selection of 14 major SEs and WDs, throws out the duplicates and summarizes the results in a neat listings page. Use the Advanced Search if you want to customize the search, especially the timeout of the search engines.

p. My Prowler [http://www.myprowler.com/]

Searches over a dozen search engines, news, images, audio/MP3, music videos, auctions and various other sites.

q. Gimenei [http:// www.gimenei.com/]

Use of the "Advanced Search" option is strongly recommended. You can customize the results page, including my favorite option, "All Results" in one page.

r. Search 66 [http://www.search66.com/]

Groups together pages from the same domain. Beautiful. To avoid SEs timeouts, select the "Speed": "Comprehensive." Obviously, you'll get more results from this excellent Australian MSE .

(a) Internav [http://www.internav.com/]

(b) NetXplorer [http://www.netxplorer.de/]

(c) Metengine [http://www.metengine.com/]

(d) One2Seek [http://www.one2seek.com/]

(e) Ithaki [http://www.ithaki.net/]

(f) Fossick [http://www.fossick.com/Search.htm]

(g) Pandia [http://www.pandia.com/powersearch/index.html]

(h) meta EUREKA [http://www.metaeureka.com/

(i) Widow [http://www.widow.com/]

(j) Meta 360 [http://www.meta360.com/]

(k) 7 Meta Search [http://www.7metasearch.com/]

(l) Metor [http://www.metor.com/]

(m) Ixquick [http://www.ixquick.com/]

Unimpressive meta search engines

The following is a list of some unimpressive meta search engines. These MSEs do not provide the breadth of coverage offered by the sites recommended above. Each of these has its own flawed characteristics, but generally they are old and have not kept up with the latest capabilities or they suffer from too many functional problems

(a) Metacrawler [http://www.metacrawler.com/]

(b) Dogpile [http://www.dogpile.com/]

(c) Mamma [http://www.mamma.com/]

(d) Pro Fusion [http://www.profusion.com/],

(e) Bytedog [http://www.bytedog.com/]

(f) il motore [http://www.ilmotore.com/]

(g) METASEEK.NL [http://www.metaseek.nl/]

(h) ApocalX [http://www.search.apocalx.com/])

The type I “Pseudo” Meta Search Engine

It sends the query to the search engines, and then presents the results grouped by search engine in one long, easy to read scrollable list. The best MSEs in this category are:

(a) Mall Agent [http://www.mallagent.com/web.html]

(b) qb Search [http://www.qbsearch.com/]

(c) Better Brain [http://www.betterbrain.com/] My Net Crawler [http://www.mynetcrawler.com/]

(d) NBCi [http://www.nbci.msnbc.com/]

(e) Planet Search (Sherlock Hound) [http://www.planetsearch.com/]

(f) Rede Search [http://www.redesearch.com/] 1 BLINK [http://www.1blink.com/]

(g) Search Wiz [http://www.searchwiz.com/]Search Fido [http://www.searchfido.com/

"Pseudo" Meta Search Engines Type II

There are two types of Type II "Pseudo" MSEs: a) You type your query one time and then select the search engines. One browser window will open for each SE selected. The best are:

(a) Multi-Search-Engine.com [http://www.multi-search-engine.com/]
(b) GoGettem [http://www.gogettem.com/]
(c) Search Bridge [http://www.searchbridge.com/]
(d) The Info [http://www.theinfo.com/]
(e) Net Depot [http://www.netdepot.org/]

The best of this type are:

(a) Alpha Seek [http://www.alfaseek.com/]

(b) Westlaser [http://www.westlaser.com/]

(c) Dan's No Overhead Search Thingy [http://www.danielc.com/thingy.html]

(d) Express Find [http://www.expressfind.com/]

(e) Freeality [http://www.freeality.com/meta.htm].

Search Utilities

These are downloadable meta search tools that search multiple search engines. Results are collated and ranked for relevancy with redundancies removed. They are not free but most of them have a free trial version available. Example

(a) Copernic [http://www.copernic.com/en/index.html]

(b) Arrow Search [http://www.rt-software.co.uk/arrow_search/]

(c) SearchRocket [http://www.searchrocket.com/]

(d) WebFerret [http://www.ferretsoft.com/index.html].

The Big Four Meta Search Engines

Dogpile

It is designed as a mainstream consumer site, with a simple presentation. Results are grouped by provider, typically with Overture and FindWhat results presented first. This presentation makes it easy to compare and contrast results from different search engines for the same query, and is one of Dogpile's most useful features.Dogpile offers no advanced search capabilities, though you can limit your search to Web search; Images from Ditto and Fast Image; Audio/MP3 from Astraweb, Fast Audio and MP3Board; Files from Fast FTP; News from Dogpile Newscrawler and Fast News; or Multimedia files from

Fast.You can also select, to an extent, which search engine results you want to be displayed first, or not displayed at all, using the "custom search" form.

Metacrawler

"Metacrawler is a hardcore site for the sophisticated searcher," said InfoSpace's Baur. Unlike Dogpile's approach of presenting results grouped by their original source, Metacrawler blends results based on relevancy and performance. Speed is emphasized — if a particular engine isn't processing a query quickly, its results won't be included in your Metacrawler results. The source of each result is clearly labeled. This lets you see that a particular result came from several search engines, or perhaps just a single one. Seeing the attribution displayed like this offers clues that can help you decide whether to click through to the underlying page or not. For example, if a particular result is attributed to Fast, the Open Directory, and Find What, you can be relatively confident that it's an authoritative site that they've all "agreed" is a highly relevant match for your query.

Excite and Webcrawler

When InfoSpace purchased Excite and Webcrawler, the intention was to keep the user experience as similar as possible to those provided by Excite, primarily to maintain the high traffic levels enjoyed by each site. To a large extent, the company has succeeded in its goal. Excite still offers most of the portal features that have long made it an appealing start page, such as news, stock quotes and so on. Webcrawler still has its clean, simple look.What's changed, though, is the underlying search engine for both properties. Search results for both are now blended metasearch results, similar to Metacrawler results. Neither Excite nor Webcrawler offer Metacrawler's advanced customization features, though you can limit your search to the web, news or photos.Results are identical for both properties, with one key exception: Webcrawler results are ad-free, apart from the links served by Overture, FindWhat and Ah-Ha. No banners; no annoying pop-ups. Of course, you don't have access to the personalization features offered by Excite, but the ad-free environment is refreshing.Bottom

Other Meta Search Engines

(a) C4http://www.c4.com

C4 allows meta searching against several major search engines.

(b) IcySpicyhttp://www.icyspicy.com/

IcySpicy is both a meta search engine offering results from Google, Overture, MSN, WiseNut,

FindWhat, etc., and a collection of useful directory links and search forms for package tracking,

movie locations, and so on.

(c) Moonmist http://www.moonmist.info/index.asp

Moonmist allows you to do a general or country specific meta search. Results include links to site info and a link to the Wayback machine's archived copies of the underlying result page.

(d) Searchy.co.uk http://www.Searchy.co.uk

Searches 15 U.K. engines. The advanced search form allows you to change the order that results

are presented, either by speed or manually to suit your own preferences.

(e) TeRespondo http://sl.terespondo.com

Spanish metacrawler that searches on the more popular search engines. Motor de busqueda que

buscatu consulta enlosbuscadores mas popularesenespanol.

(f) Turbo10 http://turbo10.com/

Turbo10 is a metasearch Engine accesses both traditional web search engines and some invisible web databases, with a very speedy interface.

(g) **Watson for the Macintosh http://www.apple.com/**downloads/macosx/internet_utilities/

watson.html

Watson is a "Swiss Army Knife" with nineteen interfaces to web content and services — an improvement on Sherlock, with nearly twice as many tools, including Google Searching.

(h) Widow Meta Searchhttp://www.widow.com

Easy to choose exactly which search engines you wish to query, and the same listings found at

multiple search engines are combined together.

(i) SearchIQ http://www.zdnet.com/searchiq/directory/multi.html

Not a meta search engine but instead reviews of meta search engines.

Offline Databases

0.1 Ulrich'sonDisc

Ulrich's on Disc from R. R. Bowker provides the ability to search and browse the entire Ulrich's family of databases. They included nearly 250,000 titles from over 200 countries, Information on about 11,000 new titles per year, annotations for almost 90,000 titles, full text reviews fromMagazines for Libraries and Library Journal for over 8,700 publications, indicators for over 21,000 refereed publications and complete names and addresses for 80,000 serials publishers and distributors. The main screen of Ulrich's is shown in Figure 1

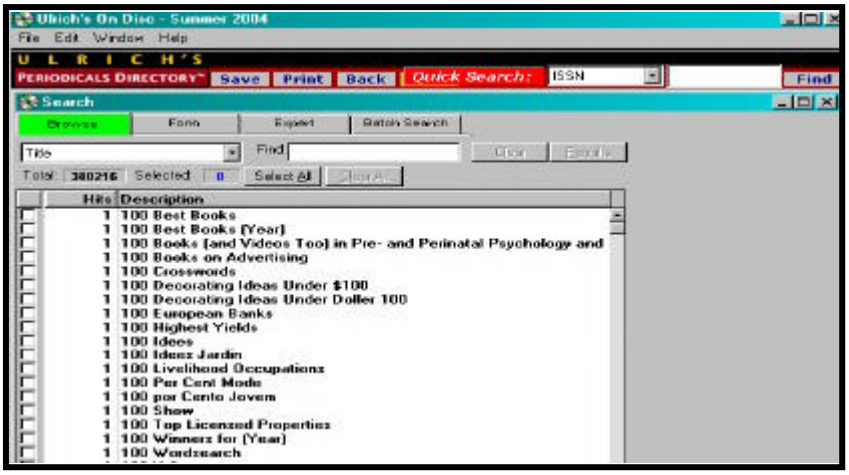
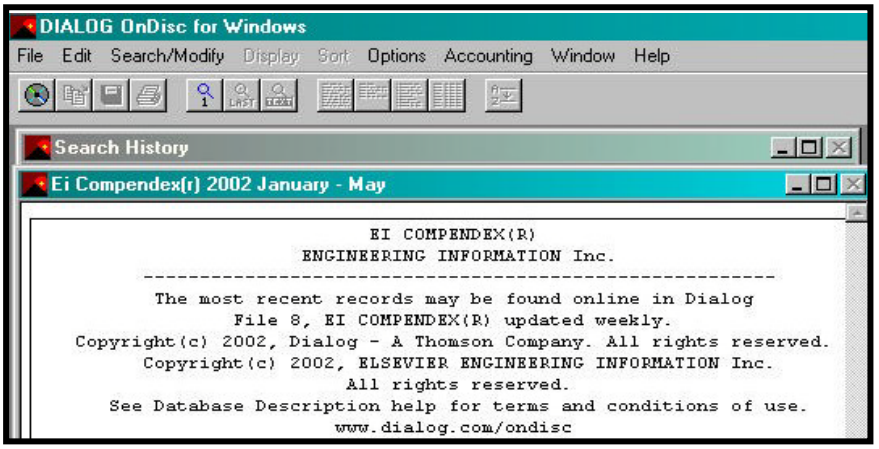


FIG.1'ULRICH'Sondisc'MainScreen

EiCompendexBiblographic Database

DIALOG OnDisc® Compendex, produced by (Ei) Engineering Information Inc., provides coverage of the world's significant engineering and technical literature. Subject coverage includes but is not limited to the various disciplines of engineering, applied physics, electronics and instrumentation, light and optical technologies, and other areas of significant technology. Compendex contains references to and abstracts from journals, technical reports, books, proceedings and conference papers, and more. Author-prepared abstracts are used when available. Publications from around the world are indexed, including approximately 4,500 journals and 2,000 conference proceedings per year. Approximately 10 percent of the documents indexed are in a language other than English.

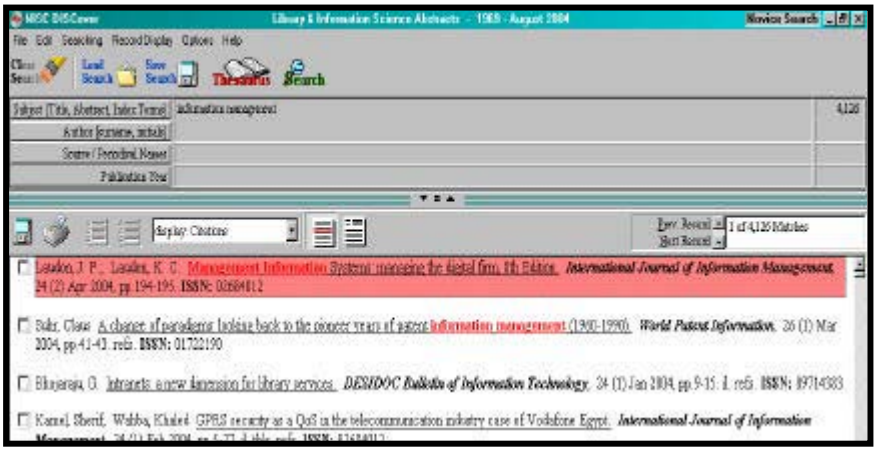


Opening main Screen is like as Figure 2.

