INFORMATION TECHNOLOGY

M.L.I.Sc., Semester – I, Paper-IV

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M.L.I.Sc.,

FOREWORD

Since its establishment in 1976, Acharya Nagarjuna University has been forging ahead in the path of progress and dynamism, offering a variety of courses and research contributions. I am extremely happy that by gaining 'A' grade from the NAAC in the year 2016, Acharya Nagarjuna University is offering educational opportunities at the UG, PG levels apart from research degrees to students from over 443 affiliated colleges spread over the two districts of Guntur and Prakasam.

The University has also started the Centre for Distance Education in 2003-04 with the aim of taking higher education to the door step of all the sectors of the society. The centre will be a great help to those who cannot join in colleges, those who cannot afford the exorbitant fees as regular students, and even to housewives desirous of pursuing higher studies. Acharya Nagarjuna University has started offering B.A., and B.Com courses at the Degree level and M.A., M.Com., M.Sc., M.B.A., and L.L.M., courses at the PG level from the academic year 2003-2004 onwards.

To facilitate easier understanding by students studying through the distance mode, these self-instruction materials have been prepared by eminent and experienced teachers. The lessons have been drafted with great care and expertise in the stipulated time by these teachers. Constructive ideas and scholarly suggestions are welcome from students and teachers involved respectively. Such ideas will be incorporated for the greater efficacy of this distance mode of education. For clarification of doubts and feedback, weekly classes and contact classes will be arranged at the UG and PG levels respectively.

It is my aim that students getting higher education through the Centre for Distance Education should improve their qualification, have better employment opportunities and in turn be part of country's progress. It is my fond desire that in the years to come, the Centre for Distance Education will go from strength to strength in the form of new courses and by catering to larger number of people. My congratulations to all the Directors, Academic Coordinators, Editors and Lesson- writers of the Centre who have helped in these endeavors.

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INFORMATION TECHNOLOGY

M.LISc, Semester – I, Paper-IV

Syllabus

Objectives:
1. To introduce the students to the basics of information technology
2. To acquaint the students with computer technology and its development
3. To acquaint the student with the aspects of computer applications
4. To create awareness on computer software

UNIT - 1
Overview of Information technology: Basics – Components – Application of Information Communication Technology

UNIT - 2
Network Technology - Concepts – Resource Sharing – Topology – Library Networks – Types of Networks: LAN, MAN, WAN – Network Transmission

UNIT - 3
Web Technology - World Wide Web (www) - Internet and Intranet

UNIT - 4
Information Communication Technology - Telecom Technology; Satellite Technology, Reprographic Technology, e-Publishing

UNIT- 5
Application Software : MS office

Books for study and reference:

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5. Chopra, Y.L. & Chopra, Mamta (ed). Challenges before Library and Information science new Millennium. Delhi, Ess, 2001
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32. Somasekhara Rao and others. Eds. Advances in Library and Information Science (Festschrift in honour of Dr Sai Ramesh). Visakhapatnam, Sai Pub., 2008
33. Sooryanarayana, P.S. & Mudhol, M.V. Communication Technology its Impact on Library and Information science. Delhi, Ess Ess. 1999
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INFORMATION TECHNOLOGY

CONTENTS

LESSON - I

OVERVIEW OF INFORMATION TECHNOLOGY: BASICS

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the information technology;
- History of Computer;
- Definition of information technology;
- Significance of information technology in education.

Structure

1.1 INTRODUCTION

Technology has been defined as "systematic knowledge and action, usually of industrial processes but applicable to any recurrent activity". In providing tools and techniques for action, technology at once adds to and draws from a knowledge base in which theory and practice interact and compact. At its most general level technology may be regarded as definable specifiable way of doing anything. In other words, we may say a technology is a codified, communicable procedure for solving problems. Technology, Manfred Kochen observed impacts in three stages. First, it enables us to do what we are now doing, but better, faster and cheaper; second, it enables us to do what we cannot do now; and third, it changes our life styles.

Information technology is a recent and comprehensive term, which describes the whole range of processes for generation, storage, transmission, retrieval and processing of information. An attempt is made to discuss the components of information technology and to identify elements that really matter the investigation and implementation of new information technologies in information systems and services.

1.1.1 Concepts of Information Technology

The term "Information technology" in English is derived from the French word "Informatique" and "Informatika" in Russian encompasses the notation of information handling. IT is a new science of collecting, storing, processing and transmitting information.

The word "Information Technology" is a combination of two words. One is information and other is technology. Information means knowledge, it can be a Bit or a Para or a Page. Technology is science of information handling, particularly using computers to support the communication of knowledge in technical, economic and social fields.

Information technology is a generic term that covers the acquisition, processing, storage and dissemination of information. It involves the application of computers and communication technology in the task of information handling and information flow from the generation to the utilization levels. It is restricted to systems dependent on microelectronics based combination of computers and telecommunication technologies.

1.2 HISTORICAL DEVELOPMENT

Information technology as a technical support for human thinking and communication, has been evolving aver thousands of years. New developments have been rapid over the last few decades. It is only recently that the term has been used as a collection term for the whole spectrum of technologies providing the ways and means to acquire, store, transmit, retrieve and process information.

According Manfred Kochen, any technology develops in three stages "In the first stage, technology enables us to do things, that we have been doing, but to do them better, cheaper and faster. In the second stage, technology provides new capabilities and enables us to do things that we had not been able to do previously. An in the third stage technology becomes an integral part of our activities, if affects the way we do things and changes our life style". Development in computer and communication technology has brought a

new dimension to the program of information handling. The introduction of microprocessor and microcomputers has made things easier. All these developments facilitate better and quicker services to the library user.

1.3   DEFINITION OF IT

Information technology is new technology to apply to the creation, storage, selection, transformation and distribution of information of many kinds. The British department of industry considers information technology as science of handling, particularly computers, used to support the communication of knowledge in technical, economical, and social fields. It is defined as "The acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by microelectronics based combination of computing and telecommunication".

The term 'Information Technology' (IT) has varying interpretations. Macmillan Dictionary of Information Technology defines IT as "the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics-based combination of computing and telecommunications". Two points are worth consideration about this definition:

- The new information technology is seen as involving the formulating, recording and processing and not just transmitting of, information. These are elements in the communication process which can be separated (both analytically and in practice) but in the context of human communication they tend to be intertwined.

- Modem information technology deals with a wide variety of ways of representing information. It covers not only the textual (i.e., cognitive, propositional and verbalised forms, we often think under the head information), but also numerical, visual, and auditory representations.

UNESCO defines Information Technology as "scientific, technological and engineering disciplines and the management techniques used in information handling and processing information, their applications; computers and their interaction with man and machine and associated social, economic and cultural matters" (Stokes).

According to ALA Glossary:-Information Technology (IT) is the application of computers and other technology to the acquisition, organization, storage, retrieval & dissemination of information.
Information Technology (IT) as defined by the information technology-Association of America (ITAA) is "the study design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware. It deals with the use of electronic computers and computer software to convert, store, protect process, transmit, and retrieve information".

1.4   NEED AND IMPORTANCE OF INFORMATION TECHNOLOGY *NEED*

- ➢ Education is a lifelong process therefore anytime anywhere access to it is the need
- ➢ Information explosion is an ever increasing phenomena therefore there is need to get access to this information
- ➢ Education should meet the needs of variety of learners and therefore IT is important in

meeting this need

➢ It is a requirement of the society that the individuals should possess technological literacy
➢ We need to increase access and bring down the cost of education to meet the challenges of illiteracy and poverty-IT is the answer for this

Importance

➢ Access to variety of learning resources
➢ Immediacy to information
➢ Anytime learning
➢ Anywhere learning
➢ Collaborative learning
➢ Multimedia approach to education
➢ Authentic and up to date information
➢ Access to online libraries
➢ Teaching of different subjects made interesting
➢ Educational data storage
➢ Distance education
➢ Access to the source of information
➢ Multiple communication channels-e-mail, chat, forum, blogs etc.
➢ Access to open courseware
➢ Better accesses to children with disabilities
➢ Reduces time on many routine tasks

1.5   INFORMATION TECHNOLOGY IN EDUCATION

Information Technology in Education, effects of the continuing developments in information technology (IT) on education. The pace of change brought about by new technologies has had a significant effect on the way people live, work, and play worldwide. New and emerging technologies challenge the traditional process of teaching and learning, and the way education is managed. Information technology, while an important area of study in its own right, is having a major impact across all curriculum areas. Easy worldwide communication provides instant access to a vast array of data, challenging assimilation and assessment skills. Rapid communication, plus increased access to IT in the home, at work, and in educational establishments, could mean that learning becomes a truly lifelong activity an activity in which the pace of technological change forces constant evaluation of the learning process itself.

1.6   SIGNIFICANCE OF IT IN EDUCATION

1.6.1   Access to variety of learning resources

In the era of technology. IT aids plenty of resources to enhance the teaching skills and learning ability. With the help of IT now it is easy to provide audio visual education. The learning resources are being widened and widened. Now with this vivid and vast technique as part of the IT curriculum, learners are encouraged to regard computers as tools to be used in all aspects of their studies. In particular, they need to make use of the new multimedia technologies to communicate ideas, describe projects, and order information in their work.

1.6.2   Immediacy to information

IT has provided immediacy to education. Now in the year of computers and web networks

the pace of imparting knowledge is extremely fast and one can be educated anywhere at any time. New IT has often been introduced into well-established patterns of working and living without radically altering them. For example, the traditional office, with secretaries working at keyboards and notes being written on paper and manually exchanged, has remained remarkably stable, even if personal computers have replaced typewriters.

1.6.3 Any time learning

Now in the year of computers and web networks, the pace of imparting knowledge is very fast and one can be educated .One can study whenever he wills irrespective of whether it is day or night and irrespective of being in India or in US because of the boom in IT.

1.6.4 Collaborative learning

Now IT has made it easy to study as well as teach in groups or in clusters.Online we can be united together to do the desired task. Efficient postal systems, the telephone (fixed and mobile), and various recording and playback systems based on computer technology all have a part to play in educational broadcasting in the new millennium. The Internet and its Web sites are now familiar to many children in developed countries and among educational elites elsewhere, but it remains of little significance to very many more, who lack the most basic means for subsistence.

1.6.5 Multimedia approach to education

Audio-Visual Education, planning, preparation, and use of devices and materials that involve sight, sound, or both, for educational purposes. Among the devices used are still and motion pictures, filmstrips, television, transparencies, audiotapes, records, teaching machines, computers, and videodiscs. The growth of audio-visual education has reflected developments in both technology and learning theory.

Studies in the psychology of learning suggest that the use of audio-visuals in education has several advantages. All learning is based on perception, the process by which the senses gain information from the environment. The higher processes of memory and concept formation cannot occur without prior perception. People can attend to only a limited amount of information at a time; their selection and perception of informa- tion is influenced by past experiences. Researchers have found that, other conditions being equal, more information is taken in if it is received simultaneously in two modalities (vision and hearing, for example) rather than in a single modality. Furthermore, learning is enhanced when material is organized and that organization is evident to the student.

1.6.6 Authentic and up to date information

The information and data which are available on the net is purely correct and up to date. Internet, a collection of computer networks that operate to common standards and enable the computers and the programs they run to communicate directly provides true and correct information.

1.6.7 Online library

Internet supports thousands of different kinds of operational and experimental services one of which is online library. We can get plenty of data on this online library. As part of the IT curriculum, learners are encouraged to regard computers as tools to be used in all aspects of their

studies. In particular, they need to make use of the new multimedia technologies to communicate ideas, describe projects, and order information in their work. This requires them to select the medium best suited to conveying their message, to structure information in a hierarchical manner, and to link together information to produce a multidimensional document.

1.6.8   Distance learning

Distance Learning, method of learning at a distance rather than in a classroom. Late 20th-century communications technologies, in their most recent phases multimedia and interactive, open up new possibilities, both individual and institutional, for an unprecedented expansion of home-based learning, much of it part-time. The term distance learning was coined within the context of a continuing communications revolution, largely replacing a hitherto confusing mixed nomenclature home study, independent study, external study, and, most common, though restricted in pedagogic means, correspondence study. The convergence of increased demand for access to educational facilities and innovative communications technology has been increasingly exploited in face of criticisms that distance learning is an inadequate substitute for learning alongside others in formal institutions. A powerful incentive has been reduced costs per student. At the same time, students studying at home themselves save on travel time and other costs.

Whatever the reasoning, distance learning widens access for students unable for whatever reason (course availability, geographical remoteness, family circumstances, individual disability) to study alongside others. At the same time, it appeals to students who prefer learning at home. In addition, it appeals to organizers of professional and business education, providing an incentive to rethink the most effective way of communicating vital information.

1.6.9   Better access to children with disabilities

Information technology has brought drastic changes in the life of disabled children. IT provides various software and techniques to educate these poor peoples. The integration of information technology in teaching is a central matter in ensuring quality in the educational system. There are two equally important reasons for integrating information technology in teaching. Pupils must become familiar with the use of information technology, since all jobs in the society of the future will be dependent on it, and information technology must be used in teaching in order to improve its quality and make it more effective.

1.7   INFORMATION TECHNOLOGY AND MODERN SOCIETY

The information society challenges the education system. In recent years, the speedy, effective and global communication of knowledge has created a new foundation for co-operation and teamwork, both nationally and internationally. The increasing role played by information technology in the development of society calls for an active reaction to the challenges of the information society.

Already, new and greater demands are being made as to the core qualifications of individuals, as well as to their understanding and knowledge of the consequences of the introduction of information technology for the work and organisation of a company. Companies are no longer forced to gather all their functions in one place. The knowledge-intensive functions such as development and marketing can be sited in countries where the labour market can supply highly educated employees, whilst production itself can be moved to low wage countries. The result is the efficient handling, processing, co-ordination and administration of company

resources, which is decisive for the competitiveness of the company. In a society which is becoming increasingly dependent on information and the processing of knowledge, great demands are therefore made that the individual should have a solid and broad educational foundation on which to build. Educational policy in the information society must ensure that:

➢ IT qualifications are developed by means of their integration in all activities in the education sector and
➢ The individual citizen must have an active and critical attitude to developments and not passively allow technological development to set the pace.

1.8 IT EDUCATIONAL POLICY MUST ENSURE

▪   Up-to-date qualifications in the information society
▪   Up-to-date qualifications gained against the background of a high general level of education to maintain competitiveness and its share of the global labour market in the information society. IT skills and IT understanding are thus central prerequisites for the individual, both now and especially in the future.

The advantage of using information technology is that time-consuming work routines can increasingly be performed by means of this technology and time can thus be devoted instead to communicating and informing, to the processing of information and the production of knowledge.

1.9   TECHNICAL TERMS

ITAA: Information Technology Association of America

1.10   SELF ASSESSMENT QUESTIONS

1.   What is Information Technology?
2.   What are the significance of Information Technology in Education?
3.   Definition of Information Technology.

1.11   SUGGESTED READINGS

1.   http://www.expertsmind.com/questions/introduction-to-information-technology-30120532.aspx
2.   http://en.wikipedia.org/wiki/Information_technology
3.   http://wikieducator.org/Need_and_Importance_of_Information_Technology_in_Education
4.   http://neerajmishra.wordpress.com/2008/07/21/information-technology-it-in-india-the-challenges-future-scope/
5.   http://www.smallbusinessbible.org/advan_disadvan_informationtechnology.html(Accessed on :10/10/2012 at:1.19PM)
6.   http://amiree.files.wordpress.com/2010/07/basic-concepts-on-information-technology.pdf
7.   http://www.guruischool.com/it/CompofIT.htm (Accessed on 8/11/2012 at: 11.19AM).

LESSON - 2
COMPONENTS OF INFORMATION TECHNOLOGY:HARDWARE

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:

- Understand the components of IT;
- Computer Hardware-Input & Output devices;
- Software-System Software & Application Software
- Also you will come to know how these components are integrated with each other.

Structure

2.1   INTRODUCTION

Information and communication technology today usually means computer-based management of data or ideas. In a broader sense, communication and information technologies are the foothold on which humankind distinguished itself from other animals.

The vast difference between today's information and communications technologies and humankind's first simple shared concepts hints at what these technologies now mean for our world. For you, the explosion of information and technologies exposes a wealth of new opportunities to explore. Information communication technology has five components which are describe below:

2.2   HARDWARE

The term hardware refers to the physical components of computer such as the system unit,

mouse,keyboard, monitor etc. Hardware is any physical part of a computer that you can see or touch. A computer's monitor, CD-ROM or DVD drive, mouse, keyboard, and printer are all different types of hardware. In this Chapter we will takes a closer look at the physical parts that constitute a computer. This Chapter is broken up into several sections, since there are several different categories of hardware devices. First we'll examine processing devices, such as computer's CPU and memory. You'll finally understand whatthose technical sounding words megahertz and gigabyte mean. From there we'll move on to input devices, such as the keyboard and mouse and output devices, such as the monitor and printer. The last part of this Chapter discusses about storage devices, such as hard drives and CD-ROM drives.

Hardware Components

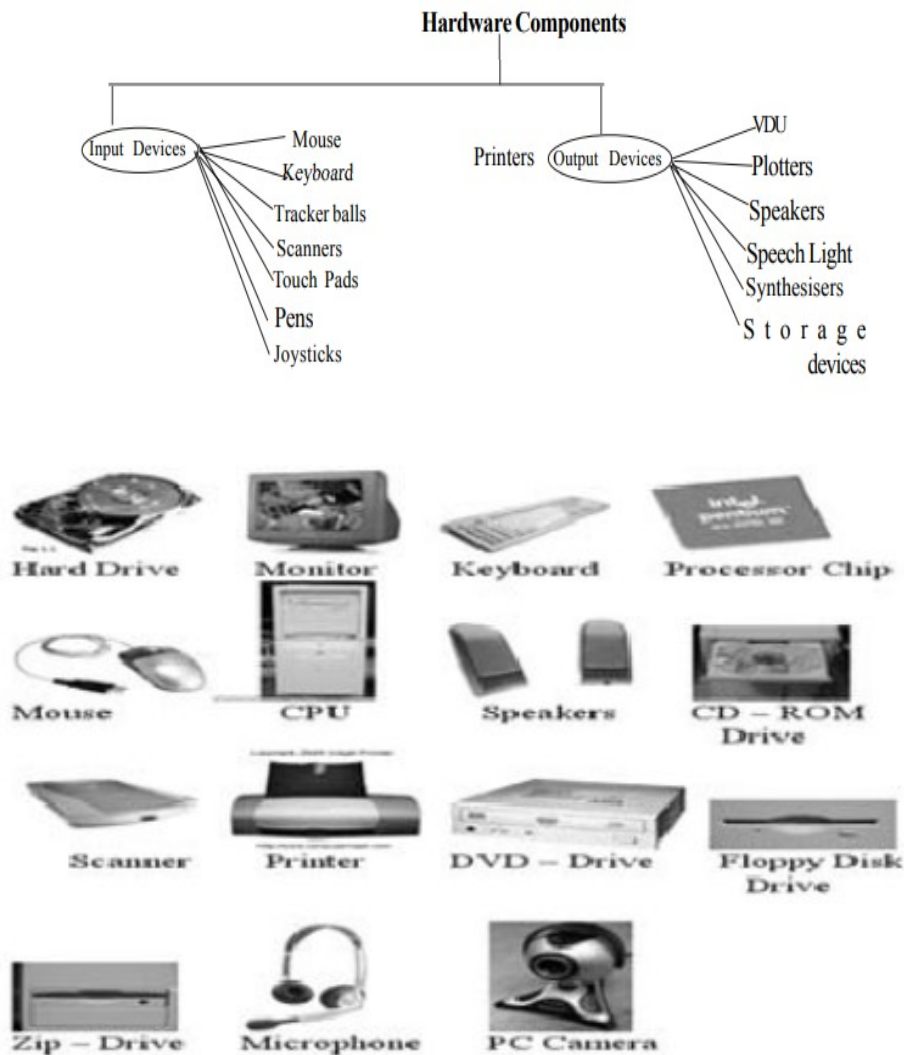**2.2.1 Input Devices** – "How to tell it what to do"
A keyboard and mouse are the standard way to interact with the computer. Other devices includejoysticks and game pads used primarily for games.

2.2.2 Output Devices – "How it shows you what it is doing"
The monitor (the screen) is how the computer sends information back to you. A printer is also anoutput device.

2.3 SOFTWARE

The software is the instruction that makes the computer work. Software is held either on your computer's hard disk, CD-ROM, DVD or on a diskette (floppy disk) and is loaded (i.e. copied) from the disk into the computers RAM (Random Access Memory), as and when required. Generally there are two types of software as followed:
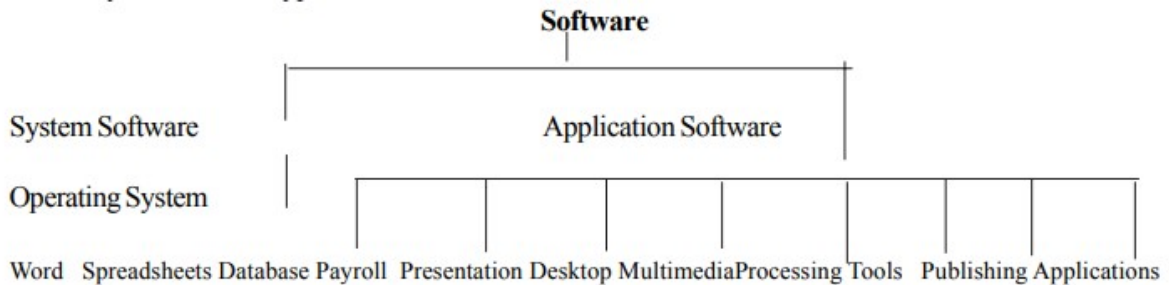

2.3.1 Application Software:
- Application software is a subclass of computer software that employs the capabilities of a computer directly to a task that the user wishes to perform. This should be contrasted with system software which is involved in integrating a computer's various capabilities, but does not directly apply them in the performance of tasks that benefit the user.

- An application is a computer program designed to help people perform an activity. An application thus differs from an operating system (which runs a computer), a utility (which performs maintenance or general-purpose chores), and a programming language (with which computer programs are created).

2.3.2 System Software:
- System software is a generic term referring to any computer software whose purpose is to help run the computer system. Most of it is responsible directly for controlling, integrating, and managing the individual hardware components of a computer system.
- System software is opposed to application software that helps solve user problems directly.
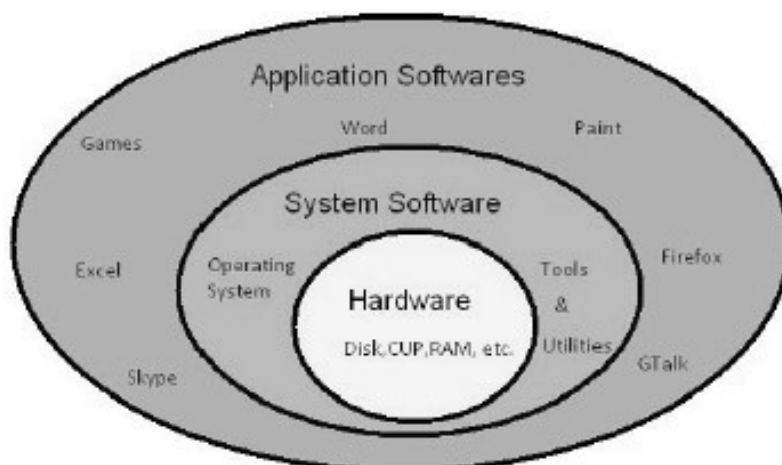
2.4 PROCEDURE

A set of instructions that performs a specific task for a main routine, requiring direction back to the proper place in the main routine on completion of the task. Computer data processing is any process that uses a computer program to enter data and summarise, analyse or otherwise convert data into usable information. It involves recording, analysing, sorting, summarising, calculating, disseminating and storing data. Because data are most useful when well-presented and actually informative, data-processing systems are often referred to as information systems. Nevertheless, the terms are roughly synonymous, performing similar conversions; data-processing systems typically manipulate raw data into information, and likewise information systems typically take raw data as input to produce information as output.