Fig.2'EiCompendex'MainScreen

Library & Information Science Abstracts (LISA plus)

LISA plus is the world's best known resource for the coverage of ongoing research in all aspects of library and information studies. Over 245,000 abstracts keep user well informed about such topics as artificial intelligence, information and knowledge management,



publishing and copyright, World Wide Web resources and much more since 1969. Lisa plus main screen is as Figure 3

Fig.3'LISAplus'MainScreen

Emerald Full-Text Database of Journal Articles

Emerald is a full text database from MCB, covers more than 82 top journal across ten broad subject areas. It provides access to the full text of articles in PDF and HTML format published from 1994 to date. The subjects covered include Marketing, Human Resources, Quality Management, Information Management, Library and Information Services, Training and Education, General Management Property, Operations and Production Management etc. Users can choose any subject and get a list of all the journals covered in that subject. First screen of Emerald is as Figure 4

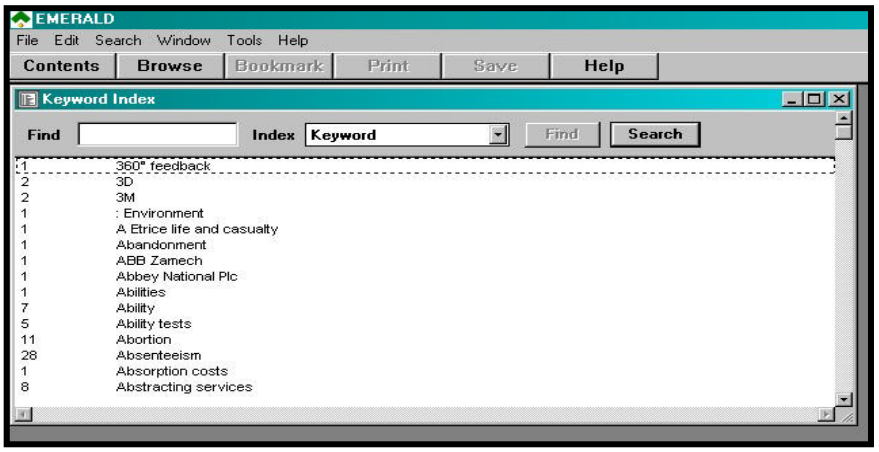


Fig.4'EMERALD(Full-TextDatabase)'FirstScreen

Accessing Different Databases

Four databases mentioned above may be accessed by the following ways

Searching in Specific Field of Selected CD-ROM Databases

There are two forms of searching for information in CD-ROM databases – field-specific and free-text search. A user may know which field to search, or might like to restrict a given search to one or more fields. This is a field specific search. If the user are not sure of the field to be searched, they can conduct a free-text search, which means that the search is not restricted to any particular field. While the free-text search is not universally available, field specific search is the simplest form of search, and CD-ROM databases offer various options to conduct searches on one or more specific fields. The simplest option is the form search, where the user can select a specific box for a particular field as shown in figure no. 1 and can key in the search term/phrase. Which search field can be searched in a database depends on the content and structure of the database concerned, and there fore they differ from one database to another. Various search fields of selected databases are given below

Ulrich's on disc : Search fields are Abstracting and Indexing Service, Area Code, Circulation, CODEN Number, Country, Dewey Number, Document Availability, Electronic Vendor, ISSN, Keyword, Keyword In Title, LC Class, Media Type, Personnel Name, Price (US Dollar), Publication Code, Publisher, Special Features, Special Index, Status Code, Subjects, Title, US State/Zip, Year First Published. Search screen is shown by Figure 5

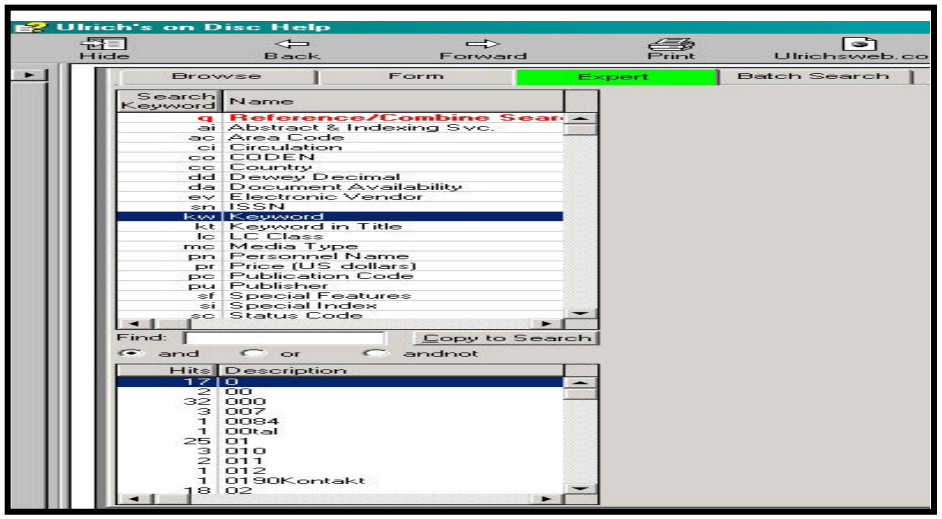


FIG.5'ULRICH'Sondisc'SearchFieldsScreen

EiCompendex : Under option 'Search/Modify' search fields are Word/Phrase Index, EI Subject Headings, Author Name, Author Affiliation, Title Words, Journal Name, Conference Search Options (Conference Title, Conference Location, Conference Sponsor, Conference Year), Limit Options 'English…', (English only, Journal Articles Only, Conference Papers Only, Latest On Disc Records Only), Additional Search Options (Words/Phrases, EI Classification Codes, Major Subject Headings, Treatment Codes, Year of Publications, Language) different fields and Search results screen shown in Figure 6

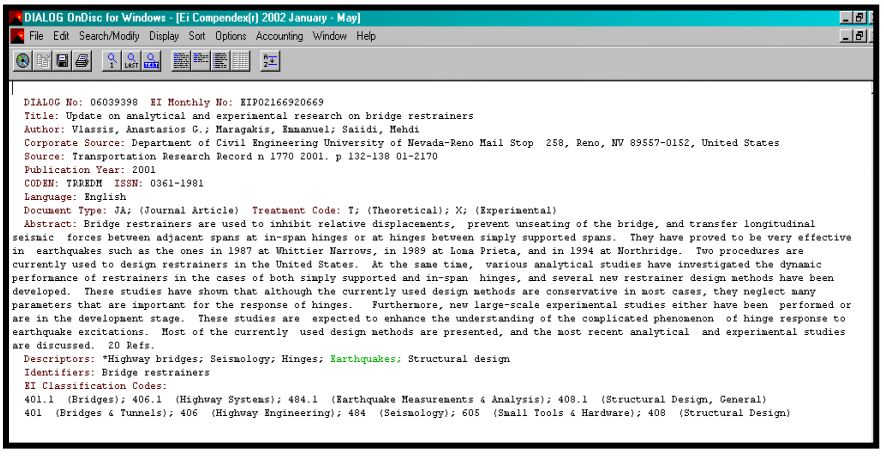


Fig.6'EiCompendex'DifferentFieldsandSearchResultsScreen

LISA plus: Subject, Title, Abstract, Index Term Or Keyword, Author, Source, Title Database Name, , Keyword, Language, Publication Date, Author Affiliation, Country Of Research, Record Number, CODEN, CATNI name, ISSN, Thesaurus term

Emerald : Full Text, Author, Article Title, Keyword, Publication Year, Journal Title,

Quality Indicators, Article Type

Keyword search, author search subject search are most common search features. Search terms or phrases for the same or different fields can be combined using Boolean operators. Following table no.1 shows how searches on specific fields containing keywords and phrases can be conducted and what options are available in selected CD-Rom databases for searches on keywords or phrase

CD-ROM Databases	OptionFor ConductingSearch MethodOnWords/Phrases	
Ulrich'sondiscBrowseIndex		Selectafield,enterthesearchtermintheappropriatebox,and search.ClickonFindafterenteringtheterm
LISAplus	Browse	Afterenteringandselectingthechosenterm,clickonviewtitle toseetheresults
Ulrich'sondiscFormSearch		Selecttheparticularfield,enterthesametermandsearchuser cancombinesearchterms,fromthesameordifferentfieldsby Booleanoperators.FormSearchScreenisshowninFigure7
LISAplus	EasySearch	Select anyparticular field and choose to view theindex .select a termtheindexandsearch
Ulrich'sondiscSearch		Enterthesearchtermprecededbyafieldcode(chosenfroma list showninthesearchfieldsbox)andanequalssign,andthen search
LISAplus	ExpertSearch	Selectanyparticularfieldcodeandchoosetoviewtheindex. Selectthetermfromtheindextosearch
EiCompendexSearch/Modify		Clickon'search/modify'andthenclickon'word/phares'index. Entertheterminthesmallboxafter'enter'anduserwillseethe correspondingportionoftheindex.Selectoneormoreterms andclickOK.Userwillthenseeasearchsetwiththegiven
Emerald	BasicSearch	termsinthe'searchhistory'windowandtheoutput(thecompleterecord)i ntheoutputwindow)intheoutputwindow Enterthekeywordintheboxforsearchtermsandclickonthe search,thesystemwillthenconductthesearchandshowthenumberofhi tsandbriefinformationabouteachrecord (documentnumber,title,author,documenttype,andqualityindicator)wil lappear,doubleclickonanyrecordtoseethefulltext.Multiple keywords can be joined by Boolean operator. Click onbrowseandclickonanyfield(author,keyword,etc)andthecorrespond ingindexwillbedisplayed,browsethroughtheindex anddoubleclickonanytermstoselectandsearch.Notethatherekeywor dscanbesinglewordsorphrases.
Emerald	AdvancedSearch	Selectafield(eg.fulltext,author,andkeyword)entersearch termsandselectsearch.usercancombinesearchtermswithanyotherte rmsfromthesameordifferentfieldcombinedwith Booleanoperation(and,or,not)

TableNo.1.OptionsavailableforSearchesonKeywordsandPhrases

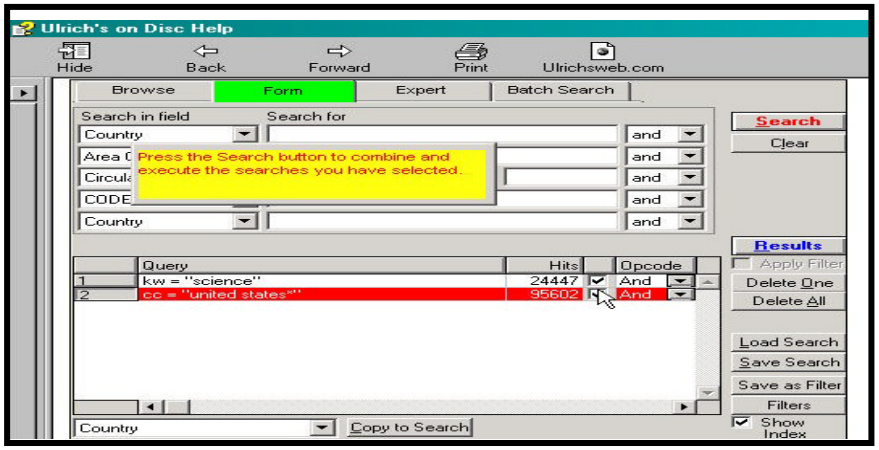


FIG.7.ULRICH'Sondisc'FormSearchScreen

Boolen Search

Combine terms to make the search broader or narrower. How broad or narrow the search is depends on the search logic used to combine search terms. Three logical connectors, or Boolean operators, are used to define the relationship between search terms: "and", "or ", and "not". The Boolean operators may be used to join search terms within search fields in all search modes and to join search criteria between search fields in the Advanced and Expert search modes only. (Novice mode always uses a Boolean AND between search fields). Boolean searches can not be conducted in the 'browse index' mode of CD-ROM.-

Ulrich's on disc: Operators are AND, OR, NOT/AND NOT and Options are, In the Form Search mode user can combine terms/phrases with Boolean operators in a chosen field box, or can type one term/phrase in each box and click on a Boolean operator in the box next to the box next to the term on the right. In the search mode user have to type the Boolean operator to combine terms/phares from the same or different fields.

EiCompendex: Operators are AND, OR, NOT and Options are: use these operators to combine search terms in the 'Modify Search Option'

LISA Plus: Operators are AND, OR, ANDNOT (not can also be used in free-text search mode) Options: In the Easy Search mode, user can combine terms/phrases with Boolean operators in a chosen field box, or can type one term/phrase in each box and click on a Boolean operators in the box next to the term on the right. In the Expert Search Mode, user has to type the Boolean operator to combine terms/phases from the same or different fields. No nesting is possible.
Emerald: Operators are And or, not and Options enter theses operators in the search in the search as well as Advanced Search Mode

Truncation Search

Truncation of the three kinds of truncation (left, right and middle truncation), left truncation is not commonly available in CD-ROM databases. The symbols for truncation and their syntax and effect vary, and the user has to learn these to conduct an effective search.

Ulrich's on disc: * or $ substitute for any number of characters and can be used for right truncation only. '?' Substitutes for one character, can be used anywhere in a word, or user can use multiple '?'Symbols. LISA: Truncation is the substitution of a wildcard symbol for any portion of a word to retrieve a group of words. Most often, truncation is used to abbreviate a word — to trim a term back to its stem, or root word. Truncating lets user search for word variants thereby broadening the search. The asterisk * is a multi- character wildcard and the question mark ? is a single character wildcard. Wildcards are typically used at the end of a word but may be embedded within a word as well. Right and middle or internal truncation is allowed. Both the symbols can be used for right as well as middle truncation. User can enter the symbol as appropriate in the Easy Search as well as the Expert Search mode. Multiple ? can be used. Wildcards are typically used at the end of a word but may be embedded within a word as well. Avoid truncating words to less than five characters or user may retrieve unwanted results.

EiCompendex: '?' for any no. of characters. A combination of '?' and space can be used to conduct different types of truncation. To search on words that start with a word stem and that have no more than one character after the stem, enter '? ?' (Question mark, space, question mark). For example, ROBOT?
? Retrieves robot and robots .to search on words that starts with a word stem and have no more than two characters after the stem. Enter '??' (two question marks) for example, Robot?? Retrieves: robot, robots, robotic.

Emerald: Use a ? to find any single character in the position. Use an * to find any one or more characters in the position.

Index Search and Thesaurus Search

The indexes allow users to select the search terms/phrases from the term index, and a thesaurus allows users to consult a map of available terms to widen or narrow down a given search, as required. CD-ROM retrieval software provides index search facilities, ie users can select an index to browse and select from the index for searching. There may be an index file or a separate index

for each searchable field so that the user can choose a field and then browse the corresponding index file. Index search facilities are more commonly available than thesaurus facilities. Thesauri are hierarchically structured. This means that they go from broad terms to narrower, more specific, terms.

Ulrich's on disc: User can choose a field from either the search or the From Search mode. In each case user can display and browse the corresponding index and select a term/phrase from the index.
EiCompendex: In order to conduct a search, user need to choose an index: author, subject heading, keywords, etc, and then the corresponding index will be open for user to browse and to select the search term

LISA plus: The thesaurus may be accessed via the Browse window by clicking on the Index drop-down list and selecting Thesaurus Term; highlight the required term and click View Titles. In the Expert Search mode enter the thesaurus term in the Search Query Box, click on ok or press Enter. Press the 'View Brief' button to display the results of the search ie the thesaurus block. A thesaurus term can be selected to conduct a search in the database as shown in Figure 8

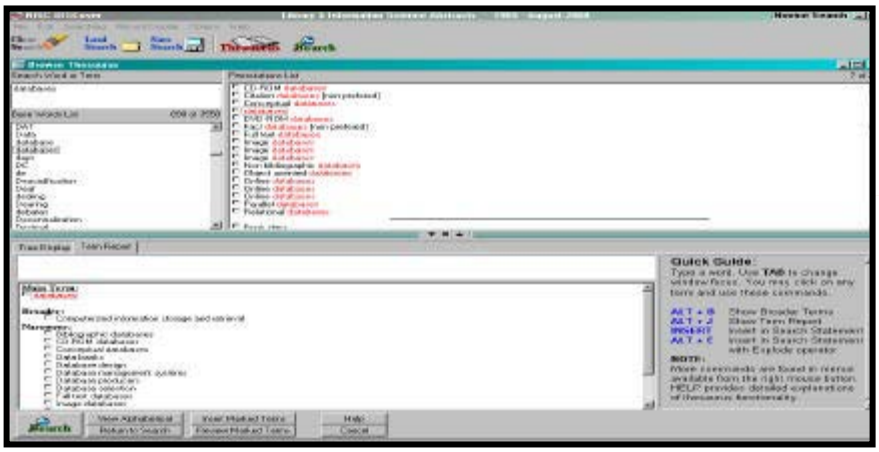


Fig. 8 'LISA plus' Thesaurus Search

Emerald: In the Advanced Search mode, user can choose one or more fields to search, and once users have entered a search term correspond to a field, they can click on the 'Thesaurus' button to get other words correspond to the search term.

Proximity Search

With a proximity search, user can specify the number of words allowed between the search terms. In a general sense, there is a correlation between the number of intervening words (the words creating the "distance" between search terms) and the topical relevance of users search results. The closer the distance between users search words, e.g., 5 words, the more relevant but fewer the results may be. Likewise, the wider the distance between the search words, e.g., 20 words, the less relevant but larger the CD-ROM results may be. The type of proximity search operator to use depends upon whether user need search terms to be found in the same order as listed in the search statement (adjX) or found in the same or reverse order of what user originally specified (nearX).

Ulrich's on disc: not available

Lisa plus: ANDx or NEARx locates both words, in any order within x words in the same field. NOTx locates the first word, but not the second within x word in the same field. WITH: locates both words in adjacency, forward order only, in the same field. WITHx: locates both words, forward order only withx words in the same field. Option in proximity search is only allowed for the free text search. It can be used in both the Easy Search and Expert Search modes. Expert Search Screen of lISA is shown in figure 9

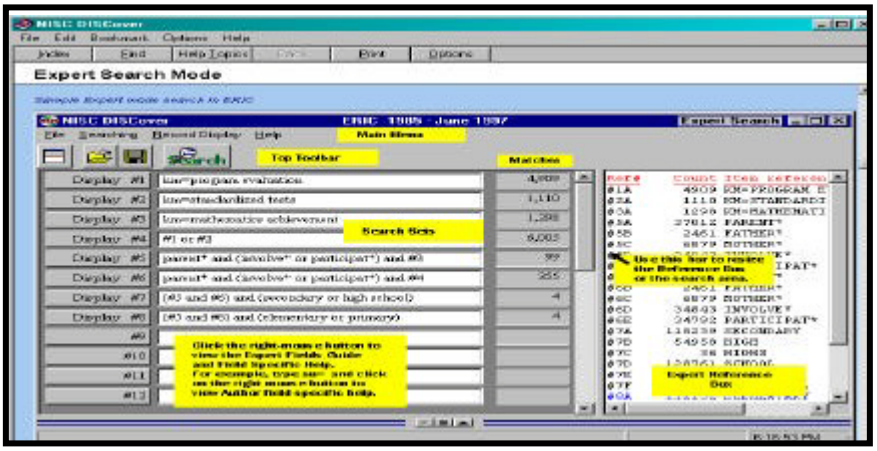


Fig. 9 'LISA plus' Expert Search Screen

EI Compendex: Write two or more words consecutively to search as a phrase. Use periods (.) for on or more intervening words. Option for search expression 'artificial intelligence' will be searched as phrase, ie the word next to each other in the same order. User can specify the maximum no. of intervening words by one or more periods, eg information; management will retrieve both information management and information resource management.
Emerald: Same document, same paragraph, word apart, exact order. In the Advanced Search mode, user can choose any of the four options to conduct a proximity search.

Free-Text Search

Free-Text Search enables the users to specify one or more search or phrases that are not limited to any particle field. There may also be index for free-text search terms. Instead of searching field, in some cases the user might like to conduct a search in all or many different fields. This is possible through what is known as the free search facility. In some cases, the default setting is the free text search, ie whenever a user enters a search term it is searched in all or a number of selected fields as shown in figure 1. Free text option in selected databases as

Ulrich's on disk: No option is available for free-text searching

EiCompendex : No free text search is possible; user have to choose an index (ie a field) to conduct a search

LISA plus: Here a free-text term is any single word taken from any field in the record, with the exception of stop words (). Free text differs from keyword searching in that a space between two terms is treated as meaning true proximity in relative position and order. For example: ft = catalog$ will retrieve all references that have 'catalog' as the first seven characters of the term; 'ft=line', will retrieve all references that contain the terms 'line' including 'line management', author/research worker 'Line Maurice B' ft=public libraries will retrieve all references where the term 'public libraries' occurs, but it will not retrieve records with the combinations. 'Libraries public' or with the phrase 'public and academic libraries'. If a term is entered in the Search mode' with out an operators a free text (ft) will be automatically carried out.

Emerald: In the search option, or using the 'Full -text' option in the Advanced Search mode, user can conduct a full-text search, i.e. a search on any part the document

Results

After the comparison we come to know that all databases have almost same basic accessing techniques as keyword search, Phrase Search, Boolean Search, Truncation, Index and /or Thesaurus Support, Proximity Search, Field-Specific Searches, Free-Text Search, Combing Search Sets and Search Refinement, Limiting or Range Search, Searching through the Retrieved Records and they may vary from one CD-ROM to another with a slight variation as given below.

1.5 Internet and E-mail

INTRODUCTION

In the present age of information Technology, use of Internet is becoming quite popular for accessing information on any topic of your interest. It also provides tremendous opportunities to students, researchers and professionals for getting information on matters related to academic and professional topics and lot more. In the present world, most of the people who have computers around themselves use Internet to access information from the World Wide Web, exchange messages & documents and e-services.

OBJECTIVES

- After going through this lesson, you would be able to:
- explain various terminology used in internet
- use various services provided by internet
- search the desired information over internet
- define e-mail and its various features
- explain the process of downloading file.

INTERNET

The Internet is a global system of interconnected computer networks thatuse the standard Internet protocol suite (TCP/ IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks, of local to global scope,

that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries a vast range of information resources and services, such as the inter- linked hypertext documents of the World Wide Web (WWW) and the infrastructure to support electronic mail.

Uses of Internet

Internet has been the most useful technology of the modern times which helps us not only in our daily lives, but also our personal and professional lives developments. The internet helps us achieve this in several different ways.

For the students and educational purposes the internet is widely used to gather information so as to do the research or add to the knowledge of various subjects. Even the business professionals and the professionals like doctors, access the internet to filter the necessary information for their use. The internet is therefore the largest encyclopedia for everyone, in all age categories. The internet has served to be more useful in maintaining contacts with friends and relatives who live abroad permanently.

Advantages of Internet:

E-mail: Email is now an essential communication tools in business. With e-mail you can send and receive instant electronic messages, which works like writing letters. Your messages are delivered instantly to people anywhere in the world, unlike traditional mail that takes a lot of time. Email is free, fast and very cheap when compared to telephone, fax and postal services.

24 hours a day - 7 days a week : Internet is available, 24x7 days for usage.

Information: Information is probably the biggest advantage internet is offering. There is a huge amount of information available on the internet for just about every subject, ranging from government law and services, trade fairs and conferences, market information, new ideas and technical support. You can almost find any type of data on almost any kind of subject that you are looking for by using search engines like google, yahoo, msn, etc.

Online Chat: You can access many ‘chat rooms’ on the web that can be used to meet new people, make new friends, as well as to stay in touch with old friends. You can chat in MSN and yahoo websites.

Services: Many services are provided on the internet like net banking, job searching, purchasing tickets, hotel reservations, guidance services on array of topics engulfing every aspect of life.

Communities: Communities of all types have sprung up on the internet. Its a great way to meet up with people of similar interest and discuss common issues.

E-commerce: Along with getting information on the Internet, you can also shop online. There are

many online stores and sites that can be used to look for products as well as buy them using your credit card. You do not need to leave your house and can do all your shopping from the convenience of your home. It has got a real amazing and wide range of products from household needs, electronics to entertainment.

Entertainment: Internet provides facility to access wide range of Audio/Video songs, plays films. Many of which can be downloaded. One such popular website is YouTube.

Software Downloads: You can freely download innumerable, softwares like utilities, games, music, videos, movies, etc from the Internet.

Limitations of Internet

Theft of Personal information: Electronic messages sent over the Internet can be easily snooped and tracked, revealing who is talking to whom and what they are talking about. If you use the Internet, your personal information such as your name, address, credit card, bank details and other information can be accessed by unauthorized persons. If you use a credit card or internet banking for online shopping, then your details can also be 'stolen'.

Negative effects on family communication: It is generally observed that due to more time spent on Internet, there is a decrease in communication and feeling of togetherness among the family members.

Internet addiction: There is some controversy over whether it is possible to actually be addicted to the Internet or not. Some researchers, claim that it is simply people trying to escape their problems in an online world.

Children using the Internet has become a big concern. Most parents do not realize the dangers involved when their children log onto the Internet. When children talk to others online, they do not realize they could actually be talking to a harmful person. Moreover, pornography is also a very serious issue concerning the Internet, especially when it comes to young children. There are thousands of pornographic sites on the Internet that can be easily found and can be a detriment to letting children use the Internet.

Virus threat: Today, not only are humans getting viruses, but computers are also. Computers are mainly getting these viruses from the Internet. Virus is is a program which disrupts the normal functioning of your computer systems. Computers attached to internet are more prone to virus attacks and they can end up into crashing your whole hard disk.