2.5 DATA

Data are values of qualitative or quantitative variables, belonging to a set of items. Data in computing (or data processing) are represented in a structure, often tabular (represented by rows and columns), a tree (a set of nodes with parent-children relationship) or a graph structure (a set of interconnected nodes). Data are typically the results of measurements and can be visualised using graphs or images. Data as an abstract concept can be viewed as the lowest level of abstraction from which information and then knowledge are derived. *Raw data*, i.e., unprocessed data, refers to a collection of numbers, characters and is a relative term; data processing commonly occurs by stages, and the "processed data" from one stage may be considered the "raw data" of the next. Field data refers to raw data collected in an uncontrolled insitu environment. Experimental data refers to data generated within the context of a scientific investigation by observation and recording.

The word *data* is the plural of *datum*, neuter past participle of the Latin *dare*, "to give", hence "something given". In discussions of problems in geometry, mathematics, engineering, and so on, the terms *givens* and *data* are used interchangeably. Such usage is the origin of *data* as a concept in computer science or data processing: data are numbers, words, images, etc., accepted as they stand. Though data is also increasingly used in humanities (particularly in the growing digital humanities), it has been suggested that the highly interpretive nature of humanities might be at odds with the ethos of data as "given". Peter Checkland introduced the term *capta* (from the Latin *capere*, "to take") to distinguish between an immense number of possible data and a sub-set of them, to which attention is oriented. Johanna Drucker has argued that since the humanities affirm knowledge production as "situated, partial, and constitutive," using *data* may introduce assumptions that are counterproductive, for example that phenomena are discreet or are observer-independent. The term *capta*, which emphasizes the act of observation as constitutive, is offered as an alternative to *data* for visual representations in the humanities.

The terms data, information and knowledge are frequently used for overlapping concepts. The main difference is in the level of abstraction being considered. Data is the lowest level of abstraction, information is the next level, and finally, knowledge is the highest level among all three. Data on its own carries no meaning. For data to become information, it must be interpreted and take on a meaning. For example, the height of Mt. Everest is generally considered as "data", a book on Mt. Everest geological characteristics may be considered as "information", and a report containing practical information on the best way to reach Mt.

Everest's peak may be considered as "knowledge".

Information as a concept bears a diversity of meanings, from everyday usage to technical settings. Generally speaking, the concept of information is closely related to notions of constraint, communication, control, data, form, instruction, knowledge, meaning, mental stimulus, pattern, perception, and representation. Beynon-Davies uses the concept of a sign to distinguish between data and information; data are symbols while information occurs when symbols are used to refer to something.

It is people and computers who collect data and impose patterns on it. These patterns are seen as information which can be used to enhance knowledge. These patterns can be interpreted as truth, and are authorized as aesthetic and ethical criteria. Events that leave behind perceivable physical or virtual remains can be traced back through data. Marks are no longer considered data once the link between the mark and observation is broken.

Mechanical computing devices are classified according to the means by which they represent data. An analog computer represents a datum as a voltage, distance, position, or other physical quantity. A digital computer represents a datum as a sequence of symbols drawn from a fixed alphabet. The most common digital computers use a binary alphabet, that is, an alphabet of two characters, typically denoted "0" and "1". More familiar representations, such as numbers or letters, are then constructed from the binary alphabet.

Some special forms of data are distinguished. A computer program is a collection of data, which can be interpreted as instructions. Most computer languages make a distinction between programs and the other data on which programs operate, but in some languages, notably Lisp and similar languages, programs are essentially indistinguishable from other data. It is also useful to distinguish metadata, that is, a description of other data. A similar yet earlier term for metadata is "ancillary data." The prototypical example of metadata is the library catalog, which is a description of the contents of books.

2.6 People

Last component of information technology is user, who use computer for their personal purpose. People use computers as they make their jobs easier. They can be used for communicational purposes (internet), to store and calculate data and to write up massive documents multiple times while only needing to write it up once. Others use computers for entertainmen value; to play games, watch movies and play music etc. Computers are also more convinient and reliable than the older ways of doing things, like type writers, scales and other counting devices.

2.7   TECHNICAL TERMS
RAM: Random access Memory
URL: Universal Resource Locator

2.8   SELF ASSESSMENT QUESTIONS

1. Explain in brief components of IT.
2. What is input & output devices?
3. Enumerate the types of software packages.

2.9   SUGGESTED READINGS

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Example. (Quantitative Applications in the Social Sciences, no. 07-085).
Sage Publications.
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<div align="center">

LESSON - 3

APPLICATION OF INFORMATION COMMUNICATION TECHNOLOGY

</div>

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the application of information communication technology;
- Concept of ICT;
- Definition of ICT;
- ICT Enabled Library Services

Structure

3.1 INTRODUCTION

Information needs and diverse information tools have affected our daily life as well as research and developmental activities. Latest devices for information communication have resulted in the expeditious dissemination of information and revolutionized the information handling activities in research and academic libraries in India. Academic libraries, mostly attached to universities and research institutions as centers of information services, have largely benefited by the rapid changes in technology. The advent of digital computer advances in telecommunication and audiovisual technologies has opened up new ways of collecting, organizing and disseminating scientific and technical information. Academic libraries have already transformed their specific functions by utilizing effectively innovative information technologies to enhance and integrate their specific information resources and services. Eventually, library and information professionals in academic libraries need to update their knowledge and skills in information and communication technology (ICT) as they play the role of key success factor in enabling the library to perform its role as an information support system for society.

3.2 CONCEPT OF ICT

ICT is technology that supports activities involving information. Such activities include gathering, processing, storing and presenting data. Increasingly these activities also involve collaboration and communication. Hence IT has become ICT: information and communication technology.

Some underlying principles

- Technology does not exist in isolation

- ICT contributes at various points along a line of activity

- ICT is used in activities – the ICT use depends on the activities

- The key outputs of educational activities are context are knowledge, experience and products

- The output should be useful to the users (self and others)

3.3 DEFINITIONS

Definitions of important terms are as follows:

Oxford Dictionary and Thesaurus (2001) defines impact as immediate effect or influence, or consequence. The Webster's New World College Dictionary (2005) defines impact as the power of an event, idea, etc., to produce changes, move the feelings, etc. Collins Dictionary (1987) terms it as profound effect or collision. The term Information Technology (IT) is commonly used to mean a combination of computer and communication technologies used for information storage and dissemination. In an academic environment, the term ICT or Information Communication Technology is more commonly used. It is generally used both as singular and plural nouns. There are

various definitions for ICT and a few that are relevant to this study are described here. In the UNESCO training module for ICT, Information Communications Technologies (ICT) are described as the technologies that enable society to create, collect, consolidate, communicate, manage and process information in multimedia and various digital formats for different purposes, i.e., computing and telecommunications technologies like the personal computer, CDROM, cable TV, cellular phones and the Internet (David, 2001).

Information communication technologies can be split into three components: the technology part; information that the technology helps deliver; and a communication process that the technology facilitates and serves as a medium for the information. (Rhine, 2006). Hamelink (1997) classifies ICT according to five different functionalities-capturing technologies (like input devices), storage technologies (magnetic tapes and disks), processing technologies (systems and application software), communication technologies and display technologies (e.g. output devices for display of digitized information).

3.4   ICT AND LIBRARIES

Libraries which were considered only as the storehouses of knowledge, have got a new outlook in the modern Information Communication Technology era. The activities which were carried out manually in libraries with so much of pain and strain are being carried out smoothly with the help of ICT with greater effectiveness. Library organization, administration and other technical processing have become easier and more quantum of work can be done in relaxed mood. ICT, which is the basis for the MBO, generates more results at a given time.

3.5 ICT ENABLED CONVENTIONAL LIBRARY AND INFORMATION SERVICES

3.5.1   *Online public access catalogue and user services*

Library catalogue is perhaps the most important tool for locating material in the Library. Unfortunately until recently its value has been restricted by its physical form, most commonly a large card catalogue or a set of printed volumes. The advent of computers, with their ability to process large amounts of information and output in a variety of formats has finally brought the library to the customer, wherever he or she may be located, in the form of Online Public Access Catalogue (OPAC).

OPAC provides access to the catalogue through a computer terminal. OPAC allows searching the entire catalogue online, conveniently and quickly, using one or more search criteria. One can, for example, search by author, title, keywords, class number or one or more of these combined together. OPAC even shows the current status of a book, whether it is loaned out, available on the shelf or lying elsewhere. Another advantage of OPAC is its ability to display catalogue records in a variety of formats such as *AACR2, MARC* etc, and the records can be displayed in a desired order. For example one can display records arranged (sorted) by author, title or call number. Most library management packages offer printing of bibliographies from OPAC either on a printer or on a file. An OPAC terminal should be equipped with search software, which is usually part of integrated library management systems such as LibSys, EasyLib, NewGenLib, SOUL, Sanjay etc. Some integrated library management packages even use OPAC for other user services like

reservation,membership enquiry and registration, interlibrary loans etc.

3.5.2 Information Services

Some of the important changes that developments in ICT have brought about in information services are:

1. Changes in formats, contents and methods of production & delivery of information products, and a new business model for use of information products. This requires procedural and infrastructural changes and cost implications in Libraries.
2. Emergence of Internet as the largest repository of information and knowledge.
3. Extinction or significant transformation of some of the conventional information services such as pressclippings, contents pages, company information etc.
4. Use of new tools and technologies for dissemination of information.
5. Transformation of role of LIS professional as the subject specialist and end-user gets directly involvedin the information work and consequent need for new skills.
6. Shift from physical to virtual services that offer convenience of time and location for access to services.

In the following paragraphs we will now briefly discuss a few types of information services viz. Reference service, Bibliographic Service, and Current Awareness Service in ICT enabled environment. Some new information services are described later.

3.5.3 Reference Service:

Asynchronous tools such as email, subject gateways, FAQs, and electronic libraries and interactive tools like chat rooms, virtual reference desk, and ask-me are replacing the conventional means of post, phone or in-person reference enquiries. *Ask-a-Librarian* allows the user to click on *ask-a-librarian* link to send a formatted enquiry to the reference librarian. The reference librarian either provides an answer, links to resources or link to a subject expert. Interactive tools now allow a reference interview online.

3.5.4 Bibliographic Service:

Compilation of bibliographies, reading lists and state-of-art reports are very parts of LIS

work, particularly in research and academic libraries. Browsing through the manual indexes and abstracts is a tedious and time consuming work, and does not always produce up to date result. Availability of databases in electronic form on CDROM or online, offers convenient, efficient and cost effective information retrieval. Electronic databases also provide unique search features such as searching on multiple criteria (key-word, subject, author, source, classification code, year of publication, language etc.), and variety of display formats & styles. Advance features like natural language query ranking the search results in also available in many databases. Web based services facilitate full text searches and link to full text of the documents. *Dialog, STN* and *Silver Platter* are some of the popular database companies that offer bibliographic and reference databases on CDROM and Online platforms.

3.5.5 Current Awareness Service:

Current Awareness Services has been important means for keeping the users up to date in their

areas of interest. A current awareness service may be as simple as copy of table of contents or a bulletin containing bibliographic records, of articles selected from the current issues of journals and other material, and usually organized by subjects. Libraries now compile current awareness bulletins using predefined search strategy and running on the database either on CDROM or online periodically and getting the desired output. Subject to copyrights, the output can also be stored on a local system, and disseminated online (internet, intranet) and offline (print, CDROM, email). Table of contents of most journals are available free from the publishers' sites. Some publishers even offer free email update of table of contents. A large number of lectronic publishingsites or portals now offer current information via email to registered users. For example one can register on New York Times newspapers to receive summary of news on daily basis.

Internet has enabled a lot of innovations in contents, methods of production and distribution of current awareness products. Tools such as Listserv, Weblog, Webzines and e-news letters are common. Listserv give the latest information, hot topics, ideas and opinions, a chance to discuss issues, a source of advice and assistance. Weblogs literally log the web. They review, select and package the latest relevant information, in a subject area. Some examples of web based current awareness service are The NSDL Scout Report for Math, Engineering, and Technology (http://scout.wisc.edu/Reports/NSDL/MET/Current/) and Free Pint (www.freepint.com) are examples of web based current awareness services.

3.5.6 Document Delivery

It is not possible for libraries to have everything that its clients may need. Libraries use document delivery services from other libraries and commercial organizations for copies of research papers etc not held by them. Locating a source and procuring the document requires considerable time and efforts and the process is laden with uncertainties. ICT has made the document delivery services very simple and reliable. From searching the holdings to ordering and delivery have been benefited by the use of ICT. A large number of libraries now host their up to date holdings on their website and can be searched on internet. Many library networks such as INFLIBNET and DELNET maintain union catalogue of their member's journal holdings. One such document delivery service provider British Library Document Supply Service (BLDSC) offers a flexible system of receiving orders and tracking. BLDSC's email based document supply system Artmail allows registered users to send requests through a formatted email that automatically is processed by BLDSC's system, which generates location of the sources. The documents can be received in print as well as electronic format. Online and web based database services such as STN provides link to document delivery services of their own or a third party. Some of the commercial document delivery services are Ingenta (http:// www.ingenta.com/), and BioMedNet, OCLC (www.oclc.org/) and Science Direct (http:// www.scienceDirect.com). Full text of electronic journal articles that are available in electronic form may also be downloaded through links provided by aggregator or gateway services such as *Informatics's J-gate* (www.j-gate.informindia.co.in/). Electronic journals are discussed later in this unit.

3.5.7 Inter-Library Loans and Union Catalogues

As described earlier, no library can fulfill all the needs of its users from its collection. Resource sharing through Inter-library loan is a necessity for the libraries. Access to the catalogue of partner libraries is crucial to inter-library lending. Union catalogues, standardization and machine

readable catalogues are aimed at promoting resource sharing. Printed union catalogues and Computer Output on Microfiche (COM) catalogues and CDROM are now being replaced by web OPAC and web based union catalogues. Librarians can now access catalogues of thousands of libraries across the world using Internet. Developments in digital library and internet technologies have made it possible to automatically update the catalogue records from member library systems, distributed searches using a single user interface, and value added services. *RedLightGreen.* (http://www.redlightgreen.com/) is one of the world's largest web based union catalogues. It. contains about 130 million records from 160 member libraries of *Research Libraries Group (RLG)* in USA. In India, bodies like *INFLIBNET, DELNET* are also developing union catalogues of books, serials and theses.

3.5.8 *Audiovisual Services*

Audiovisual materials are important sources of information, education and entertainment. Many libraries particularly media libraries and large academic and public libraries hold audio visual material such as music, films, pictures and photographs etc. Old media of LP records and tape slide have long been replaced with audio and video tape. The new multimedia of audio CD, Video CD (VCD), and Digital Video Disks (DVD) have advantage of higher storage capacity, random access and longer life than audio and video tapes and cassettes. Many libraries allow their members to borrow these. Multimedia documents can now be played on standard PCs, stand-alone or networked. Recent developments in storage media, compression and encryption technology have made it possible to store large amount of multimedia documents on hard disk and disseminate through internet. Software such as Quick Time Player, Microsoft Media Player etc are now freely available to play or see these documents in a browser. You will learn more about various hardware, software and document formats that are used for creation, storage, distribution and use of digital multimedia documents later in the course.

3.6 CUSTOMER RELATIONS AND USER EDUCATION

LIS being service organization, customer services and user training are important aspects of its activities. A continuous interaction with users for feedback and information is a must to maintain the standards of service. While the conventional means of interaction such as meetings, suggestion box, surveys and interviews are still important, use of new means of communications such as email, web forms, bulletins boards, discussion forums and listserv are fast replacing these. Not only these tools provide a fast, convenient and transparent and cost effective medium, but also offer scope for innovations and greater peer participation. Some of these tools can even be used by the libraries to involve the users in book selection etc. LIS customer relations can be tremendously improved by innovative use of technology like virtual library tours, making interactive library maps and floor plan available on the library web site. A highly ICT enabled environment requires appropriate training to its users also. The contents of user training must include use of internet tools and resources. Conventional user education programmes can be supplemented with web based instructions and guides for use of resources. In the conventional class room based user education also ICT tools are used for presentation and demonstration.

A library web page or Universal Resource Locator (URL) facilitates single window access to various web enabled library services. A URL could be as simple as a library web page listing the services with some links to catalogue and external free and subscribed resources or may include advance features like interactive helps and value added services such as subject gateways, self-help

tools and frequently asked questions, and information about the library such as timings, calendar, rules etc can be hosted on the library web site. Apart from the ICt enabled conventional services, Libraries are making use of potential of internet and computing power to provide new and innovative services. In a web enabled environment the new LIS services can be grouped into the following three categories:

- Providing access to internet and internet based services
- Providing access to web based resources
- Providing access local or internal information resources in digital form

3.7 INTERNET ACCESS

Internet is not only a medium for digital communication but also the world's largest repository of information. However, under developed internet infrastructure in a country like India, poses a serious challenge to growth of ICT enabled services. Large segment of user groups may still be deprived of personal access to internet facility. Libraries, therefore, provide free or controlled access to internet and email. Depending upon the availability users can be given time slots for use of internet facility. Usually a few internet enabled terminals are provided in the library that can be used by the visitors for internet access and email etc.

3.8 ACCESS TO WEB BASED RESOURCES

As already discussed, many types of library materials such as journals, books, patents, newspapers, standards, photographs, pictures, motion pictures or music are now available in electronic or digital form. From the user's point of view digital resources hold many advantages such as time and place convenience, timeliness, ability to search directly on text (as against the catalogue records), ability to link to further reading material, and ability to disseminate and share information. From the library's point of view digital format offers convenience of storage and maintenance, cost advantage, ability to target global users, etc. However, digital resources also pose human, social and technological problems, such as discomfiture in reading on the screen, problems in internet access and speed, poor infrastructure, lack of sufficient skills to use the digital resources, and perceptional change resulting from right to use rather than physical possession, etc. In this section, we will briefly discuss various some types of library materials such as journal, books, theses & dissertations, patents, course material etc.

E-Journals:

Libraries have been exploring easy to cope with the problems of ever increasing prices of the journals, space requirements and decreasing level of usage as the journals get older. Nevertheless, libraries are required to maintain back issues of the journals, usually in bound form. Electronic Journal helps the librarians in addressing these problems to a great extent without significantly affecting the service levels. Electronic Journals can be accessed via internet from any web enabled PC. Depending on the type of subscription, one or more users can access the service simultaneously, either directly from an independent web enabled PC or in a local area network through a proxy server (IP addresses based access). Electronic journals also offer benefit of full text searching and downloading of articles. Many publishers of electronic journals offer their journals through consortia of libraries at much lower rates. *INDEST (Indian Digital Library of*

Engineering, Science and Technology), and *INFLIBNET*are two such consortia operating in India. Access to articles in electronic journals can also be made through aggregator services which offer searchable databases of contents of e-journals from several publishers, and links to journal site for full text. Emerald, OCLC and J-Gate are some of the example of e-journal aggregator services. The main disadvantage of electronic journal is that libraries can not physically possess the journals.

have also implemented Electronic Theses and Dissertation programmes, where researchers submit theses

In addition to above meaning of reprographic there are few meanings of reprographics are givenbelow:

> ➢ Reprographics generally refers to methods of copying or reproducing documents that includexerography and scanning. The term applies to both soft and hard copy reproduction.

> ➢ Reprographics is a general term used to refer to multiple methods of reproducing content both physical and digital which include xerography, photography, scanning and digital printing.Systems Ltd, Endeavor Information Systems , Epixtech, ESP, Ex Libris ,Fretwell-Downing Informatics, IBM, Sirsi, and SydneyPlus. Greenstone (http://www.greenstone.org) is a leading open source digital library management software.

3.9   Impact of Information Communication Technology on Libraries

The Exponential rise in generation of new information, especially Scientific and Technological information since World War II has gradually reduced the effectiveness of the traditional tools and retrieval aids used by librarians. We are now in the age of information technology revolution along with information explosion. Due to information explosion, automation of library service is imperative for efficiency and effective working of library and information center. The automation is defined as a technique of making, a process ora system operates automatically. Though generally library automation may mean use of suitable machines to perform the activities of library mechanically without much manual or mental efforts by human beings, today library automation signifies "mechanization of library house keeping operations predominantly by computerization". The most commonly known house keeping operations are acquisition control, serialscontrol, cataloguing and circulation control. In recent times, even the related topics such as informationretrieval, semi-automation, automatic indexing and networking of automated systems are also treated as part of library automation. Although computers have a major role in library automation, telecommunication and reprographic technology have an equally important role because of the extent of support they offer. Most of the Library and Information Centres (LICs) of India have started using computers and Information Communication Technologies in organising their collections, housekeeping operations, processing, retrieval and dissemination of information to the end users. The use and impact of ICTs is now visible in Indian library and information centres which may be due to the drastic reduction /escalation of the cost of hardware and software and their easy availability in the markets with service support from the suppliers or

venders.

The impact of IT is also evident on the activities of many LICs associated with universities and other institutions of the national importance. Thanks to University Grants Commission for establishing INFLIBNET which have been playing an important role since its inception for initiating the automation and networking activities of library and information centres of universities, colleges, R&D laboratories, and various institutions of higher learning. So far 142 universities have been covered under the INFLIBNET Programme which enables the university libraries to purchase computers, modem, printer, air –conditioner, software (Operating and application software) and get telephone connectivity etc. The recurring grant is also provided for meeting the expenses of data support work, salary of Information Scientist, telephone charges for accessing INFLIBNE Databases through Internet and maintenance charges for first five years from the date of installation of systems.

3.10 Technical Terms

ETD: Electronic Theses and Dissertations

ICT: Information Communication Technology

RIG: Research Libraries Group

BLDS: British Library Document Supply Service

COM: Computer output on Microfiche

3.11 Self Assessment Questions

1.   Explain the concept of ICT.

2.   Describe ICT enabled library services.

3.   Write any two definitions of ICT.

3.12   SUGGESTED READINGS

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      95820-4.
3.   Akash Mitra (2011). ”Classifying data for successful modeling”.
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5.   P. Beynon-Davies (2009). Business information systems. Basingstoke, UK:Palgrave. ISBN 978-0-230-20368-6.

LESSON - 4
NETWORK TECHNOLOGY-CONCEPTS

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the basics of network technology;
- Components of computer network;
- Types of networks;
- Categories of network.

4.1 INTRODUCTION

A network is actually a set of independent computers that talk with one another over a common network medium. A computer network is a combination of two or more connected computers. With the help of this connected network, people can share files and peripherals such as modems, printers, tape backup drives, or CD-ROM drives. When networks at many locations are connected using services available from phone companies, people can send e-mail, share links to the global Internet, or conduct video conferences in real time with other remote users. An open source network can be managed properly with online collaboration software. Nowadays, companies rely heavily on applications like electronic mail and database management for core business operations thus making computer networking indispensable.

4.2 COMPONENTS OF COMPUTER NETWORK

A computer network comprises the following components:

- A minimum of at least 2 computers
- Cables that connect the computers to each other, although wireless communication is becoming more common (see Advice Sheet 20 for more information)
- A network interface device on each computer (this is called a network interface card or NIC)
- A 'Switch' used to switch the data from one point to another. Hubs are outdated and are little used for new installations.
- Network operating system software

4.3   TYPES OF NETWORKS

A network is a means of sharing computerized information among people residing across geographically distant places. Based on this basic need of the network, you can classify networks according to the geographical area within which they can transmit data. The area size determines the cabling requirements and the speed of data transmission within the network. The different types of networks based on the scope of the physical area are:

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)
- Storage Area Network (SAN)

4.3.1   Local Area Network (LAN)

LANs are networks usually confined to a smaller geographic area, such as a single building or a college campus. LANs can be linking as few as three computers, but often link hundreds of computers used by thousands of people. The pace of development of standard networking protocols and media is really high. Nowadays LANs are omnipresent particulary in business and educational organizations
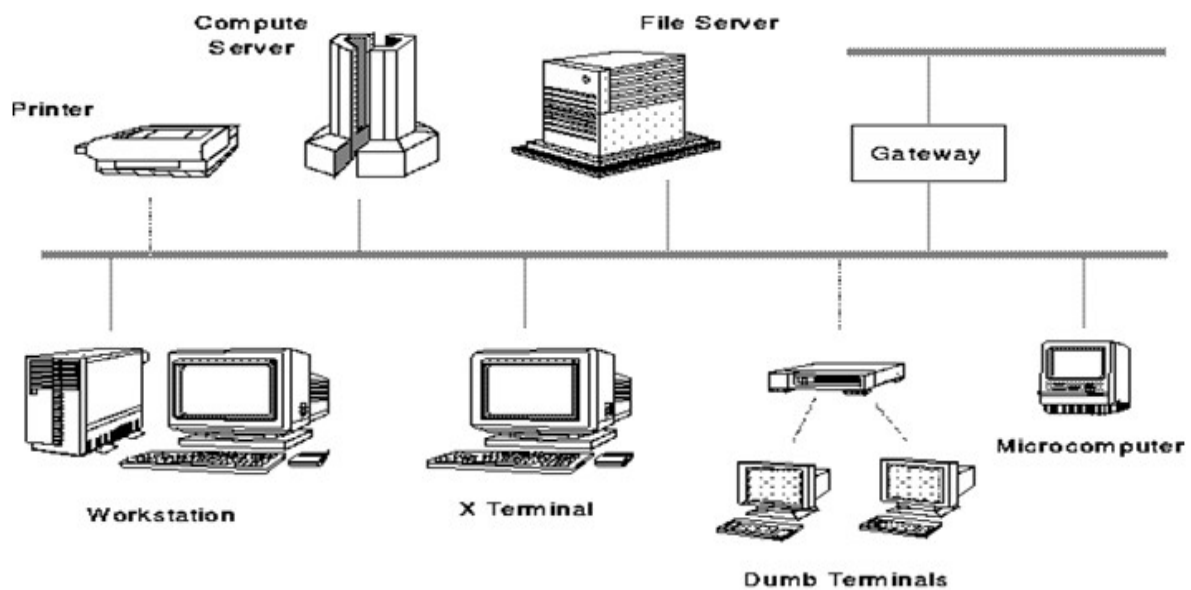

Figure 1 Local Area Network

4.3.2 Metropolitan area Network (MAN)

A MAN is bigger than LAN and covers the distance b/w 5-50km in diameter. It functions within the physical area larger then LANs but similar to WANs e.g. MAN can be utilized to connect the branches of an organization which is spread within the 50km area of a city. Therefore, MAN includes LANs to form a large network. Usually, the cabling requirements and other equipments of MAN are owned by a group of people or by a service provider
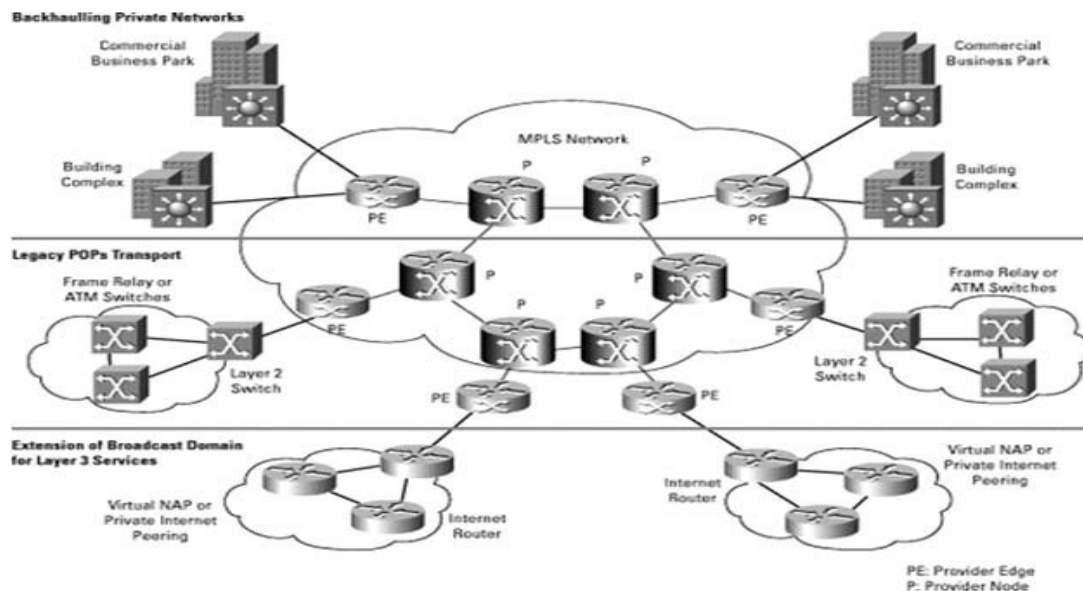
4.3.3 Wide Area Network (WAN)

Wide area networking combines multiple LANs that are geographically separate. This is accomplished by connecting the different LANs using services such as dedicated leased phone lines, dial-up phone lines (both synchronous and asynchronous), satellite links, and data packet carrier services. Wide area networking can be as simple as a modem and remote access server for employees to dial into, or it can be as complex as hundreds of branch offices globally linked using special routing protocols and filters to minimize the expense of sending data over long distances.
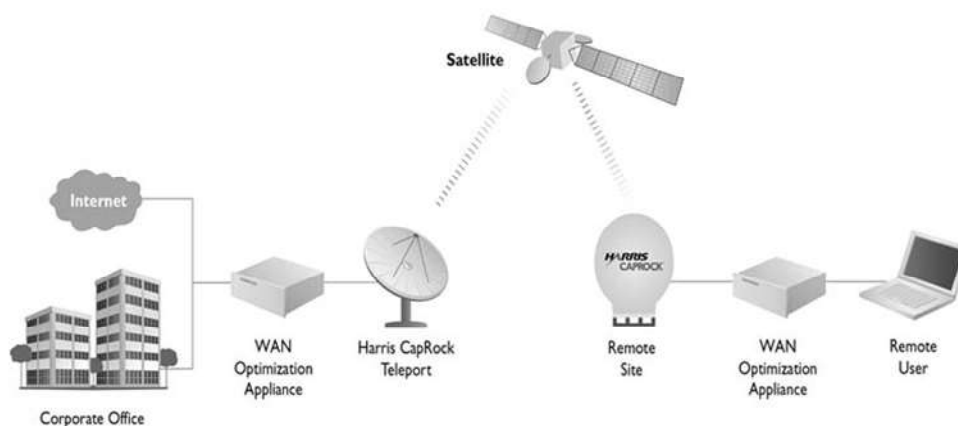

Figure.3 Wide Area Network

4.3.4 Storage Area Network (SAN)

SAN is a type of Network that is referred to a Network of different storage media or devices. It is implemented for facilitating huge data storage and retrievals and is a part of the enterprise network. In SANs, remote computer storage devices, such as arrays of disc, tapes and optical storage devices are connected to high speed data servers in the enterprise network. They are connected in such a manner that it provides an illusion of being connected locally to the other workstations, Operating Systems and the peripheral devices. Therefore, SANs are dedicated storage networks, which effectively handle only the I/O traffic among the storage resources and servers.

SANs are sometimes referred to as the System Area Networks. These networks involve a collection of high performance computers used for handling distributed applications in a network that requires quick processing. A distributed application refers to an application running on more than one computer on a network
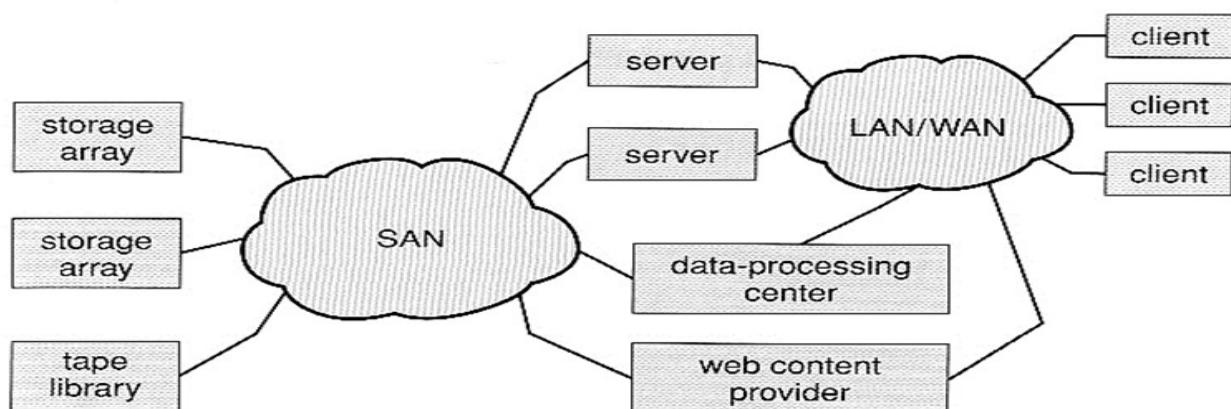
Figure.4 Storage Area Network

4.4 CATEGORIES OF NETWORK:

Network can be divided in to two main categories:

- Peer-to-peer

- Server–based

4.4.1   Peer-to-Peer

In peer-to-peer networking there are no dedicated servers or hierarchy among the computers. All of the computers are equal and therefore known as peers. Normally each computer serves as Client/Server and there is no one assigned to be an administrator responsible for the entire network.

Peer-to-peer networks are good choices for needs of small organizations where the users are allocated in the same general area, security is not an issue and the organization and the network will have limited growth within the foreseeable future.
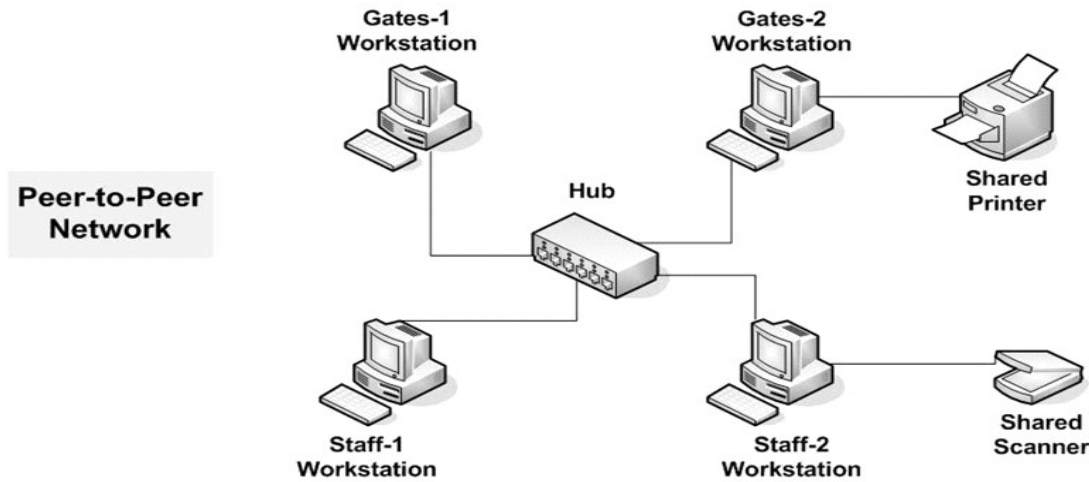

Figure.5 Peer-to-Peer Network

4.4.2   Service Based

Client-Server

The term Client/server refers to the concept of sharing the work involved in processing data between the client computer and the most powerful server computer.

The client/server network is the most efficient way to provide:
* Databases and management of applications such as Spreadsheets, Accounting, Communications and Document management.
* Network management.
* Centralized file storage.

The client/server model is basically an implementation of distributed or cooperative processing. At the heart of the model is the concept of splitting application functions between a client and a server processor. The division of labour between the different processors enables the application designer to place an application function on the processor that is most appropriate for that function. This lets the software designer optimize the use of processors—providing the greatest possible return on investment for the hardware.

Client/server application design also lets the application provider mask the actual location of application function. The user often does not know where a specific operation is executing. The entire function may execute in either the PC or server, or the function may be split between them. This masking of application function locations enables system implementers to upgrade portions of a system over time with a minimum disruption of application operations, while protecting the investment in existing hardware and software.
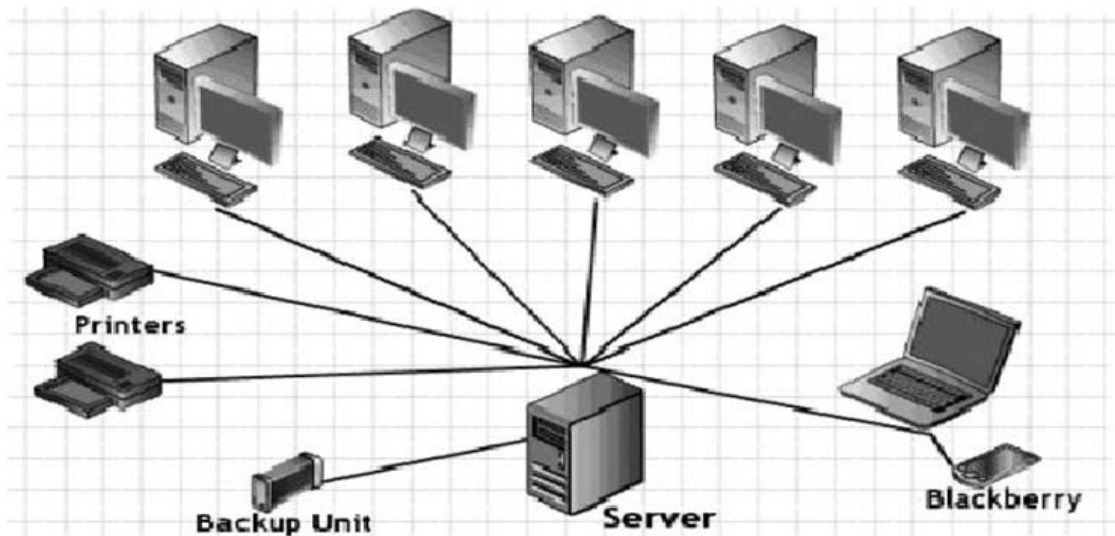
Figure.6 Client Server Network

4.5 TECHNICAL TERMS

LAN: Local Area Network

MAN: Metropolitan Area network

WAN : Wide Area Network

SAN: Storage Area Network

4.6 SELF ASSESSMENT QUESTIONS

1. What is network technology?
2. Explain components of network technology.
3. Describe types of networks.

1. 4.7 SUGGESTED READINGS

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7. http://www.webjunction.org/content/dam/WebJunction/Images/webjunction/img11019.jpg
8. http://www.sensible-computer-help.com/images/clientnetwork.jpg

LESSON - 5
RESOURCE SHARING

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:

- Understand the meaning of resource sharing;

- Need and scope of resource sharing;

- Resource sharing through network;

- Steps to promote resource sharing through network.

Structure

5.1.1   INTRODUCTION

Resource sharing, a well-established practice among libraries in most developed countries, cannot be taken for granted in all libraries. Barriers to sharing include underdeveloped infrastructures, institutional restrictions on cooperation and lack of staff expertise. Even those with the luxury of excellent interlibrary loan (ILL) systems occasionally use a personal connection or manipulate the established system to get an item quickly or track down the

obscure item. Professional networks and personal contacts can be useful for rush requests or finding specialized, un-cataloged resources but this process takes time and even the best personal network can fail. Members of an organization may rely on an email discussion list to alert colleagues of their needs. However, discussion lists can be flooded with interlibrary loan requests to the detriment of professional discussion. Established interlibrary loan processes are appropriate for the bulk of resource-sharing requests for those with access to such processes; yet there remains a need for efficient use of professional networks to supplement traditional ILL services and, in the case of colleagues in the developing world, to establish resource- sharing options. A professional organization builds the capacity, or self-sufficiency, of all members by endorsing a resource-sharing system for its network.

5.2   OVERVIEW OF RESOURCE SHARING

Library co-operation is age old and can be traced to 200BC when Alexandria Library shared its resources with Pergamon Library. According to Kraus, there existed library co-operation among monastery libraries in the 13th century. There were exchanges of agreements among the universities of Lund, Abo and Greifswald as early as 1740. The other examples of library cooperation include a projected union catalogue of the libraries of Weimar and Jean and a proposal for a co-ordinated acquisition scheme for Walfenbuttel and Gottengen. The 'Catalogue of Manuscripts in various parts of India' complied by Whitney Stokes in 1868, and in 1863 Part I of Sanskrit manuscripts in private libraries of North-west provinces covering Varanasi was published. The first major union list entitled 'A Catalogue of Scientific and Technical Periodicals' was complied by Henry C.Bolton in 1885. With the advent of the 20th century, the Library of Congress started co-operative cataloguing projects and began working on the National Union Catalogue. Thereafter, in the 20th Century the compilations and publications of union catalogues of different types increased in number in most countries. The first library cooperation activity in India is reported to be the Catalogue of Manuscripts complied by Whitney Stokes in 1868. Union catalogue development was one of major cooperative efforts in Indian libraries up to the 1960s. We can look at the following union catalogue development activities:

1918: - Catalogue of Scientific Serial Publications in the Principal Libraries in Calcutta complied by Stanley Kemp, Asiatic Society of Bengal.

1931: - List of Scientific Periodicals in the Bombay Presidency. Royal Institute of Science, Bombay.

1953: - Catalogue of Periodicals in CSIR organizations corrected up to December 1953 CSIR, New Delhi. Union Catalogue of Learned Periodical publications in South Asia, vol.1: Physical and Biological sciences compiled by S.R. Ranganathan and others. ILA, Delhi.

1956:- Catalogue of Medical Periodicals in Indian Libraries corrected up to December 31, 1955. 4th ed. Director General of Health Services, Delhi.

1968:- A Union List of Learned American Serials in Indian Libraries. Indian Council for Library Development.

The 1960s also saw a large number of ILA and IASLIC national seminars devoted to the concept of library cooperation. However, with the advent of computers in library work, a change occurred. It is reported that the first use of computer in library work for the production of the Union List of Serials in 1964 using the IBM/ 602 machine at INSDOC. Since then library automation has been a matter of primary importance in Indian Libraries. With the establishment of the National Informatics Center (NIC) in 1975 and the development of NICNET in 1977, networking and communication technology in India received a major boost. This as a whole

had a major influence in resource sharing among various libraries and information centers through networks. In 1984, the working group of the Planning Commission headed by Dr. N. Seshagiri recommended modernization of library services and inter linking of library systems in the seventh plan.

The 1990s are said to be the golden period of library networking in India. There has been a plethora of publications and seminars on library networking during this period. Today besides INFLIBNET, there are various local library networks in India such as ADINET, BONET, BALNET, CALIBNET, DELNET,MALIBNET, MYLIBNET, and PUNENET etc.

We therefore notice that the efforts made for library cooperation in the 20th century began with the compilation of union catalogues, as no co-operation could be effective without the knowledge of the resources of other libraries. The scope of co-operations soon took big leap. It became diversified and incorporated the various activities of the libraries such asAbstracting and Indexing,Acquisition, Bibliographic access, cataloguing, Circulations development, continuing education for staff and users, literature searching, management and accounting, microfilming, photo coping, processing, referral services, storage and union lists.

5.3   RESOURCE SHARING: MEANING

Resources sharing is sharing of library resources such as document collection, staff members, technical facilities and mechanical aids among the participating libraries on the basic principle of cooperation, "All for one and one for all". In this respect it is possible to consolidate the document collection of participating libraries, exchange their technical capabilities and share their services. In this way it is possible to share the resources to provide on access to the vast amount of library and information sources to a larger user communityat the least-cost. The objective of resource sharing is obviously to make the greatest amount of best information available to the most users at the reasonable cost.

Thus Resources sharing is a need-based concept founded on the sound principles of give and take. It is not the quantum of exchange but the real desire to do so, that is essential to become part and parcel of the important programme of resource sharing activities.

5.4 NEED

There has been a voluminous growth of published documents in the recent part. As a result no library inable to procure, process or store all documents that its users demand. According to Kent " it is difficult to anyone single library to acquire even one percent of the total document published in the world" due to one or more of the following reasons:

Growth of Knowledge in different subjects Rapid increase of literature and growth of publication In the second half of the 20th century, the growth of new publication became unmanageable for traditional libraries. Its impact was felt primarily in major programs and later by the smaller libraries. In the field ofScience and Technology alone about three million documents are published each year which includes articles, conference papers, books, technical reports and these the rate doubles every eight to ten years according to V.A. Kamath. There has been an alarming growth lately in journal articles.

According to Faxton Company in USA, the number of journal titles rose from 38,079 in 1974 to 1,04,714 in 1989 an increase of 175 percent According to Conen, Two articles are

generated in the sciences alone every minute or over 10 lakh articlesa year. Also fast production of literature takes in different places in different formats and in different subjects

(i) Increasing trend of new born subjects and specialization
(ii) Limitations of funds
(iii) Increase in the cost of publications

According to Faxton company in USA, the average price per serial title paid by college and university libraries in 1979 was $50.11; by 1959 it has risen to $ 125.87. Scientific and technological libraries pay an average of $ 234 per serial title a year. The average price for foreign tittles has risen from $41.34 per title in 1976 to $143.09 in 1989 According to Bowker Annual 1989-90, the average prices of a monograph rose from $32..43 to $38.39 from 1986 to 1988

(iv) Increase in the number of members of user community teachers, scholars and students in universities.
(v) The information needs of academic community being wide in scope and varied in nature
(vi) Such information needs being often repetitive and recurring
(vii) Lack of environment to make use of available computer and communication technology for efficient andproduction use in libraries.

Therefore some resource sharing is necessary between one library and another library to acquire more information in a specific subject with low cost as published records are increasing at incredible rate andtheir prices are keeping pace, is such circumstances library cooperation will assume a pivotal role andresources sharing will become the focal point of cooperation.

5.5 SCOPE OF RESOURCE SHARING

The idea of resource sharing for a long time was restricted to the area of lending of books and periodicalsnow it has become diversified and incorporated the various activities of the libraries such as abstracting and indexing, acquisition, bibliographic access, Cataloging circulation, collection development continuing education for staff and user, literature searching management and accounting, microfilming photo coping , processing, referral services, storage and union lists. The resource sharing in modern times is helpful in the following four main activities.

Acquiring books – selection, ordering and purchase,etc
Recording books- cataloging and classification
Making them available –their own books by consultations and lending books not held by them by borrowing from elsewhere
Storing books – for present and future uses

5.5.1 Shared acquisition:

The shared acquisition involves procurement of books, periodicals and other materials from publishers and booksellers of foreign and own country through mutual agreement among the participating libraries. By the process of shared acquisition the saving of money and time, avoiding wasteful duplications and building up a sound and large cumulative collection is possible. The savings on this count may be utilized for further utilization of documents to enrich the library collection.

All the acquisition activities such as placing order, reminding the suppliers, passing bills and other activities, besides book selection can be reduced to a great extent through co-operative acquisition of documentation. This may bring down cost, care discount and save time and labor of individual libraries participating in the system. The various problems associated with subscribing foreign journals can be avoided through cooperative acquisition.

5.5.2 Shared cataloguing:

The processing of library materials is claimed to be the highest shares of bottleneck in library work. Serious attentions being paid to document processing under the concept or resource sharing. The shared cataloguing projects of USA, UK, Australia and Canada have shown how processing work could be done very effectively, and economically, saving lot of time, effort and money. The on-line computer Library center (OCLC) project and the library of congress shared cataloging projects have shown how shared processing of library documents can undertaken and how the individual libraries can save their time and lab our.

5.5.3 Future Scenario:
The future scenario of resources sharing could be termed as 'Global resources sharing interconnections' Not only are these interconnection going to grow because of INTERNET and electronic publishing, but their growing trends are felt at various regional groupings two. There will be a gradual move towards greater integration of services and resources sharing.