Spamming: It is often viewed as the act of sending unsolicited email. This multiple or vast emailing is often compared to mass junk mailings. It needlessly obstruct the entire system. Most spam is commercial advertising, often for dubious products, get-rich-quick schemes, or quasi-legal services. Spam costs the sender very little to send — most of the costs are paid for by the recipient or the carriers rather than by the sender

SERVICES OF INTERNET -E-mail, FTP, Telnet

Email, discussion groups, long-distance computing, and file transfers are some of the important services provided by the Internet. Email is the fastest means of communication. With email one can also send software and certain forms of compressed digital image as an attachment. News groups or discussion groups facilitate Internet user to join for various kinds of debate, discussion and news sharing. Long-distance computing was an original inspiration for development ofARPANET and does still provide a very useful service on Internet. Programmers can maintain accounts on distant, powerful computers and execute programs. File transfer service allows Internet users to access remote machines and retrieve programs, data or text.

E-Mail (Electronic Mail)

E-mail or Electronic mail is a paperless method of sending messages, notes or letters from one person to another or even many people at the same time via Internet. E-mail is very fast compared to the normal post. E-mail messages usually take only few seconds to arrive at their destination. One can send messages anytime of the day or night, and, it will get delivered immediately. You need not to wait for the post office to open and you don't have to get worried about holidays. It works 24 hours a day and seven days a week. What's more, the copy of the message you have sent will be available whenever you want to look at it even in the middle of the night. You have the privilege of sending something extra such as a file, graphics, images etc. along with your e-mail. The biggest advantage of using e- mail is that it is cheap, especially when sending messages to other states or countries and at the same time it can be delivered to a number of people around the world.

It allows you to compose note, get the address of the recipient and send it. Once the mail is received and read, it can be forwarded or replied. One can even store it for later use, or delete. In e-mail even the sender can request for delivery receipt and read receipt from the recipient.

- Features of E-mail:
- One-to-one or one-to-many communications
- Instant communications
- Physical presence of recipient is not required
- Most inexpensive mail services, 24-hours a day and seven days a week
- Encourages informal communications
- Components of an E-mail Address

As in the case of normal mail system, e-mail is also based upon the concept of a recipient address. The email address

provides all of the information required to get a message to the recipient from any where in the world. Consider the e-mail ID.
john@hotmail.com
In the above example john is the username of the person who will be sending/receiving the email. Hotmail is the mail server where the username john has been registered and com is the type of organization on the internet which is hosting the mail server.

FTP (File Transfer Protocol)

File Transfer Protocol, is an Internet utility software used to uploaded and download files. It gives access to directories or folders on remote computers and allows software, data and text files to be transferred between different kinds of computers. FTP works on the basis of same principle as that of Client/ Server. FTP "Client" is a program running on your computer that enables you to communicate with remote computers. The FTP client takes FTP command and sends these as requests for information from the remote computer known as FTP servers. To access remote FTP server it is required, but not necessary to have an account in the FTP server. When the FTP client gets connected, FTP server asks for the identification in terms of User Login name and password of the FTP client (Fig. 3.1). If one does not have an account in the remote FTP server, still he can connect to the server using anonymous login.

Using anonymous login anyone can login in to a FTP server and can access public archives; anywhere in the world, without having an account. One can easily Login to the FTP site with the username anonymous and e-mail address as password.

Objectives of FTP :

Provide flexibility and promote sharing of computer programs, files and dataTransfer data reliably and more efficiently over networkEncourage implicit or indirect use of remote computers using InternetShield a user from variations in storage systems among hosts.

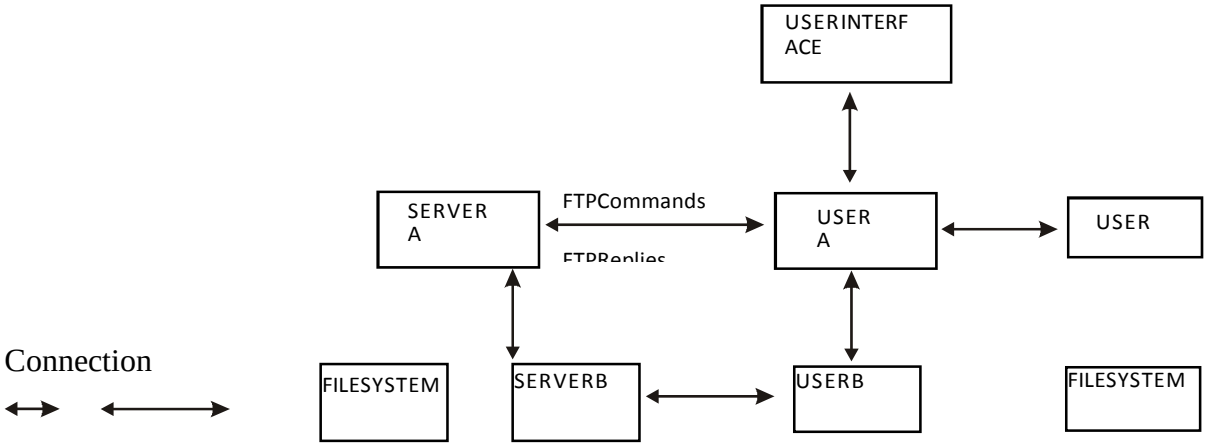


Fig. 3.1

The basic steps in an FTP session

Start up your FTP client, by typing ftp on your system's command line/'C>' prompt (or, if you are in a Windows, double-click on the FTP icon).

Give the FTP client an address to connect. This is the FTP server address to which the FTP client

will get connected

- Identify yourself to the FTP remote site by giving the Login Name
- Give the remote site a password
- Remote site will verify the Login Name/Password to allow the FTP client to access its files
- Look directory for files in FTP server
- Change Directories if requird
- Set the transfer mode (optional);
- Get the file(s) you want, and
- Quit.

Telnet (Remote Computing)

Telnet or remote computing is telecommunication utility software, which uses available telecommunication facility and allows you to become a user on a remote computer. Once you gain access to remote computer, you can use it for the intended purpose. The TELNET works in a very step by step procedure. The commands typed on the client computer are sent to the local Internet Service Provider (ISP), and then from the ISP to the remote computer that you have gained access. Most of the ISP provides facility to TELENET into your own account from another city and check your e-mail while you are travelling or away on business.
The following steps are required for a TELNET session

- Start up the TELNET program
- Give the TELNET program an address to connect (some really nifty TELNET packages allow you to combine steps 1 and 2 into one simple step)
- Make a note of what the “escape character” is
- Log in to the remote computer,
- Set the “terminal emulation”
- Play around on the remote computer, and
- Quit.

TYPES OF INTERNET CONNECTIONS

- There are five types of internet connections which are as follows:
- Dial up Connection
- Leased Connection
- DSL connection
- Cable Modem Connection
- VSAT

Dial up connection

Dial-up refers to an Internet connection that is established using a modem. The modem connects the computer to standard phone lines, which serve as the data transfer medium. When a user initiates a dial-up connection, the modem dials a phone number of an Internet Service Provider

(ISP) that is designated to receive dial-up calls. The ISP then establishes the connection, which usually takes about ten seconds and is accompanied by several beepings and a buzzing sound.

After the dial-up connection has been established, it is active until the user disconnects from the ISP. Typically, this is done by selecting the "Disconnect" option using the ISP's software or a modem utility program. However, if a dial-up connection is interrupted by an incoming phone call or someone picking up a phone in the house, the service may also be disconnected.

Advantages
Low Price
Secure connection – your IP address continually changes
Offered in rural areas – you need a phone line
Disadvantages
Slow speed.
Phone line is required.
Busy signals for friends and family members.

Leased Connection

Leased connection is a permanent telephone connection between two points set up by a telecommunications common carrier. Typically, leased lines are used by businesses to connect geographically distant offices. Unlike normal dial-up connections, a leased line is always active. The fee for the connection is a fixed monthly rate. The primary factors affecting the monthly fee are distance between end points and the speed of the circuit. Because the connection doesn't carry anybody else's communications, the carrier can assure a given level of quality.

For example, a T-1 channel is a type of leased line that provides a maximum transmission speed of 1.544 Mbps. You can divide the connection into different lines for data and voice communication or use the channel for one high speed data circuit. Dividing the connection is called multiplexing.

Increasingly, leased lines are being used by companies, and even individuals, for Internet access because they afford faster data transfer rates and are cost-effective if the Internet is used heavily.

Advantage

- Secure and private: dedicated exclusively to the customer
- Speed: symmetrical and direct
- Reliable: minimum down time
- Wide choice of speeds: bandwidth on demand, easily upgradeable
- Leased lines are suitable for in-house office web hosting
- Disadvantages
- Leased lines can be expensive to install and rent.
- Not suitable for single or home workers
- Lead times can be as long as 65 working days
- Distance dependent to nearest POP
- Leased lines have traditionally been the more expensive access option. A Service Level

Agreement(SLA) confirms an ISP's contractual requirement in ensuring the service is maintained. This is often lacking in cheaper alternatives.

DSL connection

Digital Subscriber Line (DSL) is a family of technologies that provides digital data transmission over the wires of a local telephone network. DSL originally stood for digital subscriber loop. In telecommunications marketing, the term DSL is widely understood to mean Asymmetric Digital Subscriber Line (ADSL), the most commonly installed DSL technolog y. DSL service is delivered simultaneously with wired telephone service on the same telephone line. This is possible because DSL uses higher frequency bands for data separated by filtering. On the customer premises, a DSL filter on each outlet removes the high frequency interference, to enable simultaneous use of the telephone and data.

The data bit rate of consumer DSL services typically ranges from 256 kbit/s to 40 Mbit/s in the direction to the customer (downstream), depending on DSL technology, line conditions, and service-level implementation. In ADSL, the data throughputin the upstream direction, (the direction to the service provider) is lower, hence the designation of asymmetric service. In Symmetric Digital Subscriber Line (SDSL) services, the downstream and upstream data rates are equal.

Advantages:
Security: Unlike cable modems, each subscriber can be configured so that it will not be on the same network. In some cable modem networks, other computers on the cable modem network are left visibly vulnerable and are easily susceptible to break in as well as data destruction.
Integration: DSL will easily interface with ATM and WAN technology.
High bandwidth
Cheap line charges from the phone company.
Good for "bursty" traffic patterns

Disadvantages
No current standardization: A person moving from one area to another might find that their DSL modem is just another paperweight. Customers may have to buy new equipment to simply change ISPs.

Expensive: Most customers are not willing to spend more than $20 to $25 per month for Internet access. Current installation costs, including the modem, can be as high as $750. Prices should come down within 1-3 years. As with all computer technology, being first usually means an emptier wallet.

Distance Dependence: The farther you live from the DSLAM (DSL Access Multiplexer), the lower the data rate. The longest run lengths are 18,000 feet, or a little over 3 miles.
Cable Modem Connection.

A cable modem is a type of Network Bridge and modem that provides bi-directional data

communication via radio frequency channels on a HFC and RFoG infrastructure. Cable modems

are primarily used to deliver broadband Internet access in the form of cable Internet, taking advantage of the high bandwidth of a HFC and RFoG network. They are commonly deployed in Australia, Europe, Asia and Americas.

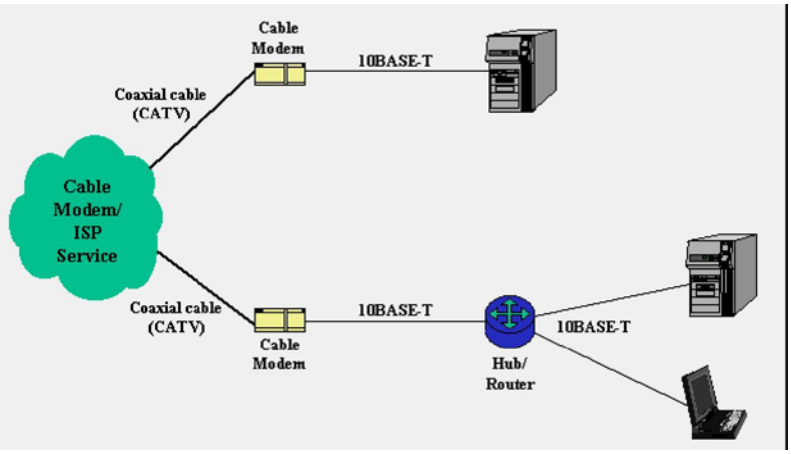


Fig.3.2 : Cable modem connection

Figure 3.2 shows the most common network connection topologies when using cable modems. The cable TV company runs a coaxial cable into the building to deliver their Internet service. Although fed from the same coax that provides cable TV service, most companies place a splitter outside of the building and runs two cables in, rather than using a splitter at the set-top box. The coax terminates at the cable modem.

The cable modem itself attaches to the SOHO computing equipment via its 10BASE-T port. In most circumstances, the cable modem attaches directly to a user's computer. If a LAN is present on the premises (something many cable companies frown upon), some sort of router can be connected to the cable modem.