5.6 RESOURCE SHARING THROUGH NETWORK

As indicated earlier, the past few decades have witnessed knowledge and information explosion the world over and inadequate financial resources to do the best in terms of dissemination of knowledge and information. Under these circumstances, resource sharing and cooperative functioning of libraries and information centres through networking becomes vital. Efficient resource sharing can be achieved by using recent advances in Information Technology, i.e. networking of libraries and information centres through Local Area Networks, Metropolitan Area Networks, Wide Area Network and so on.

Network of information/Resource sharing is to use the computer and telecom link for transmission of information or data from one library to another. Keeping this concept in view, various library networks have been established for cooperation and resource sharing among libraries. They have grown mostly during the last thirty years in different geographical environments in order to cater to the specific needs of users. In the United States, there has been a proliferation of them. Library networks in other countries are also growing. Several models have emerged that provide specific services. Not all networks conform to the essential functions of library networks. However, it is noted that the essential functions should include: promotion of resource sharing, creation of resource sharing tools like bibliographic databases such as union lists of serials, union catalogue of books, periodicals, bibliographic databases of articles and other types of materials such as CDs, Video recording, sound recording, theses, dissertations etc., rationalization of acquisition, adoption of international standards for creation of records uniformly, delivery of documents, etc.

5.7 India

In India, as elsewhere, economic pressures, enormous growth of publications and

emergence of subject specialization have compelled the libraries and information centres to think of sharing the information resources and optimizing the use of existing resources within India as well as from abroad through various networking systems. Some of the notable networks in India are NICNET, ERNET, SIRNET, INDONET and INET. In addition, there is a major initiative from the University Grants Commission called INFLIBNET, interconnecting universities, colleges and resource institutions countrywide.

5.7.1 National Level Resource Sharing

As stated earlier, INFLIBNET, a national level resource sharing of university libraries was set up in 1986 under Professor Yashpal Kapoor, the Chairman of UGC, INFLIBNET is a multiple functions/service network with focus on resource sharing and cooperation through computer communication links. It is very useful to all libraries and their readers. For this purpose, it is possible to create data banks in different subject fields, produce a number of bibliographical tools and information services. It is also possible to conserve a lot of library resource avoiding duplication at the national level.

But under the present conditions, it is not congenial to initiate a network of libraries at the national level, because all universities in India depend on the finance from central and state governments. The various universities have their own district characteristics based on factors such as geographical, linguistic and political. Each university library is following its own pattern and procedure in its routine work. For this reason, there is no uniformity and standardization. However, such a networking can be initiated in a limited environment, regional or state level.

5.7.2 State Level Resource Sharing

In India, formation of a network of university libraries in all states is possible only if the concerned administrative and professional staff and supporting agency make a sincere attempt in this direction. They should plan to co-ordinate programmes of all universities in the state to form a uniform academic calendar. They have to establish a body like Council of Higher Education to initiate a network of libraries in the state say KAULIBNET (Karnataka State University Library Network) in the interest of larger academic community. They should bring all the affiliated colleges within the fold of state level library network and extend the services to colleges.

It is not difficult to bring uniformity and adopt a standard procedure in all participating libraries within the state. After achieving the success in running the network at the state level, it is possible to link all such state level networks to the national level network. Further, it will not be difficult to link university libraries network with specialized networks in the field of library and information in India, using sophisticated modern technology and satellite facilities.

5.7.3 City Level Resource Sharing

Specialized library networks have come up for individual cities like DELNET, CALIBNET, MALIBNET, PUNENET, BALNET, ADINET, BONET, MYLIBNET, etc. These networks are meant essentially for providing a centralized database of library information to be accessed by its user libraries, mostly in a particular city for the purpose of resource sharing.

In the present day of limited resources, it is imperative that an integrated view of these networks and National Information Systems and Centres on the possibility of sharing resources among them should be taken to explore avoiding duplication of efforts, materials and resources and maximizing the utilization as they form the base for successful networking. Access through any network in the globe can be obtained virtually through INTERNET which is widely used international network.

5.8 Criticism of Resource Sharing

Resource sharing, despite its various advantages, has certain disadvantages too. The critics voice concern on the following points:

- ➢ If all libraries depend on resource sharing, no library will have books to lend;
- ➢ If co-operative acquisition doesn't operate well, serious gaps in the collection of a library will result;
- ➢ Without the sophisticated technology, resource sharing would have very limited value;
- ➢ Cost consideration may not permit resource sharing;
- ➢ The reaction of the publishing trade, if their sale gets reduced;
- ➢ Large libraries have to share a greater burden of lender rather than borrower which is not beneficial to them.

The criticism of resource sharing is no doubt sound and partially valid. But there seems to be no alternative to this. INSDOC's document supply service is an example which has been continuing for over the last four decades. INSDOC sources approximately 28,000 orders annually.

We may conclude that Library co-operation is the key to the successful functioning of a library and without it, it cannot provide effective service to its users. Without cooperation, it is impossible to start sharing of resources. We notice that the sharing of resources can help:
- ➢ acquire library materials;
- ➢ share holdings;
- ➢ provide researchers with an increased number of research materials;
- ➢ avoid duplicate purchases;
- ➢ ensure collection of special material and services;
- ➢ establish efficient communication systems;
- ➢ prepare union catalogue; and
- ➢ develop an information marketing mechanism through cooperation and control of the quality of collections.

5.9 Steps to Promote Resource Sharing through Network

As we have seen networking of libraries is essential for sharing of library resources, the same should be promoted at local, regional, national and international level. Following steps are to be taken to promote resource sharing through networks:
- • Important libraries, information centres and institutions get their catalogues and bibliographies prepared in machine readable form to provide computer aided information services to users and promoting automation of the functions in their libraries such as cataloguing, circulation, preparation of bibliographies, union catalogue, etc.
- • To promote sharing of resources among the libraries in India by developing and disseminating information and by offering computerized services to the users.
- • To optimize information resources utilization through shared cataloguing, interlibrary

loan services, catalogue production, collection development and avoiding duplication in acquisition to the extent possible.

- Encourage cooperation among libraries, documentation centers and information centers so that pooled resources can augment weaker resources centers.
- The promotion of non-bibliographic databases in India, especially by National Informatics Center has enabled institutions to perfect computer and networking technology.
- In house functions like acquisition, cataloguing, classification, serial control, circulation, SDI, current awareness services, etc; the network should support these library operations and the libraries should use the data in the central port for this purpose.
- The participating libraries should follow the rules and regulations of the network and be willing to create bibliographic records according to standards laid down.
- Anglo-American Cataloguing Rules (AACR-2) should be used as the code for cataloguing. It will help in creation of standard records.
- Library of Congress Subject Headings (LCSH) should be used as a guide for creating subject descriptors. Other thesauri available on specialized subjects could also be used whenever needed in specialized libraries.
- The network should provide technical assistance to participating libraries in the creation of bibliographic databases.
- A panel of experts should be maintained for providing assistance to libraries.
- A central host machine should be installed for creating a union catalogue, combining catalogues of all participating libraries.
- As libraries in India use mainly Dewey Decimal Classification (DDC), Universal Decimal Classification (UDC) and Classified Catalogue Code (CCC) for classification of books, it would not be within the means and worth the effort to have one classification scheme in all participating libraries.
- The network should promote inter-library service and sharing of foreign periodicals should be attempted. As far as possible, foreign exchange should be saved on avoidable duplication titles. A courier service should be established to support the sharing of resources.
- All serials should also be published in electronic format and the availability of serials in electronic format, either outline or CD-ROM.
- Most of the abstracting and indexing services have cumulated the entries forming into databases, which can be searched online.
- Networking activities should increase in India. Government should take an interest in this field. Some of the important networks established are NICNET, I-NET, ERNET, SIRNET, INFLIBNET.

Thus we see that with this network, we can pool together all resources of all libraries, resources of all universities, colleges, research institutions, various departments and also the resources of individuals. It will be possible for us to acquire a greater number of information sources taken together in all the libraries in the country. These can inter-connect people, i.e. students, teachers, researchers, users, etc. It is, therefore, assumed and expected that in order to have quick access by educated or creative member of the society to whatever is happening in their own country or the world over, networks are considered as a boon.

5.10   TECHNICAL TERMS

NIC: National Information center

OCLC: On-line Computer Library Center

KAULIBNET: Karnataka State University Library Network

LCSH: Library of Congress Subject Headings.

5.11   SELF ASSESSMENT QUESTIONS

1.   What do you mean by resource sharing?
2.   Write definition of resource sharing.
3.   Explain steps to promote resource sharing through network.

5.12   SUGGESTED READINGS

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NETWORK TOPOLOGY

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the topology;
- Types of Topology;
- Configuration of topology;
- Use of topology in computer network.

Structure

6.1   INTRODUCTION

A topology refers to a network layout that identifies how the computers and other devices would be connected with each other. It is a logical arrangement of notes that determines the manner in which the data would be transmitted between any two network nodes. There are five major types of network topologies as given below:

1. Bus
2. Star
3. Ring
4. Mesh
5. Hierarchical

6.1.1   Bus Topology

It uses a common cable to connect all the computers and devices in a network. This means that a single cable functions as the shared communication medium for all the network devices. In this topology, the data is transferred using the broadcasting method of transmission. In this method, the source node sends a broadcast message on to the cable, which is visible to all other nodes. However, only the target destination node actually processes the message. As soon as the transmissions begin, the transmission signal travels through the cable from one end to another of the topology. A device called terminator is attached to the both ends.

The bus topology, however allows limited devices to form a part of the network. Therefore, it is suitable for small networks. If any problem occurs in the main cable, the whole network stops functioning. Bus topology provides various advantages like:

- Easy setup
- Cheap as it requires less number of cables
- Support for easy expansion of the network
  Bus topology has some limitations, which include:
- Slow speed due to heavy traffic
- Support of message transmission by only a single computer at a time
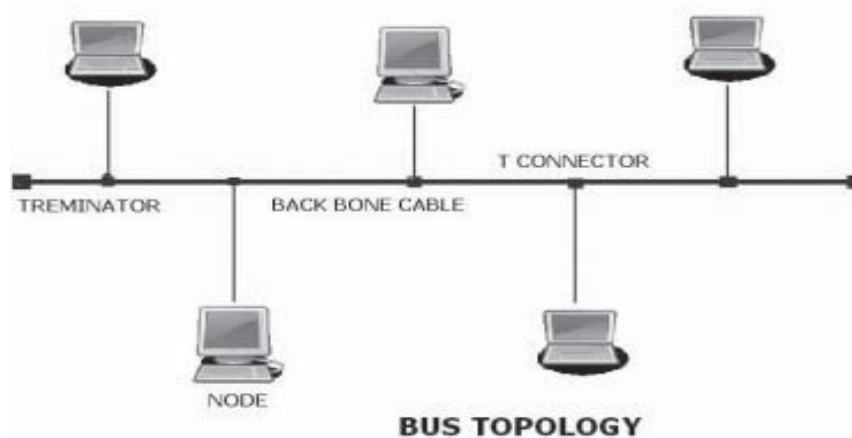- Difficult to troubleshoot

Figure.1 Bus Topology

6.1.2 Star Topology

It is the most popular topology for home and office network. In this topology, each computer in the network is connected to a central device forming a shape of the star. Besides hub, switch or a router is also used as a central device.   Similar to bus topology, star topology also implements the broadcasting method of transmitting data. Here the message transmitted from source node passed to the central device before reaching the destination.

The main advantage of star topology over bus topology is that the network continues to function even if one of the network nodes fails. However, if the central device fails, the whole network will automatically collapse. Star topology provides various advantages, which include

- Simple Setup
- Support for easy modification in the network by adding or removing computers without affecting the rest of the network
- Easy detection of network faults by monitoring the central device. Star topology has certain limitations viz.
- More cable requirements than bus topology
- Expensive due to more cabling requirements
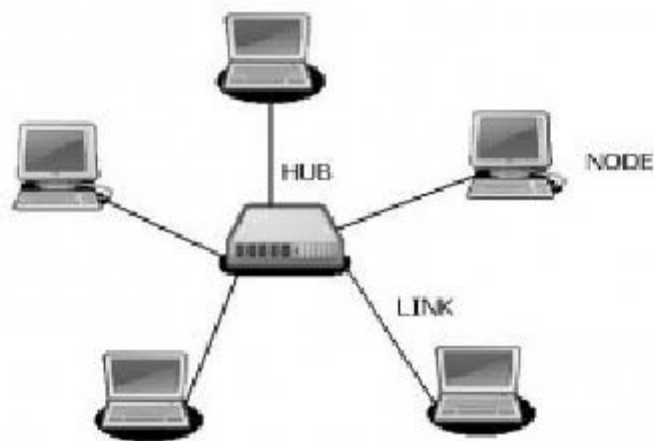
STAR TOPOLOGY
Figure.2 Star topology

6.1.3 Ring Topology

It refers to a network layout node in which each node is connected to exactly two other nodes. This connection continues until the last node is connected to the first node, which forms a circular path. In this topology, the data flow is unidirectional where each node transmits data to the next node until thetransmitted data reaches the destination node.

Therefore, unlike bus topology, ring topology is referred to as an active network and does not have terminator. Ring Topology implements the token passing method for transmitting the data through thenetwork. A token refers to a small packet that continuously loops through the network. When a node wants to send a message as a data package, it requires the token and attaches the data packet to it. The destination node transmits the packet back with an acknowledgement of the received packet. Finally, thesource node places the token back on the network. However, if there is any problem with any node or cable in the network, the entire network will automatically collapse. Ring Topology provides various advantages, which include:

- Support for big networks
- Good performance under heavy network load RingTopologyhowever, has certain limitations viz.
- Negative impact on network performance while moving and adding nodes
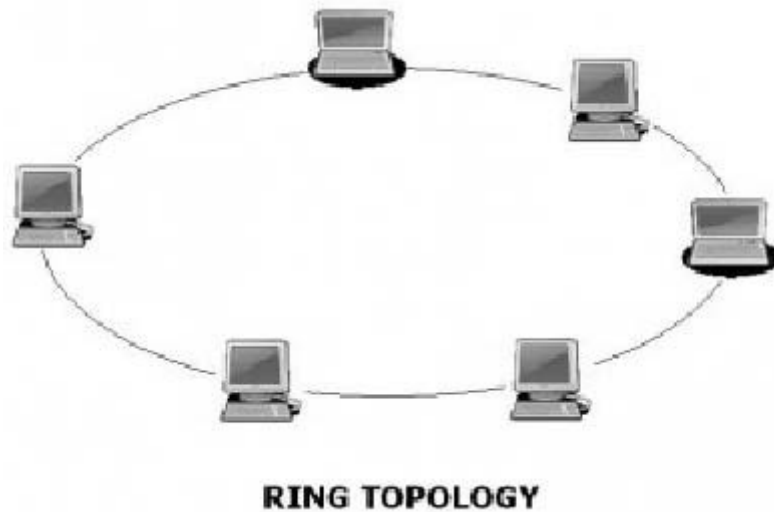- Slower under normal network load

RING TOPOLOGY

Figure.3 Ring topology

6.1.4 Mesh Topology

It is a network layout where more than one connection exists between any two nodes. Here each node is connected to all the remaining nodes using a separate cable. Such an arrangement is referred to as a fully connected Mesh Topology. However it is possible to setup the topology where only few nodes are connected to more than one node in the network. This arrangement is referred to as the partially connected network. This means that mesh topology allows setting more than one path between any two network nodes.

The mesh arrangement is useful when a specific path fails to transmit data due to the failure of a node existing in the path. In this case, one of the paths from the remaining paths can be selected to transmit data. Mesh topology transmits data by selecting the shortest available path that is identified using the router. Router remains a table of paths from which it selects the shortest path from the required source node to the destination node. Mesh topology provides various advantages which includes

- Reliability and efficiency
- Support for easy network expansion without affecting the functioning of network.Mesh topology has certain limitations viz.
- More cabling requirements
- Difficult implementation of the network
- Expensive due to full connection requirements among the nodes
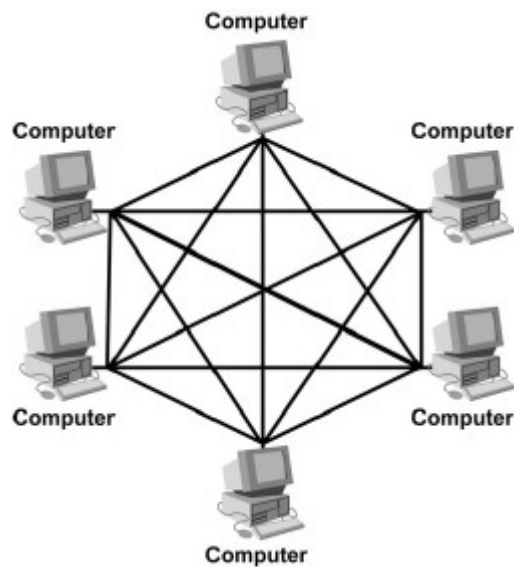
Figure.4 Mesh topology

6.1.5 Hierarchical Topology

It refers to connecting the network nodes in a hierarchical order. Here, a route node existing at the top of the hierarchy connects to the other nodes existing at one level lower in the hierarchy. The position of the root node is known as the root level and the subsequent levels are referred to as the second level, thirdlevel and so on. Nodes in the second level are further connected to the nodes in the third level. In this manner, multiple levels exist in this network structure. The root node is responsible for monitoring and controlling theentire network. Any failure in root node will bring down the network. This topology is also referred as thetree topology.

Hierarchical topology provides various advantages which include:
- Easy maintenance as adding nodes at any level does not affect the network.
- Easy troubleshooting

Hierarchical topology has certain limitations viz.
- Expensive
- Difficult configuration
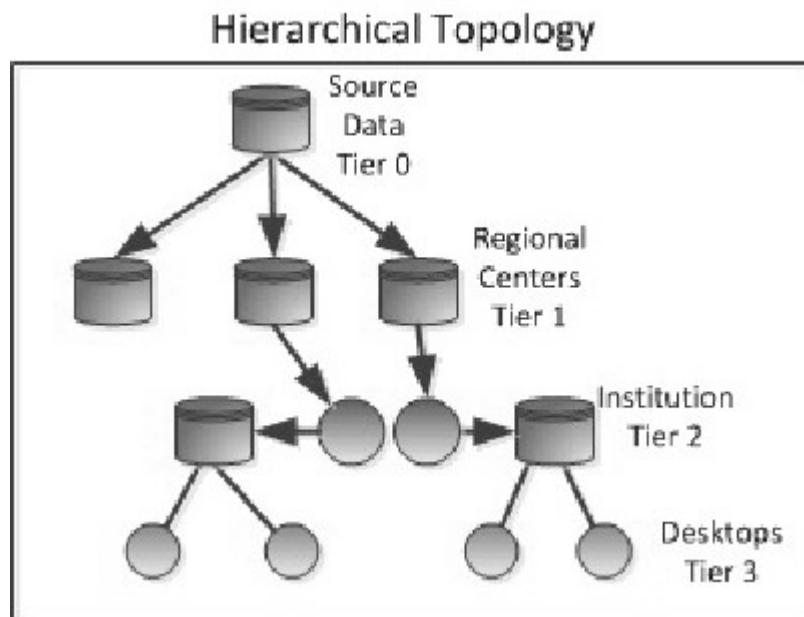
Figure.5 Hierarchical Topology

6.2   SELF ASSESSMENT QUESTIONS

1. What is topology?
2. How topology is useful in computer network?
3. Enumerate the types of topology.

6.3   SUGGESTED READINGS

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LIBRARY NETWORKS

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the library networks;
- Types of network;
- Networks connecting to library in India;
- Implications of networking in library;
- Understand the network transmission;
- Baseband or broadband;
- Types of network transmission;
- Network transmission media

Structure

7.1   INTRODUCTION

The rapid and exponential growth of information has made it necessary for librarians and information professionals to take up new techniques to deal with the massive proliferation of literature in all subjects fields Research in the science and social sciences has led to high productivity in document publications. To bring this vast amount of information under bibliographic control and to render it useful and accessible to potential users is a task of great magnitude which the information people face. So through the application of communication techniques and electronic data processing, library and information centers have now begun to realize the need of computers and associated facilities as indispensable for steady and accurate storage, processing, retrieval and dissemination of information and above all sharing resources among libraries.

For libraries to use their resources more efficiently and effectively for the users is a great task. This task can be solved to a great extent by resource sharing and cooperative functioning among libraries. And for this, networking of libraries, applying latest modern techniques is a must. In India, networking of libraries is even more necessary than in the developed nations.

The important factors that may be considered for networking of resources (Libraries holding resources) in India are:

➢ It is not possible for all the organizations and agencies to design a system to cater to its resource needs because their main aim is to provide resources rather than designing the system for providing resources. So they have to purchase an appropriate latest system to cater to their needs. Generally, it is very difficult or rather impossible to find a system which could entirely satisfy its needs. In India, manually such technologies are purchased from abroad and afterwards people face a number of maintenance problems. So while opting for networking, annual hardware maintenance, some initial training is required.

➢ The cumulative collection of scientific serials held by many important libraries in India is quite poor when compared to USA, UK and other developed countries while in India, some libraries have a very good collection, the majority of libraries suffer from very inadequate collection. There is a great need to consider the entire resources of the country as a single entity that can be available to the entire user community of the country. Networking the libraries is the best way to make resource sharing very effective in order to ensure equitable availability of required information.

➢ Literature being generated as a result of research activities being carried out is doubling every five years. Over 10 million journal articles are published every year besides news items, editorials and articles appearing in popular print media. It is not possible for all the libraries and information centers to acquire all the bibliographic material at one place due to storage problem as well as paucity of funds. Even to maintain a

reasonable level of acquisition of journals, books and reports, calls for heavy budgets in libraries. Therefore, networking with other institutions, libraries, information centers, etc. is easy and economical way to get what a particular center does not have in its capacity.

➢ Budget to the libraries/information centers/institutions and restriction on staffing has also forced institutes to opt for networking in the country and this is on the increasing trend. As for example, it is not possible to give a laser printer to each individual in many of the organizations, so best way to provide printing facilities to each of them is put the printer in the network and let all the computers users share it by way of networking operating system.

➢ Similar methods can be adopted to share other hardware resources like Modem, CD-ROM drive, etc.

➢ India is a vast country with caste, cultural and linguistic diversities. Planning for their development is done at the center only. Planning for such a big country by sitting in the capital requires an extremely fast flow of information from all parts of the country to the center. This can be done effectively by networking all the information centers in the states with the center. Poor infrastructure is a hindrance in this flow of information. With the introduction of better telecom facilities like optical fibers, satellite communication, powerful computer, this is likely to increase but still many parts of the country do not have these facilities.

Because of the above mentioned reasons, resource sharing and cooperative functioning through networking have become inescapable for libraries and information centers in this country.

7.2 NATIONAL EFFORTS AND STATUS OF NETWORKS

7.2.1 National Efforts

There have been many attempts in the country in the last two decades in computer application to library and information activities. During last so many years, libraries and information centres have become more earnest to computerize their operations and services. While NISSAT (National Information System for Science & Technology) has been promoting an integrated approach in library automation in the country, the efforts have been by and large, at the institutional level. Some of the major organizations engaged in computerized information handling are:

➢ BARC - Bhabha Atomic Research Centre, Mumbai
➢ DESIDOC - Defence Scientific Information and Documentation Centre, Delhi
➢ DRTC - Documentation Research and Training Centre, Bangalore
➢ IISc - Indian Institute of Science, Bangalore
➢ IIT - Indian Institute of Technology (Delhi, Chennai, Kanpur)
➢ INSDOC - Indian National Scientific Documentation Centre, New Delhi
➢ NIC - National Informatics Centre, New Delhi
➢ NISSAT - National Information System for Science and Technology, New Delhi
➢ PRL - Physical Research Laboratory, Ahmedabad
➢ TIFR - Tata Institute of Fundamental Research, Mumbai

Besides the above, University Grants Commission (UGC), Department of Electronics, Department of Telecommunication, Planning Commission and other various Departments of Government of India have also been engaged in establishing various networks. There are

possibilities of mounting bibliographical databases on these networks for providing online access-to-access.

The growth of Indian Library Networks may be traced to the efforts made during the last forty years. The chronology is given below:

1958:   1958 Scientific Policy Resolution. It was adopted at the instance of Pt. Jawaharlal Nehru. It emphasized the fostering of scientific temper in people. In pursuance of this agenda, several committees and commissions were appointed to look into specific issues and come up with necessary recommendations.
1959:   Sinha Committee Report
1965:   Ranganathan Report to University Grants
Commission (UGC)1972   :   V A Kamath
Report
1977:   Establishment of NICNET by NIC (1975)
1983:   Technology Policy Statement. It emphasized the need for a technology information base. 1984 :   Working group of the Planning Commission headed by Dr N Seshagiri recommended to the govt. the need for modernization of library services and information during Seventh Five Year Plan (1985-90)
1986:   NISSAT initiated the establishment of CALIBNET, Calcutta
1988:   The National Policy in Library and Information System submitted in 1988. It recommended using of information technology on a national level.
1988:   The UGC established INFLIBNET
1992:   NISSAT supported the establishment of
DELNET, DELHI 1993   :   NISSAT
supported the establishment of ADINET, Ahmedabad.
1993:   INSDOC supported the formation of
MALIBNET, Chennai.
1994:   NISSAT supported the establishment of
MYLIBNET, Mysore 1995   :   NISSAT
supported the establishment of BALNET, Bangalore

7.3   PLANNING COMMISSION EFFORTS

The Planning Commission, Government of India, has been taking considerable interest in library resource sharing and library networks. Its efforts in these areas have increased since the Seventh Five Year Plan covering 1985-90. The Commission appointed a working group on modernization of Library Services and Informatics in November, 1983. In July 1984, the working group submitted its report. It recommended among others, interlinking of library systems through library networks. This report was to be considered for the Seventh Plan.

The Commission appointed another Working Group which submitted its report in May, 1989. It again recommended among others interlinking of library systems in the country. The Planning Commission appointed in Feb, 1995, a Core Task Group to prepare an approach paper for enhancing inputs of Science and Technology for library resource sharing. The Commission again constituted a working group on Libraries and Informatics under the Department of Culture, Ministry of Human Resource Development, Govt. of India, which report was to be considered for the Ninth Plan for the period 1997-2002. The report of the Working Group of the Commission includes many important recommendations for the networking and modernization of libraries in the country.

All these initiatives by NISSAT, UGC, Planning Commission and other departments of Govt. of India have led to increased efforts to the establishment of library networks and library automation in the country.

7.4   NETWORKS IN INDIA

Current computer Networks in India can be decided into three categories:

7.4.1   Networks connecting Educational and Research Institutions all over the country

7.4.1.1   ERNET – Education and Research Network

It was launched by the Department of Education (DOE), Govt. of India in late 1986 with financial assistance from UNDP (United Nationals Development Programme) to provide academic and research institutions with electronic mail facilities. It is currently used by DSIR Labs, research centres and academic institutions.

7.4.1.2   SIRNET – Scientific and Industrial Research Network

It was established by INSDOC in late 1989 to interconnect all the CSIR aboratories and other R&D institutions in India. Its main objective is to harness the vast S&T information resources available with national laboratories and inculcate the habit of resource sharing among themselves. Its ultimate aim is to link the entire scientific community of the nation with the national library system and the international links to achieve efficient scientific communication.

7.4.1.3   OPNET – Open Education Network

Open University Network – Many institutions are venturing into the field of education and are offering professional and technological courses by using communication technologies. They are using television, computer communication, email and network to reach the students. Indira Gandhi National Open University (IGNOU), which is an apex body for open and distance education, is engaged in the task of developing a network of open universities in India called OPNET. This is a network of physical, intellectual and academic resource organized under the aegis of the Distance Education Council (DEC), an independent arm of IGNOU and distance education in India. All the open universities are partners of OPNET. The resources that are pooled together include academic programmes, norms and sharing programmes, delivery mechanisms and interactive software for student services. The OPNET will be an umbrella network with the subnet of every partner university for delivery of their own courses.

7.4.2   Networks connecting the libraries in the country

7.4.2.1   INFLIBNET: established by UGC in 1988, operations began in 1991. It is a network of university and college libraries. It has also provided financial assistance to a large number of university libraries in India.

7.4.2.2   CALIBNET: established by NISSAT in 1986. NISSAT decided to establish a

network of scientific libraries in Calcutta. At a meeting in 1986 in Calcutta, DSIR initiated action for preparation of a feasibility study for networking about 40 libraries in Calcutta. CALIBNET was the first library network visualized. At present, it has now become the center for CD-ROM databases which are acquired from outside sources. Libraries can access these CDs. The basic purpose of the library network is to share the resources availablein participating libraries. However, no resource sharing is done as there are no union catalogues prepared. This activity, is however, in progress.

7.4.2.3 **DELNET:** established in 1988 by India International Center with the initial financial support of NISSAT and later officially registered as a society in June 1992. Its main objective is to promote sharing of resources among the libraries located in Delhi and outside Delhi. It is the first operational library network in India.

7.4.2.4 **MALIBNET:** The need for interconnecting libraries and information centres in Chennai was visualizedby INSDOC in 1991. INSDOC undertook a feasibility study which was completed in March 1992.MALIBNET was registered as a society in Chennai in Feb. 1993.

7.4.2.5 **PUNENET** in Pune in 1992

7.4.2.6 **ADINET** in Ahmedabad in 1993

7.4.2.7 **BONET** in Mumbai in 1994

7.4.2.8 **MYLIBNET** in Mysore in 1994

7.4.2.9 **BALNET** in Bangalore in 1995

All these networks are supported by NISSAT. They have not, as yet, created their value added databases such as union catalogues, though work is in progress. They are, at present, mostly offering Email and CD-ROM facilities

7.4.3 Other Networks

7.4.3.1 NICNET

It was established by National Informatics Centre (NIC) in 1977 and started in the late 87's. It was launched basically for getting and providing information from/to district levels to facilitate planning process. It links for regional nodes at Delhi, Pune, Bhubneswar and Hyderabad and has established 32 nodes at state and union territory levels and 439 nodes at district headquarters. By 1991, NICNET has achieved successin the creation of databases and networking. It also provides E-mail and other facilities to users using its already existing infrastructure.

7.4.3.2 INDONET

India's first data communication and computer network was started in March 1986 by CMC Ltd. It was launched as a solution to the growing need for providing timely well processed data to various institutions. In the First phase, they have mainly networked Mumbai, Calcutta and Chennai. Later, Delhi and Hyderabad were also linked as additional stations. INDONET presently has an international gateway which provides access to worldwide pocket switched

networks like USA's Global Networks Systems (GNS) and Internet.

7.5 SPRESENT SCENARIO OF LIBRARY NETWORKING IN INDIA

The present status of library networking in India is that most of the libraries covered by some network are creating databases of their holdings and in automating the library activities. Generally, the periodicalholdings are attempted first in building up the databases as it takes less time than for the other types of library documents. This is followed by the databases of holdings of books, reports, dissertations, standards, etc. The Library Network Centres, i.e., the coordinating agencies of the networks also are concentrating on acquiring them to provide the user with access to the total records. They provide such access either by email or online through the telephone network. In addition, these centres also try to provide common software for databasedevelopment and automation of library activities and services.

Table below gives the details of status of some important library networks in the country.

Name	Year of Starting	Promoting Agency	Whether registered as a society	Database developme nt &other activities
ADINET Ahmedabad	1993 INFLIBNET & NISSAT	Society,	Yes	• Library holding database in progress • Library automation in progress • Training programme • Database of current periodicalsin member Llibraries
BALINET (Bangalore)	1995	NISSAT	Yes	• Activity will start after getting financial supportfrom NISSAT
ET (Mubai)	1994	NCST & ISSAT	No	• Online union catalogue of periodicals • Online request system for ILL • E-mail and Internet access • Online searching of foreign database • Database on computer and as aresoftware • CD-ROM database searching • Database of contents of Indian

				• periodicals • Software for OPAC
CALIBNET (Calcutta)	1992 (1986)	NISSAT	Yes	• Library automation in progress • Access to Internet and Dialog • CD-ROM database searching
DELNET (Delhi)	1990 (1988)	Society, NIC& NISSAT	Yes 2.4.7	• Books database • Multi-lingual book database • E-mail service • Union list of current periodicals0□ Database of Indian specialists • Online searching of foreign databases
INFLIBNET	1991 (1988)	UGC	Yes	• Union catalogue of 50,000 records • Database of periodicals (30,000 records) • Contents with Abstract Services (COPSAT) • Training programme for university library staff
MALIBNET (Chennai)	1993	Society & INSDO C	Yes	• Current serials database • Journal contents database (1,00,000) records • All INSDOC databases on MALIBNET • Automative engineering database (4,500 records) • Access to Internet and Knight Ridder (Dialog) database • CD-ROM database searching

MYLIBNET (Mysore)	1994	Society, Mysore Library Consotium & NISSAT	Yes	• Library automation in progress
PUNENET (Pune)	1992			

However, this scenario networks doesn't provide a growth of ideal library networks in India. From the above table, it can be seen that except DELNET and INFLIBNET, most of the other library networks have yet to develop databases of library holdings in a significant way. Even these two networks have to go a long way, tocover in their databases, the entire holdings of all the participating libraries. Unless this is achieved, the networks would not be able to achieve significant resource sharing as well as rationalization in library acquisitions. Most of the networks are, however, making efforts towards this end by conducting training programmes forthe staff of the participating libraries in data capturing, database development and automation of library activities and services.

7.6 NETWORKING OF PUBLIC LIBRARIES

The public libraries in the west have developed into a true community information and reference systems with such computerized data access and facilities for providing a variety of information to the general public from housing and social security to legal and medical aid and temperature and travel schedule.

In India, development of public libraries has not been a priority and their growth as a result has been uneven. Public libraries which could serve as the backbones of literacy mission, suffer for want of adequate funds, trained staff, modern equipment, good and adequate collections, proper reading rooms and stacking and user facilities. In order to provide to the public, access to the latest information and educate them, public libraries have to be technologically advanced so that they have access to INTERNET and internationaldatabases and networks.

According to UNESCO public library Manifesto 1994 (Revised)

"The public library acts as a living force for education, culture and information and as an essential agent for the fostering of peace and spiritual welfare through the minds of men and women"The Manifesto recommends that"The public library network must be designed in relation to national, regional, research and special libraries as well as libraries in schools, colleges and universities".

So there is a need to establish a public library network which is in conformity with the other networks in the country. Due to lack of up-d-date, actual number of public libraries could not be ascertained, however, nearly about 60,000 exist in the country. They can't be called libraries in the real sense as most of them are simply reading rooms. Most of them are without computers and the librarians working in the distances in general, are not conversant with the application of computers in libraries. Training of library staff in the computer applications for library operations and services becomes one of the basic requirements of automation and networking. In the rural areas, as rural settlement are generally scattered and their libraries are neither up-to-date nor well staffed. Since the level of users is not of a high standing and also various problems in information infrastructure, it is not possible in the first phase to connect rural libraries with the public libraries network for networking purposes. However, with the wide use of telecommunication technology, it is possible for institution located in remote area to join the network. Therefore, we notice that if the public libraries are to really reach the public and achieve the status of national network system, the adaptation of new sophisticated techniques and technologies is a highly important pre-requisite. We must change with the times and learn from the latest trends in the west. For this, we have to develop the infrastructure of public libraries and give attention to the manpower development, training given in the use of computers, AACR-II, use of MARC format Library Congress subject headings, handling of software, etc. and use of electronic mail and INTERNET.

7.7 PROBLEMS OF LIBRARY NETWORKS

As we have seen in the previous Chapters, Library Networks help us in the dissemination of information in cooperative manner where all the concerned libraries pool their resources, and use them , thus ensuring the optimum utilization of resources. But behind setting up a library network and utilize its services, there is a lot of problems facing the Library/Information professionals. Some recent studies have shown the following as major problems to be considered:

7.7.1 Status of Libraries

The status of Libraries, especially in developing countries like India is not so good. No much importance is given to libraries and library professionals compared to other fields. There is lack of growth of libraries in our country due to negligence on the pat of the Government as well as lack of will on the part of the library staff.

7.7.2 Lack of education and training

Library Networks need educated and trained staff to sustain and run smoothly. Due to attitude of certain traditional library staff, they hesitate to learn new technology which is essential in this age. Library automation is pre requisite for starting a Library Network. Library automation can not be achieved without learning new technology

7.7.3 Technical and training facilities problem

There is problem of availability of training facilities. Every Library/Information staff should be given training in the field of networking and library automation. In our country, every library/information center should be provided with adequate training facility which is not so in the present context.

7.7.4 Lack of finance

Initially Library Networking needs resources for the development and contacts with other institutions for its expansion, which is lacking in the country.

7.7.5 Problems at center

Even if an institution manages some funds there is problem of resource allocation. Often imbalance resource and personnel creates problem for further development of the networks.
Software problems, language problems in shared cataloguing systems, database design problems, etc.

7.7.6 Compatibility among systems/database

Actually various networks employ different techniques for the construction of the database of their holdings. They do not follow any common approach. So there is problem of compatibility among various systems and databases.

7.7.7 Problems with standardization

In India, due to presence of various regional languages, there is problem of standardization. Any standard cannot be so much effective.

Problems in acquiring information from international inter government organizations
In several countries, various government organizations do not show willingness in providing information. It might be due to internal security problem or simply hide the information from others in Science and Technology fields.

7.7.8 Problems while searching on-line

The world over, various networks are established in different languages. There are multiple command languages. One has to study various systems and databases for searching purpose.

7.7.9 Independent development of major networks

This is a major problem in our country. The development of Library networks in isolation creates the problem of standardization and coordination among various networks. Also a new library network has to spend much more resources in developing a network. If a new starting-network employ the methodology of an already developed and successful network, it can certainly minimize the cost for developing the network. With mutual understanding they can themselves consult each other in their respective fields of expertise.

7.8 IMPLICATIONS OF NETWORKING

The implications of Resource Sharing Networks can be categorized into five types. They pertain to staff, activities, cost, technology and time.

7.8.1 Implications pertaining to Staff

Networking means sharing of special staff skills in specific areas for training, answering of information requests, bibliographical assistance, processing, etc. It emphasizes the importance and need for higher level of reference assistance to readers. For this to achieve, it implies the need for training and retraining of reference librarians to meet the demands of networking and sharing. Networking will surely demand from librarians and library administrators more time, skill and patience than are presently required of them. In addition, it requires a change in the attitudes of librarians and other staff.

7.8.2 *Implications pertaining to activities in Libraries*

Collaborative development of resources including provision for cooperative acquisition of rare and research materials, and for strengthening local resources for currently used material is expected for successful running of a network. The development of multimedia resources is essential. There is need for identification of primary patron groups and provision for assignment of responsibility for information service to all within the network. Identification of levels of service that provide basic as well as special needs of patron groups, and distribution of each service type among the needs is required.

There must be provision for "referral" as well as "relay" and for "document" as well as "information" transfer. Critical implications of growth of networks would lead to questions of limits of size and growth, optimal size for computerized bibliographical network, etc. Development of evaluation criteria and procedures to provide feedback from users and operators and means for network evaluation and modification to meet specified operational utility needs to be developed.

7.8.3 *Implications pertaining to Cost*

Networking goal of improved access implies that it involves real cost and, therefore, it cannot be viewed as a panacea or easy means to reduced expenditure of member libraries. It means sharing of cost of telecommunications networks and of common functions of network by the member libraries.

7.8.4 *Implications pertaining to Time*

Availability through Networking implies delay in obtaining a particular item not held locally. Access to larger and larger resource/collection would cause access/search time to go up. However, this access time is much lower than the traditional manual search within a library.

7.8.5 *Implications pertaining to Technology*

After all a technology helps a person in getting or developing a new-one in a comfortable manner in less time and with less cost, not sacrificing the accuracy. So, a Networking System should be simple to use if electronic excommunication by an unforgiving operating system is to be avoided.

7.9 NETWORK TRANSMISSION

7.9.1 Introduction

The internet consists of millions of digital passages that carry signals all over the world. These conduits, which connect us to the world wide web (www), come in many shapes, sizes, and modes. The bewildering assortment and seemingly endless conduits, more commonly referred to as communication media, that are used to connect computers together can be boiled down to two types: conductive cable and wireless. Conductive media is simply a hard-wired connection, which requires someone to physically join network devices with some type of cable. The three major types of cable are coaxial, twisted pair, and fiber optic. The focus of this Chapter will be on conducted communications media. Wireless communication is the alternative to conducted communications media. This is accomplished using a variety of broad-cast transmission technologies, including terrestrial microware and satellite communications. To aid in understanding conductive communications media, a short explanation of network transmission basics will be discussed.

7.9.2   Network Transmission Basics

When computer communicate over the Internet or on private networks, they must follow certain communication protocols. In easy way, each computer that connects to a network must follow rules that govern the type of hardware and software that is used for access to the network. The protocols consist of signal types and speeds, cable layouts, and communications access schemes.

7.9.3   Baseband or Broadband

Bandwidth is the range of frequencies that a particular network transmission media can carry. It also reveals the maximum amount of data that can be carried on the medium. A baseband transmission is a single, fixed signal that uses the entire available bandwidth. Baseband signals use a single channel to communicate with devices on a network, which allows computers to transmit and receive data on one cable (Tittel & Johnson, 2001). Baseband communications are typically used for local area network (LANs). This environment is ideal for baseband transmissions because it is self-contained within a single location, where network traffic can be easily mentiored and controlled. When LANs expand into a metropolitan area network (MAN) or a wide area network (WAN), baseband systems do not provide the bandwidths that are adequate for these larger networks. A MAN consists of several LANs within a metropolitan area. WANs are similar to MANs in that they cover a wider, possibly international, geographical area.

Network connections that attach several LANs together, such as MANs or WANs, or that allow remote access from external users or networks to local server often require multichannel bandwidths because of increased signal traffic flow. Broadband transmissions help to meet these needs. In Contrast to the discrete digital signals produced in baseband communications, broadband transmission generates an analog carrier frequency, which carries multiple digital signals or multiple channels. This concept is much like cable televisionsystems that carry many channels on one cable.

The decision to use baseband or broadband is determined by the application. If the network consists of a single LAN, baseband would be the best choice. If an organization has computer networks that spread over several geographical areas, there might be a need for multiple channels of communications between locations, which can be achieved only it is not necessarily the transmission media that determines whether a signal is baseband or broadband. It is the function of the devices that connect to the cable.

7.9.4   Types of Network Transmission

There are different types of network transmission, for the most part, networking comprises of two types of data transmission, namely serial and parallel transmission.

7.9.4.1   Serial Transmission

This is a relatively simple method, where bits are transferred along a single wire to the destination one bit at a time. This method is commonly used where transmission is over long distances, this is a slower method however more efficient relatively. They are usually used to transfer data along different computer systems or to an external device some distance away.

7.9.4.2   Parallel Transmission

Here bits are sent along several individual wires at a time to the destination, bits are transferred simultaneously. This method is evidently faster as several bits are transferred at a time however this method is suitable when transferring data along short distances only as over long distances the bits tend to muddle up resulting in a failed transfer. Parallel transmission is usually used to transfer data within a computer system (short distance) or maybe to an external device which is at a relatively short distance away.

In a network both methods are effectively utilized to provide maximum efficiency and speed with data transfer, their use is based on the average distance of data transfer, also at certain points along the network, a serial-to-parallel (and vice versa) conversion may occur. That's pretty much it when it comes to types of data transmission in a network, there are other aspects like modes and topologies (the sequence at which they are connected) which I will cover later on Computer Realm.

7.10 NETWORK TRANSMISSION MEDIA

Various physical media can be used to transport a stream of bits from one device to another. Each has its own characteristics in terms of bandwidth, propagation delay, cost, and ease of installation and maintenance. Media can be generally classified as guided (e.g. copper and fibre cable) and unguided (wireless) media. The main categories of transmission media used in data communications networks are listed below (please note that wireless transmission media will be dealt with elsewhere).
- Twisted pair copper cable
- Coaxial copper cable
- Optical fibre
- Wireless transmission

7.10.1   Twisted pair cable

Twisted pair copper cable is still widely used, due to its low cost and ease of installation. A twisted pair consists of two insulated copper cables, twisted together to reduce electrical interference between adjacent pairs of wires.

This type of cable is still used in the subscriber loop of the public telephone system (the connection between a customer and the local telephone exchange), which can extend for several kilometres without amplification. The subscriber loop is essentially an analogue transmission line, although twisted pair cables are also be used in computer networks to carry digital signals over short distances.

The bandwidth of twisted pair cable depends on the diameter of wire used, and the length of the transmission line. The type of cable currently used in local area networks has four pairs of wires. Until recently, category 5 or category 5E cable has been used, but category 6 is now used for most new installations. The main difference between the various categories is in the data rate supported - category 6 cable will support gigabit Ethernet.

The main disadvantage of UTP cables in networks is that, due to the relatively high degree of attenuation and a susceptibility to electromagnetic interference, high speed digital signals can only be reliably transmitted over cable runs of 100 metres or less.

Figure.1 Unshielded twisted pair cable

Figure.2 Shielded twisted pair cable

7.10.1.2   **Shielded Twisted Pair (STP)** cable was introduced in the 1980s by IBM as the recommended cable for their Token Ring network technology. It is similar to unshielded twisted pair cable except that each pair is individually foil shielded, and the cable has a braided drain wire that is earthed at one end during installation. The popularity of STP has declined for the following reasons:
*   High cost of cable and connectors
*   More difficult to install than UTP
*   Ground loops can occur if incorrectly installed
*   There is still a cable length limitation of 100 metres

    7.10.1.1   **Unshielded twisted pair cable**
    7.10.1.2   **Shielded Twisted Pair (STP)**

7.10.2 Coaxial cable

       A coaxial cable has a central copper wire core, surrounded by an insulating (dielectric) material. Braided metal shielding surrounds the dielectric and helps to absorb unwanted external signals (noise), preventing it from interfering with the data signal travelling along the core. A plastic sheath protects the cable from damage. A terminating resistor is used at each end of the cable to prevent transmitted signals from being reflected back down the cable.

The following diagram illustrates the basic construction of a coaxial cable.
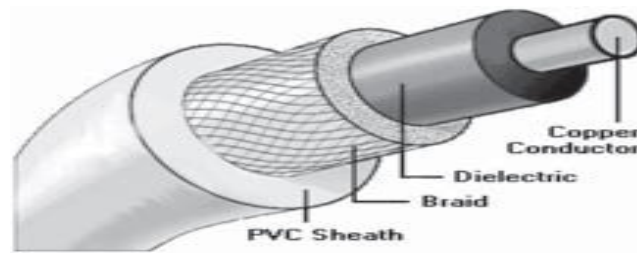

Figure.3 Construction of coaxial cable

Coaxial cable has a fairly high degree of immunity to noise, and can be used over longer distances (up to 500 metres) than twisted pair cable. Coaxial cable has, in the past, been used to provide network backbone cable segments. Coaxial cable has largely been replaced in computer networks by optical fibre and twisted pair cable, with fibre used in the network backbone, and twisted pair used to connect workstations to network hubs and switches.

Thicknet cable (also known as 10Base5) is a fairly thick cable (0.5 inches in diameter). The 10Base5 designation refers to the 10 Mbps maximum data rate, baseband signalling and 500 metre maximum segment
length . Thicknet was the original transmission medium used in Ethernet networks, and supported up to 100 nodes per network segment. An ethernet transceiver was connected to the cable using a vampire tap , so called because it clamps onto the cable, forcing a spike through the outer shielding to make contact with the inner conductor, while two smaller sets of teeth bite into the outer conductor.