Advantages

Always Connected: A cable modem connection is always connected to the Internet. This is advantageous because you do not have to wait for your computer to "log on" to the Internet; however, this also has the disadvantage of making your computer more vulnerable to hackers.

Broadband: Cable modems transmit and receive data asdigital packets, meaning they provide high-speed Internet access. This makes cable modem connections much faster than traditional dial-up connections.

Bandwidth: Cable modems have the potential to receive data from their cable provider at speeds greater than 30 megabits per second; unfortunately, this speed is rarely ever realized. Cable lines are shared by all of the cable modem users in a given area; thus, the connection speed varies depending upon the number of other people using the Internet and the amount of data they are receiving or transmitting.

File Transfer Capabilities: Downloads may be faster, but uploads are typically slower. Since the same lines are used to transmit data to and from the modem, priority is often given to data traveling in one direction.

Signal Integrity: Cable Internet can be transmitted long distances with little signal degradation. This means the quality of the Internet signal is not significantly decreased by the distance of the modem from the cable provider.

Routing: Cable routers allow multiple computers to be hooked up to one cable modem, allowing several devices to be directly connected through a single modem. Wireless routers can also be attached to your cable modem.

Rely on Existing Connections: Cable modems connect directly to preinstalled cable lines. This is advantageous because you do not need to have other services, such as telephone or Internet, in order to receive Internet through your cable modem. The disadvantage is that you cannot have cable internet in areas where there are no cable lines.

Disadvantages

Cable internet technology excels at maintaining signal strength over distance. Once it is delivered to a region, however, such as a neighborhood, it is split among that regions subscribers. While increased capacity has diminished the effect somewhat, it is still possible that users will see significantly lower speeds at peak times when more people are using the shared connection.

B andwidth equals money, so cable's advantage in throughput comes with a price. Even in plans of similar speeds compared with DSL, customers spend more per Mb with cable than they do with DSL.

It's hard to imagine, but there are still pockets of the United States without adequate cable television service. There are far fewer such pockets without residential land-line service meaning cable internet is on balance less accessible in remote areas.

VSAT

Short for very small aperture terminal, an earthbound station used in satellite communications of data, voice and video signals, excluding broadcast television. A VSAT consists of two parts, a transceiver that is placed outdoors in direct line of sight to the satellite and a device that is placed indoors to interface the transceiver with the end user's communications device, such as a PC. The transceiver receives or sends a signal to a satellite transponder in the sky. The satellite sends and receives signals from a ground station computer that acts as a hub for the system. Each end user is interconnected with the hub station via the satellite, forming a star topology. The hub controls the entire operation of the network. For one end user to communicate with another, each transmission has to first go to the hub station that then retransmits it via the satellite to the other end user's VSAT.

Advantages

Satellite communication systems have some advantages that can be exploited for the provision of connectivity. These are:

- Costs Insensitive to Distance
- Single Platform service delivery (one-stop-shop)
- Flexibility
- Upgradeable
- Low incremental costs per unit
- Disadvantages
- However like all systems there are disadvantages also. Some of these are
- High start-up costs (hubs and basic elements must be in place before the services can be provided)
- Higher than normal risk profiles

Severe regulatory restrictions imposed by countries that prevent VSAT networks and solutions

from reaching critical mass and therefore profitabilitySome service quality limitations such the high signal delays (latency)Natural availability limits that cannot be mitigated againstLack of skills required in the developing world to design, install and maintain satellite communication systems adequately

DOWNLOADING FILES

Downloading is the process of copying a file (such as a game or utility) from one computer to another across the internet. When you download a game from our web site, it means you are copying it from the author or publisher's web server to your own computer. This allows you to install and use the program on your own machine.

Here's how to download a file using Internet Explorer and Windows XP. (This example shows a download of the file "dweepsetup.exe" from Dexterity Games.) If you're using a different browser such as Netscape Navigator or a different version of Windows, your screen may look a little different, but the same basic steps should work.

Click on the download link for the program you want to download. Many sites offer multiple download links to the same program, and you only need to choose one of these links.

You may be asked if you want to save the file or run it from its current location. If you are asked this question, select " Save." If not, don't worry — some browsers will automatically choose "Save" for you. (Fig. 3.3(a))

You will then be asked to select the folder where you want to save the program or file, using a standard "Save As" dialog box. Pay attention to which folder you select before clicking the "Save" button. It may help you to create a folder like "C:\Download" for all of your downloads, but you can use any folder you'd like.

The download will now begin. Your web browser will keep you updated on the progress of the download by showing a progress bar that fills up as you download. You will also be reminded where you're saving the file. The file will be saved as "C:\Download\dweepsetup.exe" in the picture below. (Fig. 3.3(b))

Note: You may also see a check box labeled "Close this dialog box when download completes." If you see this check box, it helps to uncheck this box. You don't have to, but if you do, it will be easier to find the file after you download it.

Depending on which file you're downloading and how fast your connection is, it may take anywhere from a few seconds to a few minutes to download. When your download is finished,

if you left the “Close this dialog box when download completes” option unchecked, you’ll see a dialog box as shown in fig. 3.3(c) :

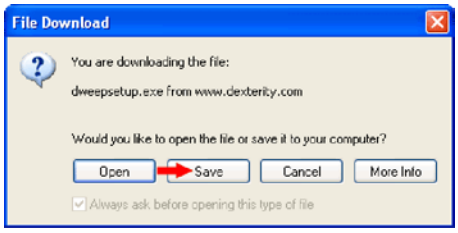
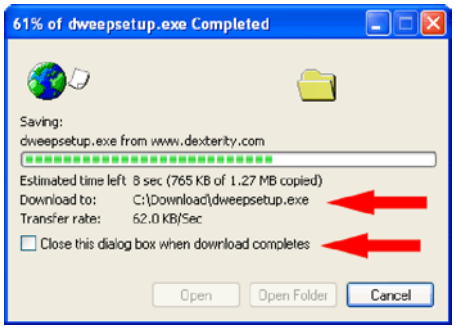


Fig 3.3.(a) Downloading Window



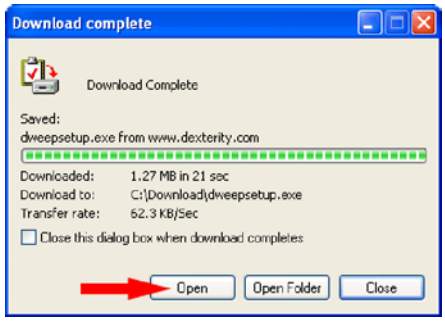


Fig 3.3.(b) Downloading Window Fig 3.3.(c) Downloading Window

Now click the “Open” button to run the file you just downloaded. If you don’t see the “Download complete” dialog box, open the folder where you saved the file and double-click on the icon for the file there.
What happens next will depend on the type of file you downloaded. The files you’ll download most often will end in one of two extensions. (An extension is the last few letters of the filename, after the period.) They are:

.EXE files: The file you downloaded is a program. Follow the on-screen instructions from there to install the program to your computer and to learn how to run the program after it’s installed.

.ZIP files: ZIP is a common file format used to compress and combine files to make them

download more quickly. Some versions of Windows (XP and sometimes ME) can read ZIP files without extra software. Otherwise, you will need an unzipping program to read these ZIP files. Common unzipping programs are WinZip, PKZIP, and Bit Zipper, but there are also many others. Many unzipping programs are shareware, which means you will need to purchase them if you use them beyond their specified trial period.

LESSON 4.2

Advance Internet Searching

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STRUCTURE

1.1 Learning Objectives
1.2 Introduction
1.3 Information Explosion
- 1.3.1 Search Engines
- 1.3.2 Meta Search Engines
- 1.3.3 Subject Directory
- 1.3.4 Subject Engine Gateways
- 1.3.5 Specialist Databases

1.4 Search Strategy
- 1.4.1 Developing Effective Search Strategy

1.5 Advanced Web Search Techniques
- 1.5.1 Phrase Searching
- 1.5.2 Truncation
- 1.5.3 Quick Searches
- 1.5.4 Boolean Expressions
- 1.5.5 Advanced Boolean Logic

1.6 Specific Search Engines
- 1.6.1 Visual Search Engines
- 1.6.2 Moving Image/Video Search Engines
- 1.6.3 Image Search Engines
- 1.6.4 Spelling and Words

1.7 Summary
1.8 Glossary
1.9 Answers to In-text Questions
1.10 Self-Assessment Questions
1.11 References
1.12 Suggested Readings

1.1 LEARNING OBJECTIVES

The objectives of the lesson are to explain the Advance Internet Searching Techniques.This lesson will make students aware about the concept of how Internet works, Internet Searching, different types of ways to manage information explosion, etc. Students will learn about how to develop effective search strategies, specific websites to find specific information beyond Google. Students will learn how to provide right information at the right time using various search strategies and relevant databases, based upon the information needs of the users.

1.2 INTRODUCTION

Internet is a global system of interconnected networks that use the standardized portals to serve billions of users worldwide. The Internet is the short name for the internet system. It may be defined as the world's largest network system that provides the fastest, easiest and cheapest means for countless users to get provide and communicate information on a global basis. It is a network of networks that consists of millions of private and public, academic, business and government networks of local to global scopes that are linked by cables, connections, and other technologies. The internet carries a vast array of resources and services, most notably the inter-linked documents of the World Wide Web (WWW) and the infrastructure to support it. In addition, it supports popular services such as online chat and voice over internet protocol (VoIP) applications allowing person-to-person communication via voice and video. The reason why the internet seems all-powerful is because it has two characteristics no other mechanisms possess: first, the internet contains the biggest resource of information in the entire world; second, it enables people an interactive mechanism and so instantly communicate with each other. An enormous amount of information is now available on the Internet. There is no central institution that organizes the information. There are countless ways of publishing new content to the internet and millions of pages are added each day. Searching and finding the information is challenging and frustrating task.Internet Search means search via a search engine that has indexed a predominant portion of the World Wide Web. For the avoidance of doubt, a search via a search engine that has indexed predominantly a specific topic or category of information or only a specific site is not an Internet Search.

In this lesson we are going to discuss about search engines, metasearch engines and how we are searching information through Google. Focus is to give overview of some specific search engines which are specialised in nature and from where you can find out specific information. Students will learn beyond Google and how to search information effectively using search strategies. This will save the time of the users and also provide targeted information relevant to their purpose of study.

1.3 INFORMATION EXPLOSION

As the amount of available data expands, managing the information becomes more difficult. “Most people today have more information coming at them than they can ever assimilate and process”. While trying to make a decision, we often have so much information that we get confused, and we don't know what to do. At the same time, we're expected to be knowledgeable about more and more things to function in our society. This state of having too much information to digest is known as *information overload.* Almost everyone suffers from it to some degree. How do we handle the information explosion?The well-trained biological systems for handling the information explosion are the humble librarian and other similar information experts.In the technological systems department, we have databases, online search engines and intelligent picture modelling and text simplifying software.

- Search Engines
- Meta-search Engines
- Subject Directories
- Subject Information Gateways
- Specialist Databases

1.3.1 Search Engines

A web search engine is a software system that has been designed to search for information on the World Wide Web. The information searched may be a combination of web pages, images, and other types of files.Search Engines are basically of two types: ‘Library Search Engines’ and ‘OpenLibrary Search Engines’.The Library Search Engines search their own selection of sites to find something suitable for the search you have entered, whereas Open Search Engines search the whole of the net.

a) How Do Google Search Results Work?Basic search in Google: How would we usually search Google to see whether vitamin C can help or prevent common cold?

Figure 1: Simple Searching in Google

ACTIVITY

1 Search Google and Yahoo for the term "Digital Library ".
2 Compare the search results of both the search engines based on the number of results, time taken and relevance of the results.

b) Searching in Google involves the following steps:

- Crawling – Following links to discover the most important pages on the web
- Indexing – Storing information about all the retrieved pages for later retrieval
- Ranking – Determining what each page is about, and how it should rank for relevant queries

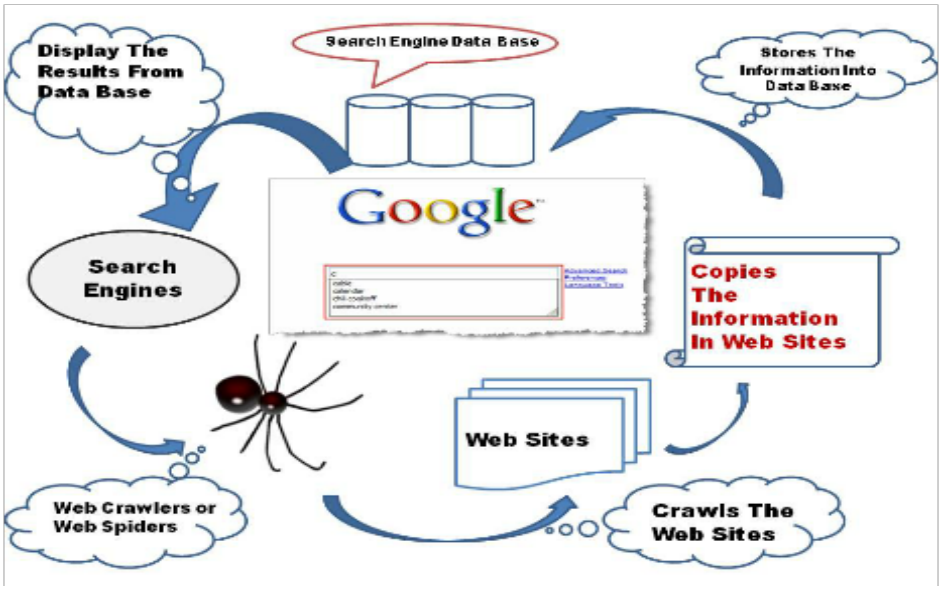


Figure 2: Searching in Google

Crawling

Crawling is the process by which Googlebot discovers new and updated pages to be added to the Google index.It uses a huge set of computers to fetch (or "crawl") billions of pages on the web. The program that does the fetching is called Googlebot (also known as a robot, bot, or spider). Googlebot uses an algorithmic process: computer programs determine which sites to crawl, how often, and how many pages to fetch from each site.Google's crawl process begins with a list of web page URLs, generated from previous crawl processes, and augmented with Sitemap data provided by webmasters.As Googlebot visits each of these websites it detects links on each page and adds them to its list of pages to crawl. New sites, changes to existing sites, and dead links are noted and used to update the Google index.Google doesn't accept payment to crawl a site more frequently, and search side of business is kept separate from revenue-generating Ad Words service.