Figure.4 Thicknet (10Base5)
coaxial cable

Transceivers could be connected to the network cable while the network was live. A separate drop cable with an attachment unit interface (AUI) connector at each end connected the tranceiver to the network interface card in the workstation (or other network device). The drop cable was typically a shielded twisted pair cable, and could be up to 50 metres in length. The minimum cable length between connections (taps)on a cable segment was 2.5 meters.

Thinnet cable (also known as 10Base2) is thinner than Thicknet (approximately 0.25 inches in diameter)and as a consequence is cheaper and far more flexible. The 10Base2 designation refers to the 10 Mbpsmaximum data rate , baseband signalling and 185 (nearly 200) metre maximum segment length . A T-connector is used with two BNC connectors to connect the network segment directly to the networkadapter card. The length of cable between stations must be at least 50 centimetres, and Thinnet can supportup to 30 nodes per network segment.

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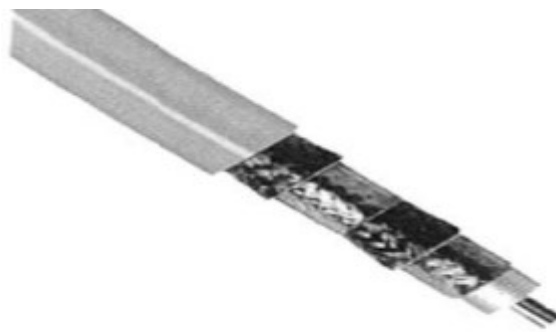
Figure.5 Thinnet (10Base2)
coaxial cable

7.10.3   Optical fibre

Optical fibres are thin, solid strands of glass that transmit information as pulses of light. The fibre has a core of high-purity glass, between 6ìm and 50ìm in diameter, down which the light pulses travel. Thecore is encased in a covering layer made of a different type of glass, usually about 125 ìm in diameter, known as the cladding. An outer plastic covering, the primary buffer, provides some protection, and takes the overall diameter to about 250 ìm. The structure of an optical fibre is shown below.
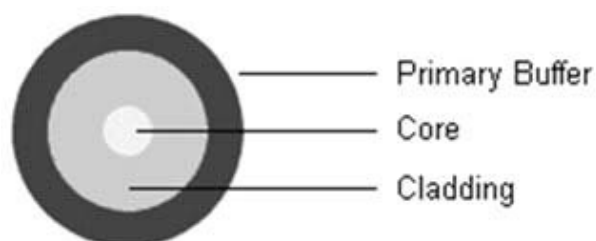
Figure.6 The basic construction of an optical fibre

The cladding has a slightly lower refractive index than the core (typical values are 1.47 and 1.5respectively), so that as the pulses of light travel along the fibre they are reflected back into the core each time they meet the boundary between the core and the cladding. Optical fibres lose far less of its signalenergy than copper cables, and can be used to transmit signals of a much higher frequency.

More information can be carried over longer distances with fewer repeaters. The bandwidth achievableusing optical fibre is almost unlimited, but current signalling technology limits the data rate to 1 Gbps due to time required to convert electronic digital signals to light pulses and vice versa. Digital data is converted to light pulses by either a light emitting diode (LED) or a laser diode.Although some light is lost at each end of the fibre, most is passed along the fibre to the receiver, where the light pulses are converted back intoelectronic signals by a photo-detector.

As the ray passes along the fibre it meets the boundary between the core and the cladding at some point. Because the refractive index of the cladding is lower than that of the core, the ray is reflected back into the core material, as long as the angle of incidence (è i) is

greater than the critical angle (è c). The critical angledepends on the refractive indices of the two materials. In the case of an optical fibre, the values are chosen so that almost all of the light is reflected back into the fibre, and there is virtually no loss through the walls ofthe fibre.

This is called total internal reflection . The critical angle for a particular fibre can be calculated using Snell'sLaw. This states that:

$$n \, 1 \sin è \, 1 = n \, 2 \sin è \, 2$$

where è 1 is the angle of incidence, è 2 is the angle of refraction, and n 1 and n 2 are the refractive indicesof the core and cladding respectively. The effect
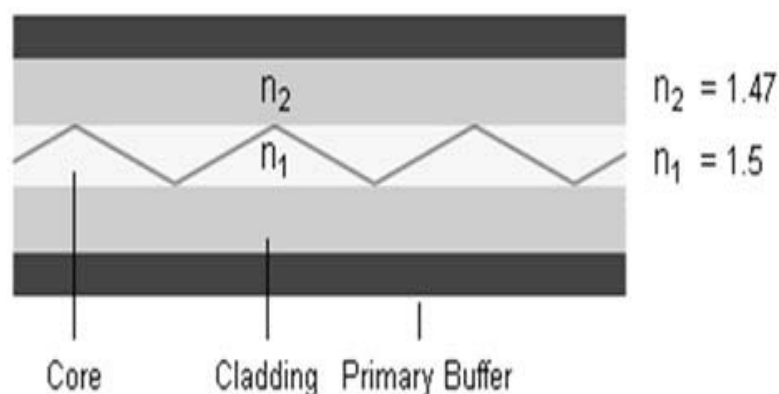
Figure.7 Light transmission in an optical fibre

Figure.8 A step-index fibre
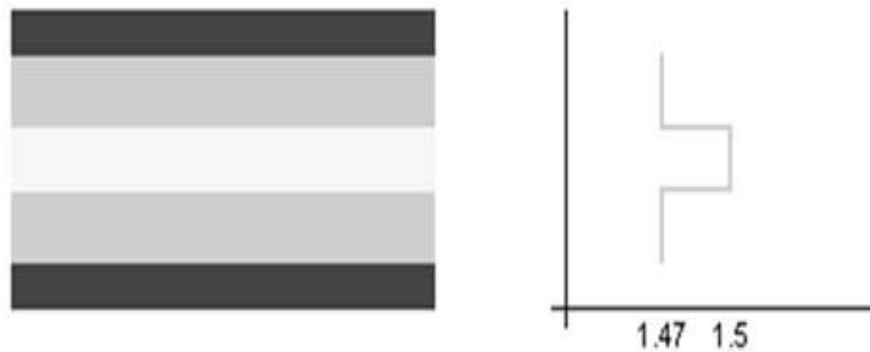
In step-index fibres, the refractive index of both the core and the cladding has a constant value, so that the refractive index of the fibre steps from one value to the next.

If the core diameter of the fibre is such that it allows light to enter at different angles and follow multiple paths, it is said to be a multi-mode fibre. The number of times the light is internally reflected will vary according to the angle at which the light initially enters the fibre, which will in turn determine the path length of the light as it travels along the fibre.

Over long distances, there will be a significant difference in path length between light rays that enter the fibre at different angles. They will, as a consequence, arrive at slightly different times, causing distortion of the transmitted signal – an effect known as modal dispersion. For this reason, multi-mode fibres are only used for short-haul applications such as LAN backbone connections, where the distances involved are likely to be considerably less than one ilometer.
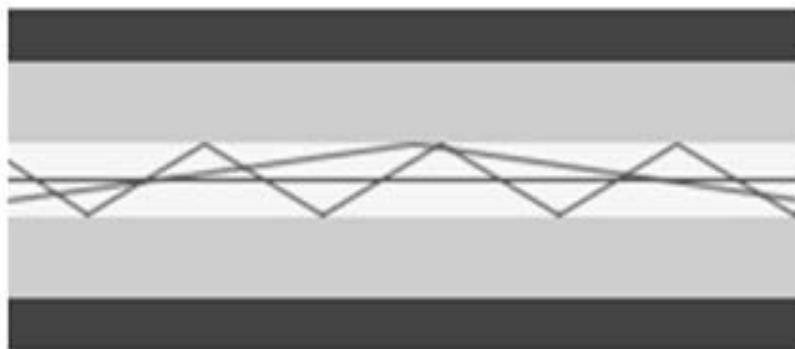
Figure.9 A multi-mode step-index fibre

If the core diameter of the fibre is made small enough, the angle at which light can enter the fibre can be limited such that most of the light travels down a single path, effectively eliminating modal dispersion. This type of fibre is called a mono-mode fibre, and is commonly used for long-haul applications such as long distance telecommunications. Distances of many ilometers are possible with mono-mode fibre before a repeater is needed.
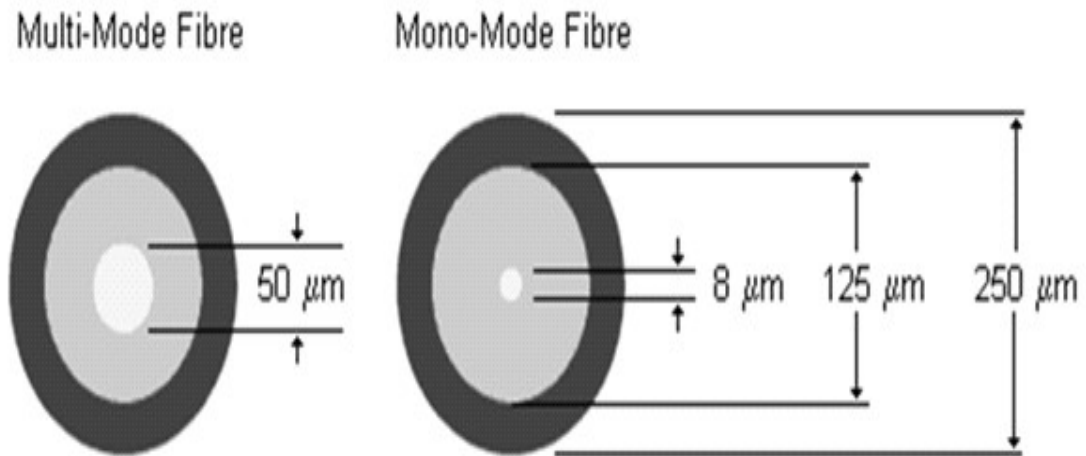
Figure.10 Multi-mode and mono-mode fibres

One way to improve the performance of multi-mode fibre is to use a graded index fibre instead of a step index fibre. The refractive index of this type of fibre varies across the diameter of the core in such a way that light is made to follow a curved path along the fibre (see below).

Light near the edges of the core travels faster than light at the centre of the core, so although some rays follow a longer path than others, they all tend to arrive at the same time, resulting in far less modal dispersion than would occur in a step-index multi-mode fibre.
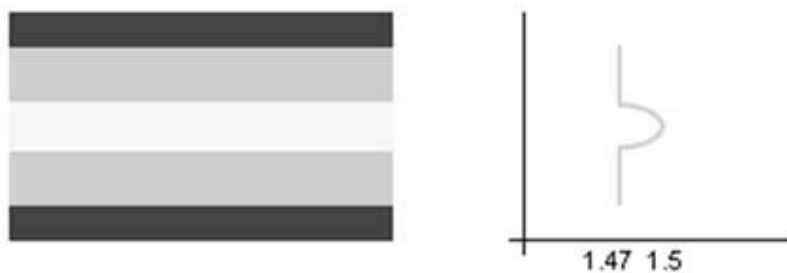
Figure.11 A graded index fibre
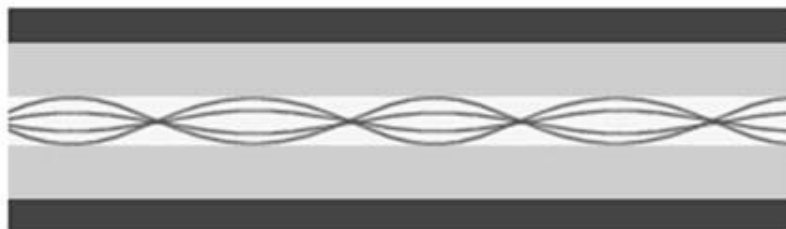
Figure.12 Light paths in a graded index fibre

7.11　　　　TECHNICAL TERMS

NISSAT: National Information System for Science and Technology

DEC:　Distance Education Council

NIC:　National Information Center

GNS:　Global Networks System

STP:　Shield Twisted Pair

LED:　Light Emitting Diode

7.12　SELF ASSESSMENT QUESTIONS

1.　What do you understand by network transmission?

2.　Expain types of network transmission.

3.　Enumerate the network transmission media.

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LESSON - 8
WEB TECHNOLOGY-WORLD WIDE WEB

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the world wide web (www);
- Importance of the web;
- Features of the web;
- How does the web works.

Structure

8.1   INTRODUCTION

The Internet and web hold tremendous potential for a whole array of activities including online distance education, global digital library, e-commerce, Internet telephony, electronic publishing, electronic journals, virtual museums, etc. It has particularly established itself as a powerful medium for self-education for people in isolated or remote areas for its ease-to-use, familiarity with masses, availability of tools and wider accessibility. The web has become the most successful networked multimedia hyper-text-based system

of our time. HTML, the de facto language of the web, is extremely simple yet powerful to use. Further, the static HTML web pages can be transformed into vibrant, dynamic and interactive web creations using ever evolving web technologies like CGI Script, Perl, Java, Javascript, ASP, DHTML, XML and open database connectivity (ODBC) drivers. The rapid growth in the web technology and its ever increasing usage has given librarians and educators with unprecedented opportunities to provide information to the students not within the four-walls of libraries and class rooms but also in the comforts of their home all over the globe. The changes, mainly driven by the new technological innovations and the new learning environment, has presented a scenario where students have access to a vast array of information in many fields from experts all over the world.

The Internet allows us to share information and resources such as, government documents, electronic journals, electronic books, media publishing, human anatomical images, computer software, bibliographic and full-text databases, speeches, live concerts, audio and video clippings. The dynamic nature of Internet is derived from scientists, other researchers and general public contributing their time, resources and energies to each other. Typical users consult electronic resources at near and distant libraries, download computer shareware and software upgrades, read and print publications, make travel arrangements and purchase goods and services. Electronic mail and news groups assist users to communicate with each other on topics of mutual interest. The discussion forum and listserv provides a platform to people with common interest to engage in thoughtful discussions. A few popular modes of usage of Internet are as follows: Retrieving information from reference sources like dictionaries, encyclopaedias, etc. available on the web, for use in day-to-day work;

Retrieving information from databases of various libraries like the Library of Congress, the British Library, and those of Indian Institute of Science, IITs and several other institutions; Searching commercial and non-commercial databases like MEDLINE, INSPEC, COMPENDEX, etc.;

- Accessing electronic books, e-journals and other e-documents available on the websites of commercial and non-commercial publishers, as required for research work;
- Referring social, economic and statistical data, such as, census, daily exchange rates, and government
  budgets and reports;
- Getting documents on fine arts and music, including digital images of art, video and audio;
- Exchanging messages with people across the world;
- Searching for computer shareware, freeware, and commercial software;
- Sending or receiving sound, animation and picture files across the Internet;
- Setting up temporary or permanent discussion or work-oriented groups;

8.2   WORLD WIDE WEB

The World Wide Web, known as WWW, W3 or simply, the web, is one of the several Internet resources developed to help people publish, organise and provide access to information on the Internet. The web was first developed by Tim Berners Lee in 1989 while working at CERN, European Particle Physics Laboratory in Switzerland, and has since become the most powerful, and popular, resource discovery tool on the Internet. The WWW can be defined as a hypertext, multimedia, distributed information system that provides links to hypertext documents, as well as too many other Internet tools and databases.

8.3 IMPORTANCE OF THE WEB

The World Wide Web is important for libraries because it provides an extremely powerful method of organising and providing access to information. The Web can provide a single interface to a large variety of information resources and systems including textual (unformatted or formatted) documents, images, sound and video files. The web can be used to provide interface to other Internet services like TELNET, FTP and Gopher. It can also be interfaced to online databases. There are several features unique to the web that makes it the most advanced hypertext-based information system on the Internet.

8.4   THESE FEATURES ARE BRIEFLY DISCUSSED BELOW:

The Web is a Hypertext System: The web is a hypertext system, in contrast to the hierarchical menu system used by earlier internal tools such as, Gopher. The user on the web moves from one document to another related document through embedded links (called hyperlinks) and a hyperlinked word or phrase, when clicked, calls for another document on that topic. Instead of moving from menu to menu, as in Gopher, users of the web can jump directly from document to document by clinking on hypertext links.

8.4.1   The Web is a Multimedia System

The web is the most successful networked, multimedia, hypertext-based system of our times. media types besides structured text. A good multimedia interactive document is a product consisting of structured text, video clips, animation, pictures, graphics, diagrams, programs, sound, etc. With the advent of graphical browsers, the web has become a multimedia system, combining different types of media into one document. Before the advent of graphical web browsers (e.g., Netscape, Internet explorer), most of the information available on the Internet was in the form of simple text devoid of any elements common to the printed page, such as, text in bold and italics, pictures and other graphical contents.

The web documents may contain the following:
- Normal text;
- Features such as, large fonts, bold, italics, indents;
- Images such as, pictures, graphics, logos, illustrations;
- Audio content such as, sounds, music, commentary, voice messages; and
- Video content such as, movie clips, animations, or computer generated simulations;

8.4.2   The Web is a Distributed System

The web is a distributed system for delivering linked documents over the Internet. It is called a distributed system because information can reside on different computers around the world, yet it can easily be linked together using hypertext. The web uses hypertext to create links from one resource to another. From the perspective of users, one set of related documents may appear to reside in one location, but in reality, the successive pages they read may have been requested from anywhere in the world.

8.4.3   The Web incorporates other Internet Tools:

The web incorporated the capabilities of most of the earlier tools, and added the ability to handle various media types. The web can provide links to other types of Internet tools, such as,

WAIS, Gopher, FTP and TELNET. A web page can provide links to other relevant information resources on the network, regardless of whether that information is available on a Gopher, through TELNET, or at an FTP site. In this way, the web and its browsers become a method to seamlessly provide access to information available through many different Internet tools. The web provides an Interface to other database systems: A particularly powerful feature of the web is that it can act as an interface to database systems connected to the Internet. There are three elements that are needed to create this interface.

i) Forms: Forms are used to collect information through web browser. Forms are a method of creating input boxes on a web page into which users can type information, or select among alternatives.

ii) Database System: RDBMS system such as, MS Access, MS SQL, MySQL, Oracle or PostGres can be used as back-end database.

iii) Control Gateway Interface (CGI): The CGI sits between the web browser and database. It takes the information gathered from the web browser and passes it to the database. Once the request is processed, the CGI passes the result back to the web browser in a format that it can display. Computer and communication technology with its capabilities of parallel processing,

multitasking, parallel consultation and parallel knowledge navigation, put together, creates a semblance of artificial intelligence and interactiveness necessary for developing an interactive learning interface. Coincided with availability of software, hardware and networking technology, the advent of World Wide Web, its ever increasing usage and highly evolved browsers have paved the way for creation of a global digital library. The increasing popularity of the Internet and developments in web technologies act as catalyst to the development of highly interactive library services.

1.5 HOW DOES THE WEB WORK?

The most important concepts and underlying mechanism that make the web work are client-server architecture, the Hypertext Transfer Protocol (HTTP), Hypertext Mark-up Language (HTML) and Universal Resource Locators (URLs). These concepts are described below:

8.5.1 Client-Server Architecture

The Client-Server Architecture is based on the principle where the 'client' program installed on the user's computer (called client) communicates with the 'server' program installed on the host computer to exchange information through the network. The client-server model involves two separate but related programs, i.e., client and server. The client program is loaded on the PCs of users hooked to the Internet where as the server program is loaded on to the 'host' (usually a PC with large storage capacity and RAM, a mini- computer or a main-frame computer) that may be located at a remote place. The concept of client / server computing has particular importance on the Internet because most of the programs are built using this design. The client server architecture is discussed in detail in Block 4, Unit 12 of this consre.

8.5.2 Hypertext Transfer Protocol (HTTP)

The Hypertext Transfer Protocol (HTTP) is a set of rules for exchanging files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. As its name implies, the essential concept of HTTP is the idea that files can contain links or references to other files whose selection would lead to transfer of requests from one file to another. Any web server machine contains, in addition to the HTML and other files it can serve, an HTTP daemon, a

program that is designed to wait for HTTP requests and handle them when they arrive. The web browser is an HTTP client, sending requests to server machines. When a user requests for a file through browser by either 'opening' a web file (typing in a Uniform Resource Locator) or clicking on a hypertext link, the browser builds an HTTP request and sends it to the Internet Protocol address indicated by the URL. The HTTP daemon in the destination server machine receives the request and, after any necessary processing, the requested file is returned. HTTP protocol is Pleae refer to Block 4, Unit 12 of this course.

8.5.3   Hypertext Links: Uniform Resource Locators (URL)

Hypertext links are words, phrases, symbols, maps or any other item in a web document that are linked to a different place in the same document or to another Internet resource. Hypertext links may be underlined, highlighted in colour, or appear as icons, to distinguish them from the surrounding text. The link must be 'selected' by clicking on it with a mouse so as to call upon another document or part of a document. The hypertext inks embed an URL into an object (such as, text or an image). The URL is a compact string representation for a resource available on the Internet. Links are based on a standard called a Uniform Resource Locator (URL). URLs contain all of the information needed for the client to find and retrieve a HTML document. An example of a link to the URL is:

HTML Tag for
Linking
Hypertext Link
IIT Delhi HTML Tag (end)
Internet Address
Protocol (http)

The link shown above has four parts:

i)   The protocol used to connect to the remote server. In this example, the protocol is HTTP; the protocol is used to connect to web servers. The protocol could also be Gopher, FTP or TELNET, indicating that the link is to one of these Internet tools;

ii)   The Internet address of the server where the document resides. In this case, the address is http://www.iitd.ac.in;

iii)   The directory on the server where the document is located, called the document path. In this case, the path is /acad/; and

iv)   The filename of the document itself. In the example, it is index.html (default file) where the html extension indicates that the document is marked-up with HTML tags.

8.6   WEB SERVERS

sThe Internet works on client-server model. A server is a computer system that is accessed by other computers and / or workstations at remote locations. Usually, a server contains data, datasets, databases and programs. The server computer is also called 'host' since it is configured to host datasets, files and databases, receive requests for it from the client machines and serve them. The term 'host' means any computer that has full two-way access to other computers on the Internet. All computers that host websites are host computers or servers since they 'host' information and 'serve' client machines. Clients and servers are two ends of the web, each with its own supporting software. A web server is a software application that uses the Hyper Text Transfer Protocol.

There are many web server software applications, including public domain software from Apache, and commercial applications from Microsoft, Oracle, Netscape and others. A web server may host or provide access to content and respond to requests received from web browsers. Every web server has an IP address and usually a domain name, e.g. www.iitd.ac.in. Server software runs exclusively on server machines, handling the storage and transmission of documents. In contrast, client software such as, Netscape, Internet Explorer, etc. Runs on the end-user's computer accessing, translating and displaying documents. Web servers process HTML documents for viewing by web browsers. The server enables users on other sites to access documents that it hosts. Web servers can run from any hardware platform. There are servers that are specifically designed for Macintosh computers, PCs, Silicon Graphics, and various other platforms. The most important software is the web server itself. Just like a web server can run on a number of hardware platforms, it can also run under several operating systems, including MS Windows, Windows NT, Unix, Linux and Macintosh.

A web server is responsible for document storage and retrieval. It sends the document requested (or an error message) back to the requesting client. The client interprets and presents the document. The client is responsible for document presentation. The language that web clients and servers use to communicate with each other is called the Hypertext Transfer Protocol (HTTP). All web clients and servers must be able to communicate HTTP in order to send and receive hypermedia documents. For this reason, web servers are often called HTTP servers, or HTTP Deamons (HTTPD).

Web documents are written in a text-formatting language called Hypertext Mark-up Language (HTML). The HTML is used to create hypertext documents for use on the web. Basically it is a set of 'mark-up' symbols or codes inserted in a web file that tells the web browser how to display a web page for the user. HTML is a language, neither an application nor a software package. It is simply a data set of text and instructions that requires a web browser to be used.

8.7 TECHNICAL TERMS

HTTP: Hyper Transfer Protocol

URL: Uniform Resource Locator

ODBC: Open Database Connectivity.

8.8 SELF ASSESSMENT QUESTIONS

1. What is world wide web (www)?
2. Expalin the features of www.
3. Why the web has become important in this era?

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LESSON - 9
INTERNET: Basics

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the Internet;
- How Internet was started;
- Types of services offered through internet;
- Advantages and disadvantages of Internet.

Structure

9.1   INTRODUCTION

The Internet has emerged as one of the most powerful media of communication. The Internet and associated technologies have created a global environment that has transformed the world into a global village defying the limitations of geographical boundaries. About two decades ago, most of the world knew very little or nothing about the Internet. Originating from a network owned by the US Defence project, the Internet, till 1970s connected a limited number of computers accessible only to computer scientists and researchers in USA and allied countries for the purpose of defence research. Initially, it became accessible to universities and research institutions to facilitate easier and faster communication between scientists and researchers. With winding of operations of ARPANET in 1990, the combined infrastructure of ARPANET and NSFNET became available commercially.

The Internet, since then, is growing at leaps and bounds around the world and broadband is rapidly becoming a large part of the growth. The number of hosts is considered an accurate measure of the size of the Internet. The Domain Survey, sponsored by the Internet Systems Consortium that discovers every server on the Internet reports that Internet host count has reached over 233 million and has grown by 35 percent in the past year. The InternetWorldStats.com reports that there are more than 745 million Internet users worldwide, with an average of 3.2 users per host. With the high quality of service in the United States there are approximately 2.4 Internet users per host, whereas in some developing countries such as China and India, there are more than 100 Internet users per host. The Internet statistics can be used as a barometer of the global economy. For example, in case of India, the total number of users increased from 5 million in the year 2000 to 16.58 million in the beginning of 2004. This 231.6% increase in the growth of number of users in four years is an indication of Internet-based economic activity in India as well as overall economic changes in the country.

The Internet has completely revolutionised the modes and methods of the computer and communications world like never before. The Internet is an integration of several functions and services rolled into one. It is a world-wide broadcasting facility, a mechanism for information storage and dissemination, a media for electronic publishing of scholarly literature and a medium for collaboration and interaction between individuals and their computers without barriers of geographic location. The Internet represents one of the most successful examples of the benefits of sustained investment and commitment to research and development in information infrastructure. Beginning with the early research in packet switching, the government, industry and academia have been partners in evolving and deploying this exciting new technology.

9.2   INTERNET

The internet in simple terms is a network of the interlinked computer networking worldwide, which is accessible to the general public. These interconnected computers work by transmitting data through a special type of packet switching which is known as the IP or the internet protocol.

Internet is such a huge network of several different interlinked networks relating to the business, government, academic, and even smaller domestic networks, therefore internet is known as the network of all the other networks. These networks enable the internet to be used for various important functions which include the several means of communications like the file

transfer, the online chat and even the sharing of the documents and web sites on the WWW, or the World Wide Web.

It is always mistaken said that the internet and the World Wide Web are both the same terms, or are synonymous. Actually there is a very significant difference between the two which has to be clear to understand both the terms. The internet and World Wide Web are both the networks yet; the internet is the network of the several different computers which are connected through the linkage of the accessories like the copper wires, the fiber optics and even the latest wireless connections. However, the World Wide Web consists of the interlinked collection of the information and documents which are taken as the resource by the general public. These are then linked by the website URLs and the hyperlinks. Therefore World Wide Web is one of the services offered by the whole complicated and huge network of the internet.

The use of IP in the Internet is the integral part of the network, as they provide the services of the internet, through different layers organization through the IP data packets. There are other protocols that are the sub-classes of the IP itself, like the TCP, and the HTTP.

9.3   HISTORY OF INTERNET

The Internet was the result of some visionary thinking by people in the early 1960s who saw great potential value in allowing computers to share information on research and development in scientific and military fields. J.C.R. Licklider of MIT first proposed a global network of computers in 1962, and moved over to the Defense Advanced Research Projects Agency (DARPA) in late 1962 to head the work to develop it. Leonard Kleinrock of MIT and later UCLA developed the theory of packet switching, which was to form the basis of Internet connections. Lawrence Roberts of MIT connected a Massachusetts computer with a California computer in 1965 over dial-up telephone lines. It showed the feasibility of wide area networking, but also showed that the telephone line's circuit switching was inadequate. Kleinrock's packet switching theory was confirmed. Roberts moved over to DARPA in 1966 and developed his plan for ARPANET. These visionaries and many more left unnamed here are the real founders of the Internet.

The Internet, then known as ARPANET, was brought online in 1969 under a contract let by the renamed Advanced Research Projects Agency (ARPA) which initially connected four major computers at universities in the southwestern US (UCLA, Stanford Research Institute, UCSB, and the University of Utah). The contract was carried out by BBN of Cambridge, MA under Bob Kahn and went online in December 1969. By June 1970, MIT, Harvard, BBN, and Systems Development Corp (SDC) in Santa Monica, Cal. were added. By January 1971, Stanford, MIT's Lincoln Labs, Carnegie-Mellon, and Case-Western Reserve U were added. In months to come, NASA/Ames, Mitre, Burroughs, RAND, and the U of Illinois plugged in. After that, there were far too many to keep listing here.

The Internet was designed to provide a communications network that would work even if some of the major sites were down. If the most direct route was not available, routers would direct traffic around the network via alternate routes.

The early Internet was used by computer experts, engineers, scientists, and librarians. There was nothing friendly about it. There were no home or office personal computers in those days, and anyone who used it, whether a computer professional or an engineer or scientist or librarian, had to learn to use a very complex system.

E-mail was adapted for ARPANET by Ray Tomlinson of BBN in 1972. He picked the @ symbol from the available symbols on his teletype to link the username and address. The telnet protocol, enabling logging on to a remote computer, was published as a Request for Comments (RFC) in 1972. RFC's are a means of sharing developmental work throughout community. The ftp protocol, enabling file transfers between Internet sites, was published as an RFC in 1973, and from then on RFC's were available electronically to anyone who had use of the ftp protocol.

Libraries began automating and networking their catalogs in the late 1960s independent from ARPA. The visionary Frederick G. Kilgour of the Ohio College Library Center (now OCLC, Inc.) led networking of Ohio libraries during the '60s and '70s. In the mid 1970s more regional consortia from New England, the Southwest states, and the Middle Atlantic states, etc., joined with Ohio to form a national, later international, network. Automated catalogs, not very user-friendly at first, became available to the world, first through telnet or the awkward IBM variant TN3270 and only many years later, through the web.

9.4 INTERNET TOOLS

Some of the important and popular tools on the Net are discussed below. These includes
- Information retrieval tools
- Communication tools
- Multimedia information tools
- Information search tools

9.4.1 Information Retrieval Tools

FTP

File transfer protocol (ftp) which was one of the first tools on the Internet, allows users to move files, such as text, graphics, sound, and so on, from one computer to another. It is a command that activates a type of client-server relationship. FTP works as follows: The user first uses the software on his or her machine called the client, to gain access to the remote machine, called the server. The user's client program communicates with a program on the remote computer, to either upload, or send to the remote computer or download certain requested files from it.

Another popular way to retrieve files is by using what is called an anonymous ftp server. In this case, the user logs on to the server using the special user ID anonymous. If the server then asks for a password, the user types in his or user ID. Freeware and shareware programs that are available at no cost on the Net – can be obtained through anonymous ftp servers. Although it is easy to retrieve the information once the site is located, sometimes it is difficult to locate on ftp site or identify the files available on that site.

Gopher

The second type of information retrieval tool available on the Internet is Gopher, a menubased interface that provides easy access to information residing on special servers, called Gopher sites. Although Gopher performs primarily the same tasks as the ftp command, its interface is much

more user-friendly and it provides additional functions, such as links to other Internet services. By selecting an item on the Gopher menu, users can move, retrieve, or display files from remote sites. The menu also allows users to move from one Gopher site to another, where each site provides different information. The entire Gopherspace can be easily expanded by adding more servers.

9.4.2 Communication Tools

Communication tools facilitate written communications and in this section we discuss three types of communication tools: E-mail, Telnet and Usenet.

E-mail
E-mail, which refers to sending messages or files electronically, was one of the first Internet tools.

Telnet
Telnet is a command that connects the user to a remote machine which may be located anywhere on the Internet and the user can then type commands to the remote machine, for example to change directories in search of certain files. While the ftp only allows users to move or transfer files, the services that Telnet provides depend on the services provided by the hose machine, which may include much more than simple file transfers. For example, some servers are dedicated to the playing of board games, such as chess or go.

Usenet
The Usenet is a network that provides users with discussion groups or forums. A user posts an article to a chosen newsgroup on the Usenet, where each newsgroup is devoted to particular topic such as politics, the environment, gun control, surfing, and so on. The article is routed only to those sites that have expressed an interest in receiving information on the topic. Many find the Usenet to be helpful for gathering information on a variety of topics. For example, vendors monitor the technical forums on the Usenet closely to answer technical questions that customers may have and to stomp out any misinformation or rumors about their company or its products. For instance, the calculation error in Intel Corp's Pentium microprocessor was first discussed on an Internet Usenet newsgroup. Another popular application on Usenet is downloading new or upgraded software from vendors and obtaining quotes for products and services. IS managers are also tapping into the Usenet to search for potential employees. One IS manager posts particularly thorny technical problems on the Usenet in the relevant discussion groups and then makes an offer to individuals who gave some of the best replies.

9.4.3 Multimedia Information Tools
World Wide Web. The World Wide Web (www) is one of the newest and most popular hypertext-based Internet tool. It allows users to access and display documents and graphics stores on any server on the Internet. In 1989, Tim Berners-Lee, a computer scientist at the CERN particle physics lab in Switzerland, designed WWW as a tool to help and international group of physicists exchange findings and information related to their research. It became popular only in late 1993, when WWW software was delivered for desktops that used popular operating systems, such as Windows, allowing users easy and friendly access to the Internet. Some WWW terms are shown as follows:

> ➤ CGI Common gateway interface. A specification for a communication interface between external systems and a Web server.

- ➢ HTML Hyper-Text Markup Language. A text formatting language used to create Web pages.

- ➢ HTTP Hyper-Text Transport Protocol. The communications protocol between a Web server and a client.

- ➢ Image Map A text file that defines regions using graphics files that users can click on to navigate.
- ➢ MIME Multipurpose Internet Mail Extensions. An Internet standard for sending and receiving multimedia E-mail.
- ➢ Server-Side A Web server feature that lets HTML pages be parsed "on the fly", filling in parts of the page with information from external files.

- ➢ S-HTTP Secure Hyper-Text Transport protocol. An extension of HTTP that provides communication and transaction security for Web clients and servers.
- ➢ SSL Secure socket layer. A transport mechanism developed by Netscape Communication for transmitting secure data over a network.

- ➢ URL Uniform resource locator. An address that specifies the location of a Web page.

- ➢ There are many interfaces to the WWW, such as Mosaic, a GUI – based hypertext browser, and Netscape, that allows users to easily navigate the Internet and access it many services. These easy-to-use interfaces are playing an important role in popularizing user of these interfaces to create their own Web pages. According to Michael J. Walsh, president of Internet Info., in Falls Church. Virgina, the number of companies with .com addresses is expected to double within the next year, primarily because it is now easy to use the Internet and gain 24-hour access to customers all over the world.

Home page

The World Wide Web has also spawned new services, known as service providers that provide a multitude of services on the Web. For example, a Web service provider can help a company establish a home page on the Net, an electronic description of the company and its products and services, similar to a catalog or a brochure. Just as catalogs should be attractive and grab the interest of customers, the homepage should also be attractive and encourage the user to further explore the company and its products.

Basic requirements to set up a home page include an Integrated Services Digital Network (ISDN) line, software to generate Hypertext Markup Language (HTML), which is the graphical interface to the internet, and a PC or Unix Server that has between 16M bytes and 32 M bytes of RAM and runs at 100Mhs or more.

Many companies are setting up home pages to attract new customers. For example, GEPlastics found that as soon as it set up a Web page, it was getting approximately 12,000 potential inquires each month its products. Before the page was set up, it took nearly 3 days to respond to customer queries: now customers can get information within a few minutes. The company firmly believes that setting up a Web page has given it a competitive advantage. Further, the cost of setting up a Web page was much lower than that of printing pamphlets and mailing

catalogs to customers. The advantages of a Web page are so great that, as one spokesperson said, "You simply can't lose. There is nothing equivalent to the Net". Security APL is an example of another company that relies on the internet to enhance internal and external communications.

In 1995, when statewide elections were held in California, tens of thousands of voters accessed a World Wide Web Server that contained poll reports culled every five minutes from the state's Election Web Server. Clinton's 1992 presidential campaign was notable for making his E-mail address public, and the White House recently established its own World-Wide Web Home Page (try whitehouse.gov).

United Parcel Service (UPS) is another company Spokesperson says, "Our competitors aren't online yet, and that gives us an edge where we can generate some allegiance to our service".

Although there are many advantages to a home page, some experts are worried that the Internet may simply become a "de facto national post office", and may become heavily commercialized. As more and more businesses start using the Net to sell their products and services, the Net may not be capable of handling the expanded volume of traffic. Ray Hoving, chairman of the Society for Information Management's (SIM) National Data Highways Advisory Council, is concerned about the technical, administrative, and security issues that will arise as traffic on the Net continues to increase.

9.4.4   Information Search Tools

Archie

The tools discussed in this section help users locate information on the Net. For example, Archie, one of the first information search tools developed on the Internet, periodically searches anonymous ftp servers that participate in the Archie database and identifies all files on these servers. It then creates a central index of all files available on anonymous ftp sites and creates a central database that users can access to locate information. least part of the filename in order to be able to search for the file. When the desired file is located, the servicer idenfies the file's address and the user can use the ftp command to access and retrieve the file. Though Archie is a very useful tool for locating files, it must be noted that not all anonymous ftp sites participate in the Archie database, and therefore, the database is not a comprehensive one.

Veronica

Veronica is a search tool designed specifically to locate all files on Gopher sites and it is listed under Other Gopher and Information Servers on the Gopher menu. Users who have access to a Gopher server and a Veronica server can then access the database. Note however, that some Gopher serves may choose not to participate in the Veronica Service. One of the biggest advantages of Veronica over Archie is that the user does not have to know the filename; hrases descriptive of the search area will do.

WAIS

WAIS (Wide Area Information Server). Pronounced "ways", is a search system that accesses servers all over the world to locate requested files. The WAIS database has an index of keyboards that help users to locate files in topic areas of interest to them. When given the keywords, WAIS returns the addresses where the files are located. The user can then user one of the other services discussed above to download the files. If a particular file is not found on a given WAIS server, the server will automatically direct the query to other

WAIS serverson the Net.

### 9.5	ADVANTAGES OF USING THE INTERNET

In the history of mankind, the Internet is the greatest development in the domain of communication industry. Internet has tremendous potential and a lot to offer in terms of services. We can notice advantages anddisadvantages of using Internet.

### 9.5.1	*Faster Communication*

The foremost target of Internet has always been speedy communication and it has excelled waybeyond the expectations. New innovations are only going to make it faster and more reliable. Now, you cancommunicate in a fraction of second with a person who is sitting in the other part of the world. With the help of such services, it has become very easy to establish a kind of global friendship where you can share yourthoughts and explore other cultures.

### 9.5.2	*Information Resources*

Information is probably the biggest advantage that Internet offers. Internet is a virtual treasure trove of information. Any kind of information on any topic under the sun is available on the Internet. The searchengines like Google, Yahoo are at your service on the Internet. There is a huge amount of informationavailable on the Internet for just about every subject known to man, ranging from government law andservices, market information, new ideas and technical support. Today, it is almost required that studentsshould use it for research or the purpose of gathering resources.

### 9.5.3	*Entertainment*

Entertainment is another popular reason why many people prefer to surf the Internet. In fact, the Internet has become quite successful in trapping the multifaceted entertainment industry. Downloading games or just surfing the celebrity websites are some of the uses people have discovered. Even celebrities are usingthe Internet effectively for promotional campaigns.

### 9.5.4	*Social Networking*

One cannot imagine an online life without Facebook or Twitter. Social networking has become so popular amongst youth that it might one day replace physical networking. It has evolved as a great medium to connect with millions of people with similar interests. Apart from finding long-lost friends, you can alsolook for a job, business opportunities.

### 9.5.5	*Online Services*

The Internet has made life very convenient. With numerous online services you can now perform allyour transactions online. You can book tickets for a movie, transfer funds, pay utility bills, taxes etc., and right from your home.

### 9.6	DISADVANTAGES OF USING THE INTERNET

### 9.6.1	*Theft of Personal Information*

If you use the Internet for online banking, social networking or other services, you may risk a theft toyour personal information such as name, address, credit card number etc. People can access this information through unsecured connections or by planting software and then use your

personal details for their benefit.Needless to say, this may land you in serious trouble.

9.6.2   *Virus Threat*

Internet users are often plagued by virus attacks on their systems. Virus programs are inconspicuous and may get activated if you click a seemingly harmless link. Computers connected to the Internet are veryprone to targeted virus attacks and may end up crashing.

9.6.3   *Pornography*

Pornography is perhaps the biggest disadvantage of the Internet. Internet allows you to access and download millions of pornographic photos, videos and other X-rated stuff. Such unrestricted access to porn can be detrimental for children and teenagers.

9.6.4   *Social Disconnect*

Thanks to the Internet, people now only meet on social networks. More and more people are getting are drifting apart from their friends and family. Even children prefer to play online games rather thangoing out and mingling with other kids.With all its drawbacks the internet has the potential to make your life simple and convenient, as well as cause destruction in your life.

9.7 Technical Terms

AAA: Authentication, Authorization and Accounting

ARPA: Advanced Research Project Agency

WAIS : Wide Area Information Server

RFC: Request for Comments (RFC)

SIM: Society for Information Management

9.8   SELF ASSESSMENT QUESTIONS

1. Describe the tools of Internet.

2. How Internet is useful for Students?

3. What are the advantages & disadvantages of internet?

9.9   SUGGESTED READINGS

1.   http://walthowe.com/navnet/history.html
2.   http://www.investintech.com/content/historyinternet/ (Accessed on 27.01.2013 at: 20:14pm)
3.   http://www.brobstsystems.com/kids/internet4/tsld003.htm
4.   http://www.studymode.com/essays/Advantages-And-Disadvantages-Of-Using-Internet- 937111.html
5.   http://en.wikipedia.org/wiki/Intranet
6.   http://www.yourmaindomain.com/web-articles/what-is-internet.asp

LESSON - 10
INTRANET

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the Intranet;
- How Internet works;
- Types of services offered through intranet;
- Hardware & Software configuration for Intranet.

Structure

10.1   INTRODUCTION

An intranet is a computer network that uses Internet Protocol technology to share information, operational systems, or computing services within an organization. The term is used in contrast to *internet*, a network between organizations, and instead refers to a network within an organization. Sometimes, the term refers only to the organization's internal website, but may be a more extensive part of the organization's information technology infrastructure, and may be composed of multiple local area networks. The objective is to organize each individual's desktop with minimal cost, time and effort to be more productive, cost efficient, timely, and competitive.

An intranet may host multiple private websites and constitute an important component

and focal point of internal communication and collaboration. Any of the well known Internet protocols may be found in an intranet, such as HTTP (web services), SMTP (e-mail), and FTP (file transfer protocol). Internet technologies are often deployed to provide modern interfaces to legacy information systems hosting corporate data.

10.2 INTRANET

An intranet can be understood as a private analog of the Internet, or as a private extension of the Internet confined to an organization. The first intranet websites and home pages were published in 1991 and began to appear in non-educational organizations in 1994. Intranets are sometimes contrasted to extranets. While intranets are generally restricted to employees of the organization, extranets may also be accessed by customers, suppliers, or other approved parties. Extranets extend a private network onto the Internet with special provisions for authentication, authorization and accounting (AAA protocol).

In many organizations, intranets are protected from unauthorized external access by means of a network gateway and firewall. For smaller companies, intranets may be created simply by using private IP address ranges, such as 192.168.0.0/16. In these cases, the intranet can only be directly accessed from a computer in the local network; however, companies may provide access to off-site employees by using a virtual private network, or by other access methods, requiring user authentication and encryption.

10.3 INTRANET HARDWARE

An intranet is a client / server system. The server is a computer that has two main functions.
  ➢ It runs the intranet server software.
  ➢ It usually stores some or all of the content that is available to users.
For an intranet, the requirements for the server computer depend mainly on how many connections per hour it will be expected to handle.

A typically equipped modern personal computer – single Pentium 120 MHz processor, 32MB of random- access memory, 2GB hard disk – would be sufficient to handle a small intranet load. The load could be upto, say, a few hundred connections per hour. When the connection load on the server gets too high, users will find themselves waiting a long time to get a page.
Eventually, their requests wil time out (the browser will get tired of waiting and give up) because the server can't get to their request fast enough.

When the server becomes overloaded, there are a number of things you can do to improve its performance.

  ➢ Add more memory to the server
  ➢ Add more processors to the server
  ➢ Add more servers and split the content among them

Almost any computer can be a client. All the client needs to do is run the World Wide Web browser software, which does not require a lot of processor power or memory. Clients can also be based on any technology, such as a Macintosh, Intel, or Sun, as long as the platform is capable of running TCP / IP.

Although it is true that browser software is relatively "light" in terms of its demands on the client computer, that situation is changing. Newer browsers, such as Microsoft's

10.4 INTRANET SOFTWARE

The software that runs on the server computer and provides services such as World Wide Web (also known as HTTP) publishing, FTP file retrieval, and indexing and searching facilities is known as server software. Server software is available free on the Internet, and commercial packages such as Microsoft's Internet Information Server and Netscape Navigator are also available. Server software is available for a variety of operating systems, such as UNIX and Windows NT Server.

The software that runs on the client is called a browser. We use the browser to access and view Web pages. Because our intranet will use the same protocols as the Web, we can use any of the well-tested Web browsers already available – either free of charge or at a reasonably low cost on the commercial market. Perhaps the best-known Web browser is Netscape Navigator. Netscape provides the user with a variety of features, such as bookmarks, e-mail automation, and "hot" lists for storing the addresses of our favorite Web sites, Navigator is available commercially and, at most times, Netscape Communications Corporation allows downloading of a recent version. The Internet is a gold mine of free software. We can find everything we need to run a full features intranet. One word of caution: if you use software from the Internet, you may be on your own when it comes to getting it set up right and solving the inevitable problems that come up. Unless we're the adventure some soft and feel comfortable poking around in the innards of computer applications, we might be better off spending a few dollars for well designed, tested, and supported software.

10.5 INTRANET SERVICES

All of Internet services are still available on the Internet. Chances are, however, we won't want or need all of them on our intranet.

Here's the suite of services and facilities you'll probably want:
- World Wide Web publishing
- FTP
- Some kind of indexing and searching service
- Some facility to run scripts.

10.5.1 Web (HTTP) Publishing

The World Wide Web is by far the most popular service on the Internet. In fact, for many people, the Web is the Internet. The World Wide Web is based on HTTP, HTTP defines how browsers and servers communicate and move information back and forth.

There's that word again: protocol. Now we have three layers of protocols: the HTTP uses the Internet Protocol over a network that has some kind of network communication protocol. One would think Internet was invented by the State Department. HTTP uses a "request and response" process. The browser on the client computer sends a request to the server for a particular page of information. The server receives the request, finds the requested page (file), and sends it to the browser. HTTP then forgets about the whole transaction. The browser and the server

maintain a connection only long enough to process the request.

Let's clear up some potential confusion here. As stated, the server and the client maintain a logical connection only long enough to process a request. However, they remain physically connected over the network. If we connect to our intranet remotely over a telephone line, the telephone connection remains open until you quit the session, even though the server and browser aren't talking to each other.

HTTP is usually used to send HTML files to the browser, but it can send any kind of file. If the browser cannot display the file, it will start another application (called a helper application) to display it, if possible. If it can't find as helper application, it will give the user option of saving the file to disk.