Indexing

When a user enters a query, the machines search the index for matching pages and return the results that are believed to be the most relevant to the user. Relevancy is determined by over 200 factors, one of which is the PageRank for a given page. PageRank is the measure of the importance of a page based on the incoming links from other pages. In simple terms, each link to a page on your site from another site adds to your site's PageRank. Not all links are equal: Google works hard to improve the user experience by identifying spam links and other practices that negatively impact search results. The best types of links are those that are given based on the quality of your content.

Ranking of Pages

A Web page's PageRank depends on a few factors:

- **The frequency and location of keywords within the Web page**: If the keyword only appears once within the body of a page, it will receive a low score for that keyword.
- **How long the Web page has existed**: People create new Web pages every day, and not all of them stick around for long. Google places more value on pages with an established history.
- **The number of other Web pages that link to the page in question**: Google looks at how many Web pages link to a particular site to determine its relevance.

1.3.2 Met Search Engine

A Met Search Engineis a search engine that queries other search engines and then combines the results that are received from all. In effect, the user is not using just one search engine but a combination of many search engines at once to optimize web searching. For example, Dogpileis a metasearch engine.

Examples of Multi or Meta search engines

- Goofram for Google and Wolfram Alpha
- Heapr for Google, Twitter, Wolfram Alpha, Wikipedia
- Ixquick has a number of UK based engines in its collection
- Izito 6+ standard free text search engines used
- Kedrix Provides options for Bing, Yahoo, Twitter, Indian and Chinese engines.
- Mamma been around forever, good reputation
- MyAllSearch You can choose from Google, Yahoo, Bing, Ask (Jeeves), Yandex, Lycos, Metacrawler, Entireweb and DuckDuckGo.
- Scour GYM search, + vote and comment on results
- Search!o wide variety of different engines; 10 in total
- Search!o wide variety of different engines; 10 in total
- Searchboth Compare 2 search engines at once, eight options
- Sputtr has 36 different option
- Soovle for Google, Wikipedia, Answers, YouTube, Ask, Yahoo, Amazon
- Trovando is a first rate choice and a personal favourite. 33 options
- Zuula 11 different search engine options

Figure 3: Popular Meta Search Engines

IN-TEXT QUESTIONS

1 Dogpile is an example of ----------?

2 Which of the following is not a Search Engine?

(A) Google (B) Yahoo (C) OPAC (D) Google Scholar

3 Meta Search Engine searches information from only Google? True/ False

1.3.3 Subject Directory:

The Subject Directoriesare defined as a collection of websites that includesubject categories and subcategories that are organized and browse-able. Such directories can deliver higher quality content as they are made by subject experts. They may include a search engine for searching their database and are thus considered best suited for browsing and searching of a general nature.

Examples: Yahoo directory, Open directory, Google directory, etc.

S. No	Search Engine	Subject Directory
1	It is an online tool used to locate or search for information on the web.	It is an online database sorted by subject and category of the online information available in websites.
2	It is mostlyreviewed and maintained by robotics.	It is created, maintained, and reviewed by human experts.

3	Users can find or locate information on the web through them by using phrases or keywords.	Users can locate information using them on the internet by using hierarchy.
4	It searches information based on relevant formulas and algorithms using automated software.	Directories are maintained and organized by expertsby discovering new websites containing relevant information either by exploring the internet themselves or by reviewing the submitted websites.
5	They are used generally for shopping, entertainment and research.	They are normally used to search broad topics, current events, or business homepages, etc.
6	They are much bigger as they include billions of web pages.	They tend to be smaller as search is limited to the subject.
7	It is usedwhen looking for complex or specific information as its advanced features allow refining and improving results.	It gives an idea about the amount of web-based information on the topic and is considered best if one wants to browse broad topics.
8	Search is based on content or information in database of the search engine.	It searches only those websites that are included in the directory.
9	Search engines automatically collect information about a website to index it.	Website submission is required to be listed in the directory.
10	Search engine automatically lists information without any regard to the content quality. It employs algorithms to filter and deliver the most relevant information to users.	Websites must meet certain criteriato be featured in a directory,to assure quality.
11	Search engines do not charge any fee to the publishers.	Some directories charge a fee for content to be listed in the directory.

Table 1: Difference between Search Engine and Subject Directory

1.3.4 Subject Information Gateways

Information gateways provide targeted discovery services for their users, giving access to Web resources selected according to quality and subject coverage criteria. Information gateways

recognise that they must collaborate on a wide range of issues relating to content to ensure continued success. By definition gateways select particular material from the wealth of resources available, so each individual gateway must consider its own strategy for relating to other gateways covering ``the rest of the world".Some of the definitions of SIGs are:

1. Internet-based services that “provide lists of quality-tested resources in specific disciplines, and often a variety of value-added services relevant to the specific disciplines.”
2. Online services and sites that provide searchable and browse-able catalogues of Internetbased resources and which typically focus on a related set of academic subject areas.
3. A gathering place of discipline specific resources … a process of identification, filtering, description, classification and indexing before they are added to a database which is freely available in the World Wide Web.
4. A web-based mechanism for accessing a collection of high quality, evaluated resources identified to support research in a particular subject discipline.

From the above definitions, it can be clearly understood that SIGs are Internet-based quality controlled information services that allow easier access to network-based resources in a defined subject area. Through SIGs access is provided to relevant information services including websites, documents, data, multimedia files and other resources available on the Internet. Each Internet resource is described with a brief annotation and grouped under the appropriate category. Users can either search the information by keyword or browse the resources under subject-headings. SIGs also help users to judge the relevance of the resources. They also minimize the possibility of repetition in search results.

Characteristics of Subject Information Gateways

The major difference between SIGs and other Internet-based technologies are as follows:

Basic Gateway Facilities: Most subject gateways allow the end user to browse the resource database. For example, the Astro Web Gateway consists of multi-level sub-areas and resources as well as a WAIS-based search mechanism.

Additional Searching Facility: Extra facility for enhanced searchingis provided by some gateways. For example, SOSIG (Social Science Information Gateway) has a thesaurus containing social science technology.

Additional Subject-related Services: Some subject gateways provide considerable number of services and information sources related to their core searchable gateway e.g. Biz/Ed (Business and Economics SIG) contains business and economic information, such as economic data sets and other financial data.

Resource Cataloguing: The main difference between SIGs and automated search tools such as Google or Alta Vista, is the quality of the results that the end-user gets. This depends on the type of indexing technique used by a particular gateway.

Quality Control: The most important concern of SIGs is quality control that is obtained by the application of selection criteria. The core issues in quality assurance are appropriateness, accuracy, authority and accessibility.

1.3.5 Specialist Databases

Specialist databases are mostly online products that are subscription-based. Most of these databases are maintained by professional associations of repute, such as the American Chemical Society (ACS), the American Psychological Association (APA), the American Economic Association (AEA), and others. Specialist databases mostly include indexing of not only journals, but also online books, dissertations,conference proceedings, patents, government documents, and other grey literature itemsto better serve the interests of their users. The main difference between specialist and multidisciplinary databasesis their comprehensive.

IN-TEXT QUESTIONS

4 Subject directories are bigger in size as compared to Search engines. True /false

5 Specialist databases are predominantly subscription-based online products. True /false

6 Information gateways provide targeted ----------services for their users.

1.4 SEARCH STRATEGY

A search strategy is a plan for conducting information research. It includes a list of databases and indexes to search, a list of keywords and subject headings relevant to the topic and the knowledge of how to enter the search into the database or index.The key to successful searching is not in the quantity of search results, but rather how relevant and appropriate they are to the topic.

Whether searching the web with a search engine such as Google, or searching a research resource like the Library catalogue or another library database, there are some common search techniques that can be employed to improve the efficiency of the search results.A well designed search strategy:

- saves the time in the long run
- allows user to search for information in many different places
- helps him to find a larger amount of relevant information

1.4.1 Developing Effective Search Strategy:-

Regardless of the search tool being used, the development of an effective search strategy is essential if one hopes to obtain satisfactory results. A simplified, generic search strategy might consist of the following steps:-

1. Choosing Search Terms: -Whether one is searching the web or searching a library database, there are some common search strategies user can use to improve his search results. The first is choosing appropriate search terms or keywords. Begin by thinking about the words and phrases that describe the topic. For instance, if he is researching the effect of pollution and global warming on the ice caps, then his keywords would be:

- Pollution
- Global warming
- Ice caps

Now think about whether there are other terms that could also be used to describe the topic, including synonyms, related terms, or words and phrases that have similar meaning, such as:

- Contamination or deterioration
- Climate change
- Antarctica or Africa or Greenland

2. Connecting Keywords:-Now that user has identified all the keywords and phrases that describe the topic, the next step is to connect them in a logical way so that he retrieves the information he needs. A search engine uses a sophisticated algorithm to sort through the keywords and phrases and produce a result list that is ranked by how relevant the documents are to the words entered. User can simply enter the keywords and phrases and let the search engine do the work. If user has a two or three-word phrase, be sure to put the phrase within quotation marks.

3. Choosing Relevant Search Terms:-Let's take the **e**xample of a possible research question: Does the increase in use of video surveillance in public spaces contribute to the erosion of our privacy rights?

- Break down the topic into keywords and phrases: video surveillance, public spaces, privacy rights
- Now, think about whether there are other terms that could also be used to describe the topic, including synonyms, related terms, or words and phrases that have similar meaning

Concept 1	Concept 2	Concept 3
electronic surveillance	public	privacy
closed circuit television	urban	civil liberties
CCTV		social control

4. Connecting Keywords using Boolean operators: Once the keywords and phrases have been identified, the next step is to convey them in a logical manner so that the database understandsand this is doneby using Boolean operators that are AND, OR, NOT. Most databases and many search engines such as Google make use of Boolean operators. If we understand how databases execute our keyword searchit will allow us to perform more relevant searches, thereby saving time.

ACTIVITY

1. Identify the keywords from the topic "use of Library automation Softwares in academic libraries in India"

2. Connect the keywords with Boolean Operators and Search on the Google for getting relevant results.

1.5 ADVANCED WEB SEARCH TECHNIQUES

Understanding how to perform sophisticated searches of online information will greatly increase your chances of finding what you want. While most popular search engines let you define your search criteria in very specific ways, not all function identically.

1.5.1 Phrase Searching

When you are using search terms that contain more than one word, enclosing them in quotation marks, returns documents containing the exact phrase only. Phrase searching involves placing

double quotation marks ("__") around two or more words to create a search term. This technique narrows the search to retrieve only those results in which the exact phrase appears.For example: "**humour therapy**" will search for results in which the words **humour** and **therapy** appear next to each other.

Note: A phrase search will only search for results that contain the exact spelling of the keywords, e.g. a search for ***"humour therapy"*** will not retrieve results containing ***"humor therapy"***.

Phrase searching can be used when searching the Library Catalogue, databases and the Internet.

1.5.2 Truncation

If you are looking for information on gardening, you could use it as your keyword. However, if your results are limited in number (though not likely with gardening) and you want to broaden your search, use a root part of the word and abbreviate it with an asterisk (garden*). The engine will return links to documents containing gardens, garden, gardener, gardeners, and so on.

1.5.3 Quick Searches

Many search engines now allow you to quickly search for specific types of content, simply by including a keyword at the beginning of your search. For instance, if you want to find out the weather in Paris, simply type “weather Paris” and you should get the current forecast for Paris. If you need a definition, include the word “dictionary” before the word you want to define.

Quick searches work for many types of information, and don’t always require a keyword:

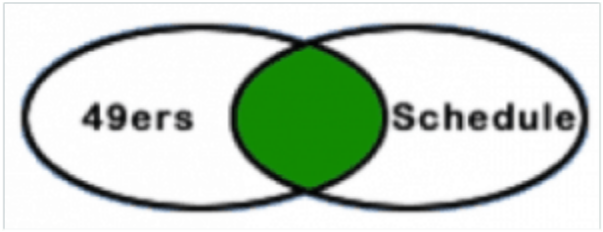
- Entering the tracking code for a package will bring up the shipping details.
- If you enter a mathematical equation, the search engine should give you the answer.
- If you want to figure out how many ounces are in a 3 pounds, type “ounces in 3 pounds.”
- Find out a flight status by searching for the airline and flight number.

1.5.4 Boolean Expressions

Perhaps the most useful feature in defining search criteria is Boolean expressions. Boolean operators provide you with powerful control over search engine logic. The Boolean operators AND, OR, NOT (or AND NOT in some engines), and NEAR allow you to create more specific search results. Here’s what these Boolean operators do for you:

♦ **AND**

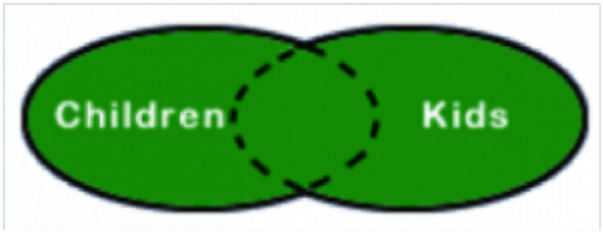
If you want a document that contains all of your keywords, use the capitalized word AND between keywords. The engine will only find documents that have both words. Here’s an example: Using the search criteria 49ers AND schedule would return all documents that contain both words.



If the left oval represents all documents containing the word “49ers” and the right oval represents all documents containing the word “schedule”, the intersection of those ovals, the green area, represents all documents containing both words. You can see how this operator is useful in narrowing your results.

♦ **OR**

If you want to broaden your search to find documents that contain either of the keywords, use the OR operator between words. This is very useful when searching for terms that have synonyms. An example is children OR kids, which would return any documentsthat, had either of the words.



If the left oval represents all documents containing the word “children” and right oval represents all documents containing the word “kids”, the green area represents documents that contain either word or both words. You can see how this operator broadens your search, obtaining more results.

The OR operator is particularly useful when combined with quotation marks. For example, searching for “Disney Land” OR “Disney World” will bring up results for either park.

♦ **NEAR**

This operator is a more specific form of the AND operator. It ensures that the document contains both terms and that they are located near each other. In many lengthy documents, just using the operator AND might not provide useful results as the two keywords may be located in very different parts of the document and might not be related to one another.

♦ **NOT or AND NOT**

Using the capitalized AND NOT preceding a search term eliminates documents that contain that term. Why would you want to do this? If you want to find information on Deion Sanders and do not want documents that include information relating to the Dallas Cowboys you could use “Deion Sanders” AND NOT cowboys.

1.5.5 Advanced Boolean Logic

The operators AND, NEAR, OR and AND NOT are powerful in their own right, but when used in conjunction with parentheses, they offer substantial control over the search logic executed by the engine. Parentheses are used in Boolean logic similar to the way they are used in a mathematical equation, limiting and ordering relations between variables.

Here's an example: If you want to find a Web-based Internet tutorial you might use the search criteria Internet AND (tutorial OR lesson). This will return two types of documents: Documents that contain both Internet and tutorial, as well as documents that contain the words Internet and lesson. Essentially, the parentheses are used as they are for the distribution property in mathematics–to distribute the keyword Internet to either of the two "OR" words inside the symbols.

The most common use of parentheses is to enclose two possible keywords separated by an OR operator and then linking those enclosed/possible keywords with other criteria using AND. However, there are times and instances where the reverse arrangement might prove useful. For example, if you were looking for information on gun control you might want to use "gun control" OR (legislation AND gun), which would return documents with the words "gun control" or documents containing the word gun and the word legislation.You can further refine the search. Since the word "law" is a synonym of legislation you can even nest one set of parentheses inside another to distribute gun to either legislation or law and while we're at it, truncate "law" with an asterisk to also distribute gun to the variation–laws.

Here's how it would look: "gun control" OR (gun AND (law* OR legislation)). Note that each left side parentheses must be paired with a right side one somewhere in the Boolean expression or the search engine will get confused.

Boolean Variations

+require and -exclude

Some engines offer a variation of the Boolean operators AND and NOT. A+ symbol preceding a word (with no space between) requires that the word is present in documents, while A– symbol preceding a keyword ensures that the word is not present in returned documents. Note that all words that must be in the document should be preceded by a + symbol, even the first word. Here's an example: +fraud +election ensures that fraud is also in all the documents.

Limited Boolean Options

Some engines offer limited Boolean logic with radio buttons or pull-down menu choices such as:

- Documents must include "All terms" (equivalent to using the operator AND between all terms).
- Documents must include "Any terms" (equivalent to using OR between all terms).

IN-TEXT QUESTIONS

7 Truncation Search is an advanced searching technique. True/ False

8 Whenever you have more than one Boolean operator which Searching Technique is helpful----------

(A) Phrase (B) Advanced (C) Nested (D) Range

Some tips to Search More Effectively on Google:

1. Exclude Stop Words: -Stop word such as "and," "the," "where," "how," "what," and "or"

Example: how a transmission works, removes the words "how" and "a," and creates the new, shorter query transmission works.

2. Search for Similar Words

There are lots of different ways to describe the item. ~ Operator helps to search not only for a single keyword, but for words that are similar to that keyword. Example: "elderly," enter the query ~elderly. This will find pages that include not just the word "elderly," but also the words "senior," "aged," "nursing homes," and so on. This really expands your search results, giving you a lot more options to choose from

3. Search for Similar Pages: Sometimes you find a web page that includes some of the information you're looking for but not all of it. The best way to proceed in this instance is to look for other web pages similar to this one, which you can do with Google's related: operator.

Example: If you've found good information about wildlife on the National Geographic website, you can find similar sites by enter the query related: https://www.nationalgeographic.com.

4.Evaluating search results: -For each of the items that appears in your search results, brief information about the source will be presented, including an abstract/summary, title, author, date of publication, etc. Consider the following to help you decide which items to review in more detail:

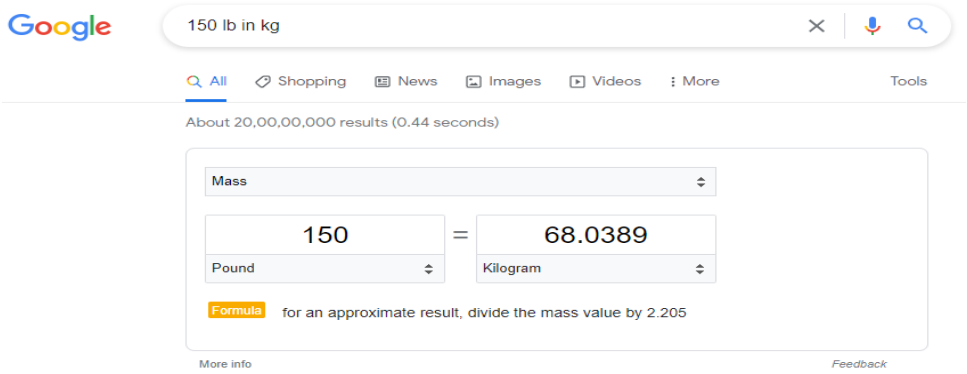
(a) Relevance: look at the title of the source. Does it appear to be on the topic?

(b)Format: is the source in the format you need? Is it a book? Is it a scholarly or peer-reviewed article? Many databases provide options that allow you to limit to a particular format.

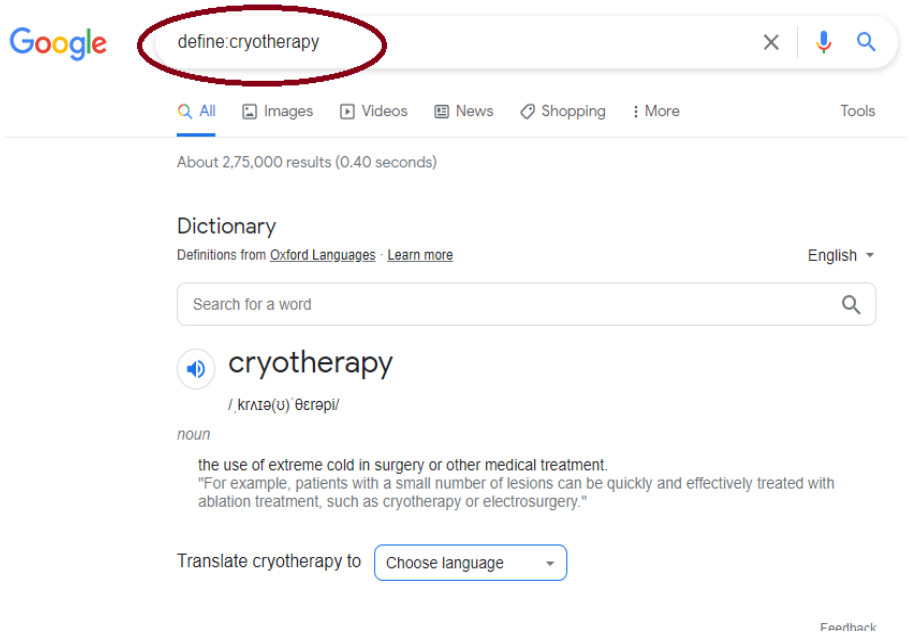
(c)Year of publication: what is the date of publication? Is it important to have the most current information? Do you need information from a particular historical period? Many databases provide the option to sort your results by date or to limit results to particular years.

Having fun with Google:-

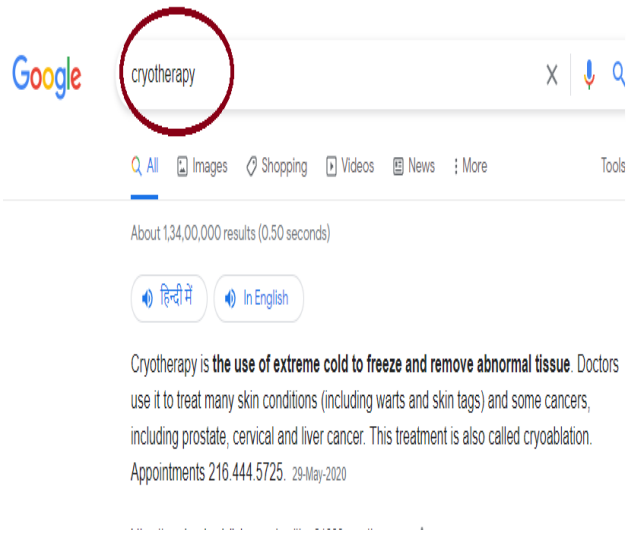
- **Google calculator and converter –** To use these Google's built in functions, simply enter the calculation or conversion you'd like done into the search.



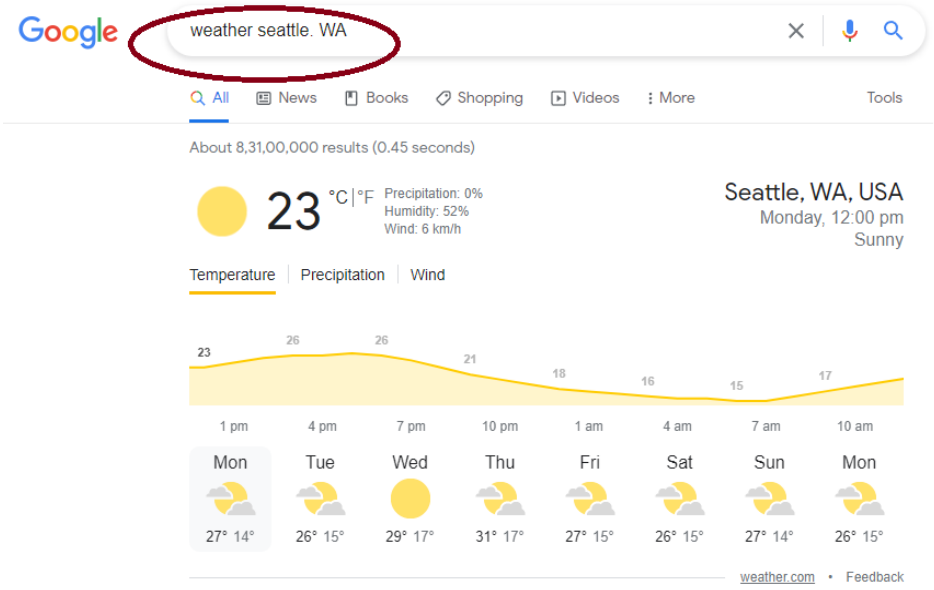
- **Using Google as your dictionary- use define: command**



- **Or use just type your term and click the definition link on the right upper corner of your screen.**



- Going to Seattle for the weekend? Check out the weather using Google – type **weather Seattle WA**



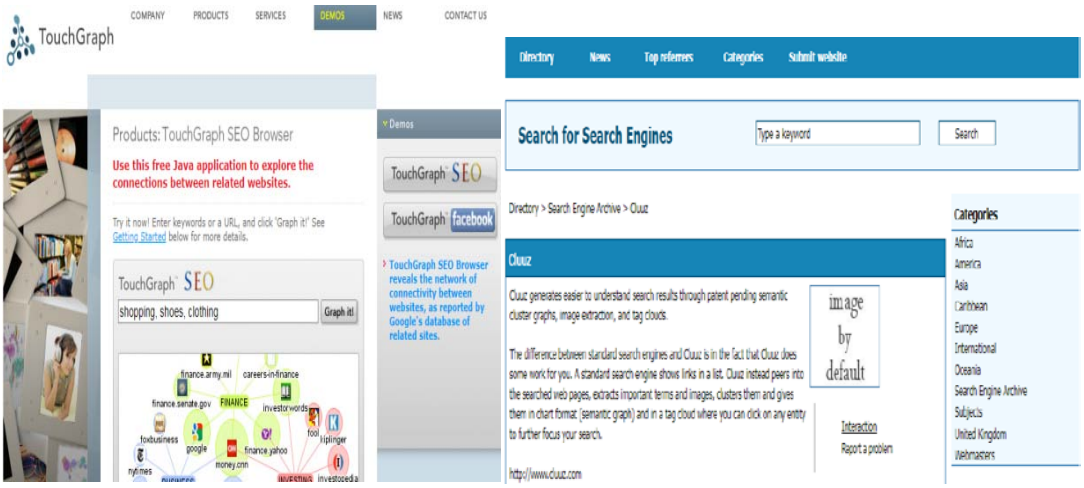
1.6 SPECIFIC SEARCHENGINES

1.6.1 Visual search engines

New concepts in internet searching include visual search engines – **Google image, Bing and TinEye etc.**Visual search engines cluster webpages by topics and present them visually –

larger cluster means more relevant documents, related documents are also interlinked. Rather than a simple textual list of results some search engines will provide content in a visual format. This is great if you want a change, or to view results differently. Following are examples:-

- Cluuz provides network results
- hashtagify.me This is a nice little search feature for hashtags on Twitter.
- oSkope uses Amazon, ebay and Flickr images displayed as thumbnails
- Quintura for kids is an engine offering a tag cloud based on results
- RedZ provides an arc of webpages you can flick through
- Simploos The method of displaying webpages is by horizontal scrolling, with an automatic sliding to make it simple to the searchers.
- Spacetime is like RedZ but larger thumbnails
- TouchGraph for Google
- Yometa takes the results from Google, Yahoo and Bing and displays them in a Venn diagram

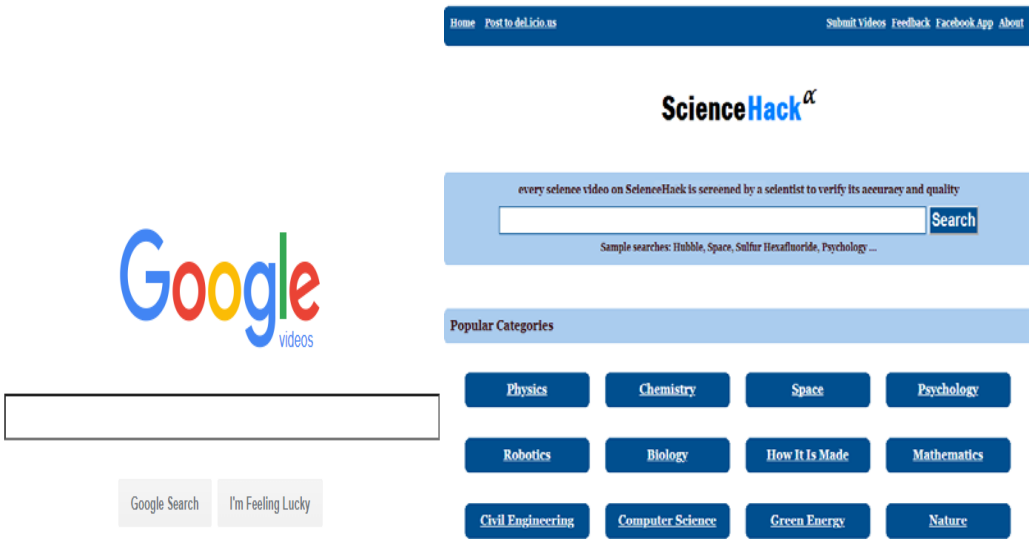


1.6.2 Moving image/video search engines

Plenty of these exist however, including some multi engines. It's also worth checking traditional search engines to see if they offer a tabbed Video search option - many do.

- Blinkx TV video search
- Break for entertaining videos
- Clipblast "the world's largest video search directory"
- CriticalPast Search over 57000 videos and 7 million photos.
- Daily Motion is a YouTube lookalike
- EHow for ‘how to’ videos

- Find any film is a database of films that are available in the UK. It's supported and funded by the UK Film Council and is very impressive.
- Google Video Search for recent television programmes
- Metacafe is similar to YouTube
- OVGuide for videos
- ScienceHack for scientific videos
- TeacherTube for safe, child friendly educational videos
- Ted Talks for well.. Ted Talks really!
- TellyAds for the bits between the shows
- Truveo finds videos for you. That's what it does.
- Veoh for TV shows, movies, anime and more.
- VideoJug is a YouTune lookalike
- Vimeo is a YouTube lookalike
- Yahoo! Video Search broad search
- YouTube is the most well known of these services
- 12Vid for handpicked videos from YouTube



Factual information:-

There are times when only a fact will do. The following are resources that point you towards facts, or will collate facts in a particular area for use. Of course, before using a fact, double check it if necessary!

- Answers.com Good standby. Viewed by many as the resource for facts
- Conversions Convert things into other things using natural language
- Factbites is good for very specific search terms
- FindHow provides information on how to do different things.
- References.net is a good collection of links to excellent resources
- Wolfram Alpha - A "computational knowledge engine," WA searches facts and does calculations based on its own database of "curated" facts
- Zanran helps you to find ‘semi-structured’ data on the web. This is the numerical data that people have presented as graphs and tables and charts.

Academic Resources:-

- ChemSpider for over 10,000,000 chemical structures.
- Google Scholar provides access to scholarly articles
- Lexis Web for legal content
- Mednar for Innovative medical search
- Refseek Academic search engine for students and researchers. Locates relevant academic search results from web pages, books, encyclopedias, and journals.
- Science Accelerator for the US Dept Energy
- Science.gov for US govt. science information
- Science research one stop source for scientific research
- SweetSearch is a Search Engine for Students.
- Vadlo for medical powerpoint content
- Worldwide Science a global science gateway

1.6.3 Image Search Engines:-

- **Behold Searching** 1,040,000 high quality images from Flickr
- Coverbrowser provides access to over 450,000 covers of books, comics 'and more'.
- Everystock photo for free photographs
- Fagan Finder lists several dozen good engines
- Facesaerch for people, with scrolling results

- FlickrStorm is another Flickr search engine.
- Freefoto for free images, over 100,000 of them
- Google Images has over 1 billion indexed
- Iconarchive for 22,000 icons in 800+ sets
- Iconfinder Search through 155,664 icons or browse 765 icon sets. Clear, simple, easy to use.
- Incogna lets you find similar images
- Macroglossa The idea is that you upload your image, it then checks it and works out what it is.
- MorgueFile for free high resolution stock photography
- Ookaboo Free Pictures of Everything on Earth. Nice although small (less than 600K of photographs) collection of free images
- oSkope visual search thru Amazon, ebay, Flickr etc
- Panoramio for local images
- Phrasr is an interactive web-based application that uses Flickr images to illustrate the phrases that users submit.
- PicSearch with 3 billion images
- Pictures and box multi search engine for images
- RevIMG allows you to upload an image and it will find others for you. Limited categories.
- seeklogo. Looking for a logo? This'll help you find it. The database has over 200,000 images available for viewing and downloading.
- Spezify provides a collage of images recently uploaded onto the net.
- Tag Galaxy exciting, innovative interface
- Terra Galleria new, limited resources
- Tiltomo search by subject or colour. New and experimental
- Tineye reverse image search engine
- Vintage Ad browser of over 100,000 adverts
- V like Vintage is an interactive photo community and photo library and image search engine for historical photos.
- WorldImages database provides access to the California State University IMAGE Project. It contains almost 80,000 images,

- Yahoo Search has over 1.5 billion images

1.6.4 Spelling and Words:-

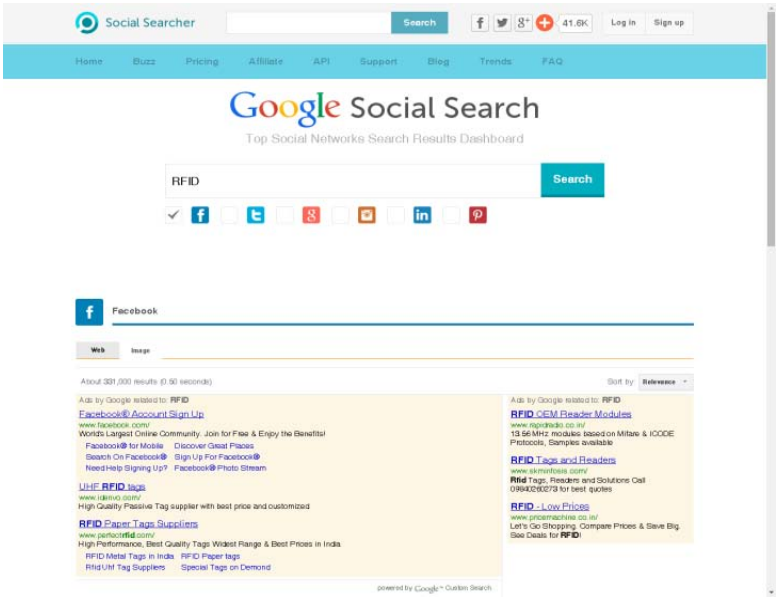
Sometimes you may not know how to spell a particular word. While Google's 'Did you mean' option can be useful, it's not always perfect. Some engines do assist in this though.

- Abbreviations Thousands of abbreviations - impressive!
- Acronym Finder is extremely good
- Anagrams very good utility for finding anagrams.
- Definitions A large database of thousands of definitions
- Dictionary.com can suggest correct spellings for you
- Exalead Advanced search allows you to search for approximate spelling or phonetic spelling
- Lyrics.net for lots of lyrics!
- Online Etymology Dictionary Large and impressive collection
- Phrases.net is all about common phrases, casual expressions and idioms
- Quotes A good selection of quotations.
- The Reverse Dictionary will suggest words based on your suggestions
- Rhymes.net for words that rhyme
- Synonyms Good collection of synonyms, also provides images
- Visuwords Look up words in the Visuwords online graphical dictionary and thesaurus to find their meanings and associations with other words and concepts.
- World Wide Words International English from a UK viewpoint

Search Engines to Use:-

- Google Advanced search for all of the file types mentioned above. The format is term filetype:txt which is to say without a space after the filetype:
- Yahoo Advanced search for .htm .pdf .xls .ppt .doc .txt The format is term filetype:txt OR filetype: txt which is to say you can go with a space or not.
- Bing has a blog post that lists the type of search that can be done with filetypes and extensions.
- There are other search engines that will search for specific types of file for you however.

- Great PDF Search Engine is a pdf search engine for PDF ebooks, manual, catalogs, sheets, forms and documents.
- PDFSearchengine Searches for PDF, CHM, DOC, RTF and TXT files.
- SlideFinder A Search engine for PowerPoint presentations.
- soPDF searches over 435 million PDF files.
- Fagan Finder Search by file format has the option of searching for 17 different file formats from 7 search engines. However, this is now quite elderly, so may not be entirely accurate, but it's still worth a try.



1.7 SUMMARY

Internet searching, how internet works and different types of ways to manage information explosion which is very relevant in the digital era have been described and explained in this lesson. How to develop effective search strategies, specific websites to find specific information beyond Google etc. are the topics discussed.Students will learn how to get right information in the minimum time using various search strategies and relevant databases based upon the information needs.

1.8 GLOSSARY

Information Explosion: a term that describes the rapidly increasing amount of published information and the effects of this abundance of data.

Search Engine: a program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, used especially for finding particular sites on the World Wide Web.

Meta search engine: an online information retrieval tool that uses the data of a web search engine to produce its own results.

1.9 ANSWERS TO IN-TEXT QUESTIONS

1. Meta Search Engine	5. True
2. OPAC	6. Discovery
3. False	7. True
4. False	8. Nested

1.10 SELF-ASSESSMENT QUESTIONS

1. Describe in detail what isa search engine, how it works and different steps of searching in Google?
2. What is Search Strategy and how to develop effective search strategy with suitable examples?

1.11 REFERENCES

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1.12 SUGGESTED READINGS

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