10.5.2   Hyper-Text Markup Language

The primary language used to create Web pages is HTML. HTML uses commends called tags embedded in a text file to tell the browser how to display the file. HTML started out as fairly simple markup language but, like everything else in the computer world, it's getting more complex all the time. An official HTML standard is published by the World Wide Web Consortium, but companies that produce browser software like to add unique extensions to the set of tags their browsers understand, to give them a competitive edge.

For example, Microsoft's Internet Explorer lets we use a special tag in an HTML document to create marquee in which a line of text crawls across the page from one side to the other. A browser that does not support this tag will not display the marquee effect. This example illustrates one of the irritating "gotchas" in the Web: All browsers do not support all the same extended HTML tags, so you can't count on them all to display the same page in the same way. For our intranet, it would be a good idea to standardize on one browser to be used by everyone, so we will always know what tags it can understand.

In the early days of the Web, creating a document in HTML format meant typing the content in a text editor and then adding HTML tags by hand. Nowadays, there are authoring tools, such as Navigator Gold, FrontPage, and bothers, that are very much like word processors. They let you create documents and add formatting and effects without ever having to touch an HTML tag. Instead, the tools add the tags behind the scenes as you create the document.

10.5.3   Hypertext
Hypertext – links that can take user to new page with a single click of the mouse button is a defining feature of the World Wide Web. Hypertext is what gives we the capability to manage information on the Web in new, highly effective ways. If we have used the World Wide Web, we have used hypertext. It shows up usually as colored text – a label, a section title, a word or two in a sentence, or even a portion of an image. When we move the mouse pointer over hypertext, the pointer changes to a pointing hand. When we click the hypertext with the mouse, something happens. Usually, we go to another page.

10.6   COMMUNICATION SYSTEMS

10.6.1   E-Mail
Electronic mail or E-mail, as it is popularly called, is a system that allows a person or a

group to electronically communicate with others through a network. A user sends an electronic message over a network; the message is stored in the electronic mailbox of the receiver. The electronic mailbox is usually a file on a server; the messages in it can be retrieved when the recipient is ready to receive them. Users can also edit, sort, save, and classify messages and forward them to other individuals on the network. If two users are logged onto the network at the same time, then they can converse through E-mail. Some E-mail systems have multimedia capabilities allowing E-mail users to send not only text, but also voice and still pictures.

There are many kinds of E-mail software; depending on the characteristics of each type used, mail can be sent between different computers or may be restricted to users on one computer. If an organization has different types of systems, say IBM, Digital, and so on, these systems must be linked together for E-mail to be successful. E-mail has many benefits. First, it allows organizations to be responsive to customer needs. For example, when Freddie Mercury died, his fans around the world sent E-mail messages to his music company. EMI Records, to order his music. As a tribute to his memory, radio stations around the world began to play his once neglected songs. The box-office blockbuster film Wayne's World features one of Freddie's old hits and MTV began showing his music videos. The dead star was suddenly hot. EMI subsidiaries around the world were flooded with E-mail orders for the star's music. The Queen albums in EMI's catalog were particularly popular with the E-mail users. The result EMI sold 3 million Queen albums in 1 month, generating $30 million to $15 million of the year's profits for the $2-billion company.

The "big 3" credit reporting agencies – TRW, Equifax, and Trans Union, use E-mail to respond quickly to customers' concerns and queries. Before the system was installed, consumes who were trying to rectify errors in their credit reports often felt harassed by the credit agencies. Consumers were forced to write to all three agencies about any errors in their credit reports. Each agency had to write to retailers and lenders about the corrections. This paper-driven process was nightmarish for some consumers; there were enormous delays in rectifying errors. There were mail delays and internal processing delays in getting the paper forms to the right people, with the result that dispute resolution could take from 30 days to 8 months.

Today, all three agencies use E-mail systems to correspond with retailers and lenders. This not only saves the agencies time and money, but has greatly alleviated the problems that consumers face when there are errors in their credit records. Most disputes are resolved in under 5 days – a big improvement over the old system.

Another advantage of E-mail is that it provides instantaneous access to and dissemination of information, thereby eliminating the time lag involved in using the postal service. E-mail messages do not get lost or reach the wrong party.

In spite of its many benefits, E-mail should be used carefully. John Beamish, senior systems analyst at the Ministry of Education in Toronto, tells this E-mail story; "At my last place of employment, the unwritten rule was; If you drink the last of the coffee, make a fresh pot. Unfortunately, not many people did. In response, an angry coffee drinker sent a ragging five page E-mail message regarding his dissatisfaction. The message was so long and went to so many people, it used all the memory of at least one dist, and no one could access their E-mail messages".

Finally, E-mail systems must be carefully selected, since a poor package may not only deter users from using E-mail but can also result in poor communications. Some factors to consider before selecting an E-mail package are: What hardware and operating system platforms must the mail system support? How many users do we currently have? How many users will we have in 2 years? In 5 years? Will remote users at multiple sites need to use the system? Must users access external services, such as Compuserve? Can messages be sent between different platforms (say, from a UNIX machine to a Macintosh or an IBM PC)? Is the package capable to meeting the growing needs of the organization? Will the vendor provide training and technical support if necessary? These and other related questions must be carefully addressed.

10.6.2   Fax:

Fax.or facsimile transmission, is another type of electronic publishing and processing system. Fax technology uses telephones, modems, and scanners to transmit text and graphics to individuals and organizations all over the world who have access to telephones. Note that a computer is not required to send a fax. all that is needed is a fax machine at either end of a telephone connection. The idea itself is very simple and elegant. A scanner in the fax machine scans the document at one end and a built-in modem sends it; in the fax machine at the other end, a build-in modem receives the message, a scanner scans the document, and a printer prints it.

In a short time, the fax, sometimes viewed as a "long-distance copier", has become part of the home office, the work office, and even of war zones! Journalists reporting the war in Bosnia used fax machines to transmit was stories because editors preferred to see the stories in handcopy form. It is estimated that there are 24.5 million fax machines in the world today. The Japanese, in particular, rely heavily on fax communication because their language, with its thousands of ideographs, is easier to write in longhand than to type on cumbersome Japanese word processors.

Fax machines can send the same document to multiple users. They can also be integrated with applications such as word processors, so that faxes can be edited without being rekeyed into the computer. Fax machines can be programmed to send faxes when telephone rates are lowest. A portable fax machine allows users to retrieve documents using a touch-tone phone's keypad. An interesting development is the fax modem, which allows users to send or receive faxes using their PCs.

10.6.3   Voice Mail:

Voice Mail facilities oral communication. This way it works is illustrated in below figure, the sender dictates a message over the telephone. A special device, called a codec, converts the analog signal of the sender's voice into a digitized message. The message is transmitted over the network and stored in a server at the receiver's end. A blinking light on the receiver's hone indicates that he or she has a voice message. When the receiver chooses, the digitized message is retrieved from the server, reconverted into alalog form, using a codec at the receiver's end, and the receiver receives it over the phone.

Although voice mail is a simple idea, it eliminates a number of problems, such as "phone tag". It also ensures that a message reaches the right party even when that party is not available. Some voice mail systems can send the same message to several people, reroute a message to another phone, save messages for future reference, and retrieve messages from any telephone, anywhere in the world. In some systems, uses need a password to access voice messages, making voice mail a secure medium for confidential messages.

An intranet is an internal, network-based infrastructure. In reality it is the same architecture as the Internet and has the same document and content standards as the World Wide Web. Corporate networks that use the same networking/transport protocols and locally based web servers to provide access to vast amounts of corporate information in a cohesive fashion. Documents must be stored in HTML, and clients need web browser software.

10.8 TECHNICAL TERMS

AAA: Authentication, Authorization and Accounting

10.9 SELF ASSESSMENT QUESTIONS

1. What is Intranet?
2. Explain about Intranet software and hardware.
3. What are Intranet services?
4. Explain about extranet.

10.10 SUGGESTED READINGS

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3. Nielsen, J. and Sano, D., '1994 Design of SunWeb - Sun Micro-systems' Intranet', Useit.com, 1994.

4. Callaghan, J (2002). *Inside Intranets & Extranets: Knowledge Management AND the Struggle for Power*. Palgrave Macmillan. ISBN 0-333-98743-8.

5. 5.http://www.msuniv.ac.in/InternetandIntranetAdministration.pdf

LESSON - 11
INFORMATION COMMUNICATION TECHNOLOGY

AIMS AND OBJECIVES
After reading this Chapter, you will be able to:
- Understand the information communication technology;
- Definition of ICT;
- How ICT is being used in education;
- Advantages of ICT use in education.

Structure

11.1 INTRODUCTION

Globalization and technological change processes that have accelerated in tandem over the past years have created a new global economy Powered by technology, fueled by information and driven by knowledge. The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. As you know the half life of

information continues to shrink and access to information continues to grow exponentially, schools cannot remain mere venues for the transmission of a prescribed set of information from teacher to student over a fixed period of time. Rather Schools must promote Learning to Lear i.e. the acquisition of knowledge and skills that make possible continuous learning over the lifetime. The illiterate of the 21st century according to futurist Alvin Toffler, ¯Will not be those who ca not read and write, but those who cannot learn, Unlearn & relearn, Concerns over educational relevance and quality co- exist with the imperative of expending educational opportunities to those made most vulnerable by globalization - developing countries in general, low income groups, girls and women and low skilled workers in particulars. Global changes also put pressure on all groups to constantly acquire and apply new skills. The international Labour organization defines the requirements for education and training in the new global economy simply as a Basic education for all, Core work skills for all and Lifelong learning for all.

In this connection, Information and communication technologies (ICTS) which include radio and television, and the Internet - have been touted as potentially and powerful enabling tools for educational change and reform. When used appropriately, different ICTS are said to help expand access to education, Strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life.

However, the effective integration of ICTS into the educational system is a complex, om ultifaceted process that involves not just technology, indeed, given enough initial capital, getting the technology is the easiest part - but also curriculum and pedagogy, Institutional readiness, teacher competencies and longterm financing, among others. In this module we will get an overal idea about the concept of ICTS. We will also dicuss the need & significance of ICTS in Education with specific reference to historical perspective and emerging trends.

11.2   CONCEPT OF INFORMATION TECHNOLOGY

Today's world is a world of information explosion. This information explosion is taking place in such a fast speed that even a literate person is feeling as if he or she is illiterate being not able to cope up with such an information explosion. Here the question arises how is one to cope up with it? The answer is, information technology (IT) that can help in coping with the information explosion. So, we can say that Information Technology is nothing but coping up with explosion of Information. Information technology (IT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics - based combination of computing and telecommunication. The term in its modern sense first appeared in a 1958 article published in the Harvard Business Review, in which authors Leavitt and whisler commented that the new technology does not yet have a single established name. We shall call it information technology. It spans a wide variety of areas that include but are not limited to things such as processes, computer software, computer hardware, Programming Languages and data constructs. In short, anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of the domains space known as Information Technology.

11.3   MEANING OF INFORMATION TECHNOLOGY (IT) :
Information Technology consists of two words Information and Technology. If you know the two words you can understand the word information technology together. The term Information refers to any communication or representation of knowledge such as facts, data or opinions in any medium or for, including textual, numerical, graphic Cartographic, narrative or

audiovisual forms.

Technology is the practical form of scientific knowledge or the science of application of knowledge to practical. Information Technology is any equipment or interconnected system or sub system of equipments that is used in the acquisition, storage manipulation, management transmission or reception of data or information.

11.4   DEFINITION OF INFORMATION TECHNOLOGY:

Information Technology is a scientific, technological and engineering discipline and management technique used in handing the information, it's application and association with social, economical and cultural matters (UNSECO).

Information technology is a systemic study of artifacts that can be used to give form to facts in order to provide meaning for decision making, and artifacts that can be used for organization, processing, communication and application of information (Darnton and Giacoletto).

From the above discussion we can conclude that information technology refers to the information processing of the software application on operating systems or hardware applications that includes computers, videos, telephones and related equipments of telecommunications, tapes, CDs etc.

11.5 CHARACTERISTICS OF INFORMATION TECHNOLOGY:

Information Technology has the following Characteristics:

➢ Acquisition, Storage, manipulation, management, transmission or reception of data or information.
➢ Real time access to information.
➢ Easy availability of updated data
➢ Connecting Geographically dispersed regions
➢ Wider range of communication media.

11.6   CONCEPT OF COMMUNICATION TECHNOLOGY

Communication Technology is also comprised of two words like Communication & Technology. We have already discussed that technology is the science of the application of knowledge to practical purposes. You also know that information means any communication or representation of knowledge in any form. Now we will know what communication is?

Communication is an integral part of human existence. It is communication that decides the very identity of human beings Modern society is turning into an information society and communication is the exchange of information. It is the process & transferring information form a Sender to a receiver with the use of a medium in which the communication information is understood by both sender and receiver.

Communication Technology implies the knowledge, skills and understanding needed to exchange information verbally or non-verbally. It is processing of information in terms of accessing information, decoding information and sending it via a medium and changer to the receivers. Medium or channel can be written or oral or gesture form of information through speech, action or

any electronic machine.

Communication Technology is the electronic systems used for communication between individuals or groups. It facilitates communication between individuals or groups. Who are not physically present at the same location. Systems such as telephone, telex, Fax, radio, T.V. and Video are included, as well as more recent computer based technologies, including electronic data interchange and e-mail.

In short, communication technology is the activity of designing and constructing and maintaining communication systems.

11.7 INFORMATION COMMUNICATION TECHNOLOGY IN EDUCATION

"Globalization and technological changes have created a new global economy powered by technology, fueled by information and driven by knowledge." The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. As the access to information continues to grow rapidly, schools cannot be contented with the limited knowledge to be transmitted in a fixed period of time. They have to become compatible to the ever expanding knowledge and also be equipped with the technology to deal with this knowledge.

Information and communication technologies (ICTs) which include radio and television, as well as newer digital technologies such as computers and the Internet have been proven as potentially powerful tools for educational change and reform. When used appropriately, different ICTs can help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by helping make teaching and learning into an active process connected to real life.

11.8 DEFINITIONS

"ICT stand for information and communication technologies and is defined, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information.""ICT implies the technology which consists of electronic devices and associated human interactive materials that enable the user to employ them for a wide range of teaching - learning processes in addition to personal use."

These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony." ICT is that technology which uses the information to meet human need or purposes including processing and exchanging.""Information and communications technology (ICT) in education is the processing of information and its communications facilities and features that variously support teaching, learning and a range of activities in education." All these definitions combine Communication technology and Information technology that have thin line between them but cannot do away without each other. When these technologies are applied in the field of education, it is termed as ICT in education. The term too can be used as the connotation to the term Educational; technology because it also uses any hardware and software approaches that can enhance yield better learning outcomes. In the era of Computer technology the term ICT mainly focuses on the infrastructure, devices and sources of computer technology and thus it is imperative to discuss about the use of ICT in education by focusing mainly on Computer based technology.

11.9   CHARACTERISTICS OF ICT IN EDUCATION

ICT in education is any hardware and software technology that contribute in the educational information processing. In the context of present era, ICT mainly comprises of Computer technology with its hardware, like, Personal computer machine, infrastructure required for setting up Internet facility and also software like, CD ROM including various programme packages, E learning strategies etc.

ICT in education is any Information Technology that focuses on the acquisition, storage, manipulation, management, transmission or reception of data required for the educational purpose. For example, the information about students' records, their admissions, updates of their auricular and co-curricular activities.

ICT in education is any technology that deals with the exchange of information or in other words communication in the teaching learning process. Uses of Electronic learning technology like, Teleconferencing, power point presentations, CD ROM are Communication Technology which is the part of ICT.

ICT in education is any educational technology that is applied in the educational process. It encompasses Hardware approach like use of machines and materials, Software approach like use of methodologies and strategies of teaching learning and Systems approach that uses the management technology that deals with the systematic organization of the hardware and the software. Different software packages for the use in different department of education; e.g. library software, administration software, software related to managing the entire teaching learning process.

ICT in education is the support material in the hands of the human resource involved in the educational process in order to enhance the quality of education. ICT in education comprises of the application of science of On-line, Offline learning with the help of the computer technology.

11.10   USES IN EDUCATION

ICT is being utilized in every part of life. Due to the increasing importance of the computer, students- the future citizens cannot afford to keep themselves aloof from this potential medium. In education, use of ICT has become imperative to improve the efficiency and effectiveness at all levels and in both formal and nonformal settings. Education even at school stage has to provide computer instruction. Profound technical knowledge and positive attitude towards this technology are the essential prerequisites for the successful citizens of the coming decades. It can be used for the following purposes:

- To broadcast material, online facility or CD-ROM can be used as sources of information in different subjects;
- To facilitate communication for pupils with special needs;
- To use electronic toys to develop spatial awareness and psychomotor control;
- To use the Online resource like, email, Chat, discussion forum to support collaborative writing and sharing of information.
- To facilitate video-conferencing or other form of Tele conferencing to involve wide range of students from distant Geographic areas.
- For Blended learning by combining conventional classroom learning with E-learning

learning systems

- To process administrative and assessment data.
- To exchange and share ideas -among teachers for the professional growth.
- To carry out internet-based research to enhance , educational process

11.11   ADVANTAGES OF THE USE OF ICT IN EDUCATION:

ICT encompasses all those gadgets that deal with the processing of information for better and effective communication. In education, communication process takes place between teachers, students, management and administrative personnel which requires plenty of data to be stored for retrieval as and when required, to be disseminated or transmitted in the desired format. The hardware and software like OHP, Television, Radio, Computers and related software are used in the educational process. However ICT today is mostly focused on the use of Computer technology for processing the data. In this context,advantages of ICT in education can be listed down as follows :

11.11.1   Quick access to information
Information can be accessed in seconds by connecting to the internet and surfing through Webpages.

11.11.2   Easy availability of updated data:
Sitting at home or at any comfortable place the desired information can be accessed easily. Thishelps the students to learn the updated content. Teachers too can keep themselves abreast of the latestteaching learning strategies and related technologies.

11.11.3   Connecting Geographically dispersed regions:

With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Students from different parts of the world can learn together by using online, offline resources.This would result in the enriching learning experience. Such collaborative learning can result in developing.

• Divergent thinking ability in students,
• Global perspectives
• Respect for varied nature of human life and acculturation.
• Facilitation of learning

ICT has contributed in shifting the focus on learning than teaching. ICT helps students to exploreknowledge to learn the content through self study. Teacher can help the students by ensuring the right direction towards effective learning. Situational learning, Programmed learning, manyOnline learning courses are some of the example of self learning strategies that are being utilized with the help of ICT.

11.11.4   Catering to the Individual differences:
ICT can contribute in catering to individual needs of the students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of everystudent in the class.

11.11.5 Wider range of communication media:

With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning are some of the resources that can be used in educational institutions. Collaborative learning, individualized learning strategies can enhance the quality of group as well as individual learning. with the real society. This can ensure the applicability of knowledge.

11.11.6 Wider learning opportunities for pupils:

Application of latest ICT in education has provided many options to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use Online tests. This can ensure fulfillment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs.

11.12 TECHNICAL TERMS

TCIL: Telecommunications Consultants India Ltd
TDML: Time Division Multiple Accesses.

11.13 SELF ASSESSMENT QUESTIONS

1. Define Information Technology
2. What is Information Technoogy? Explain its' Charateristics.
3. What is communication Technology?
4. What is Educational Technology?
5. What is ICT? Explain any two benefits of ICT in Education.

11.14 SUGGESTED READINGS

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4. w.w.w. Google.com Mac millan publishing company

In addition to above meaning of reprographic there are few meanings of reprographics are given below:

➢ Reprographics generally refers to methods of copying or reproducing documents that include xerography and scanning. The term applies to both soft and hard copy reproduction.
➢ Reprographics is a general term used to refer to multiple methods of reproducing content both physical and digital which include xerography, photography, scanning and digital printing.

LESSON - 12
TELECOM TECHNOLOGY

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the telecom technology;
- History of Indian telecom industry;
- Objectives of the National telecom policy;
- Future opportunities of India telecom sector.

Structure

12.1 INTRODUCTION

Globalization, liberalization and privatization are the three most spoken words in today s world. These initiatives paved way for all-round reforms, especially in developing economies, like India. These countries realized that development of effective and efficient means of communications and information technology is important to push them onto the path of development. The growth of the telecom sector in India during post-liberalization has been phenomenal. This research aims to throw light on the factors that contributed to growth in the segment and presents an insight on the present status of the industry

12.2 HISTORY OF INDIAN TELECOM INDUSTRY

The history of the Indian Telecom sector goes way back to 1851, when the first operational landlines were laid by The British Government in Calcutta. With independence, all foreign telecommunication companies were nationalized to form Post, Telephone and Telegraph, a monopoly run by the Government of India.

The Indian Telecom Sector, like most other infrastructure sectors is controlled by the state. The Department of Telecommunications (DoT), reporting to the Ministry of Communications (MoC) is the keybody for policy issues and regulation, apart from being a basic service provider to rest of country. By an act of Parliament, the Telecom Regulatory Authority of
India (TRAI) was formed to be the regulatory agency.

12.2.1 Ministry of Communication:

All the operations of this sector come under the control of MoC. It is responsible for all majorpolicy changes, planning, supervision, spectrum control, etc.

12.2.2 Department of Telecommunications:

DoT was formed in 1985 when the Department of Posts and Telecommunications was eparated into Department of Posts and Department of Telecommunications. Till 1986, it was the only telecom serviceprovider in India. It played a role beyond service provider by acting as a olicy maker, planner, developer as well as an implementing body. In spite of being profitable, non-corporate entity status ensured that it did nothave to pay taxes. DoT depends on Government of India for its expansion plans and funding. Its pivotal role in the Indian telecom sector has got diluted after formation of TRAI- Telecom Regulatory Authority of India.

12.2.3 Telecom Regulatory Authority of India:

TRAI was founded to act as an independent regulatory body supervising telecom development in India. This became important, as DoT was a regulator and a player as well. Founded by an Act of Parliament, the main functions of the body was to finalize toll rates and settle disputes between players. An independentregulator is critical at the present situation as the sector witnesses competition. The operations of this sector are determined as under the Indian Telegraph Act of 1885 – A document buried in the sands of time. The next major policy document, which was produced, was the National Telecom Policy of 1994, a consequence of the ongoing process of liberalization.

12.2.4   *The Telecom Commission:*

The Telecom Commission was set up by the government of India vide Notification dated April 11,1989 with administrative and financial powers of the government of India to deal with various aspects of Telecommunications. The Telecom Commission and the DoT are responsible for policy formulation, licensing, wireless spectrum management, administrative monitoring of PSUs, research and development and standardization or validation of equipment, etc. The multi-pronged strategies followed by the Telecom Commission have not only transformed the very structure of this sector, but also have motivated all the partners to contribute in accelerating the growth of the sector. The other entities in the sector under the control of MoC are the two public sector telecom equipment manufacturers, namely Indian Telephone Industries (ITI) and Hindustan Teleprinters Ltd. (HTL). Both these companies are facing financial problems because of product obsolescence, poor management and over staffing. Telecommunications Consultants India Ltd. (TCIL), another PSU was founded in 1978 to undertake consultancy services in the field of telecom. (Source; www.dotindia.com.)

12.3   OBJECTIVES OF THE NATIONAL TELECOM POLICY

The objectives of the NTP 1999 are as under:

➢   Access to telecommunications is of most importance for achievement of the country s social and economic goals.Availability of affordable and effective communication for the citizens is at the core of the vision and goal of the telecom policy.

➢   Strive to provide a balance between the provision of universal service to all uncovered areas, including the rural areas, and the provision of high-level services capable of meeting the needs of the country s economy.

➢   Encourage development of telecommunications facilities in remote, hilly and tribal areas of the country.

➢   Create a modern and efficient telecommunications infrastructure taking into account the convergence of IT, media, and telecom and consumer electronics and thereby propel India into coming an IT superpower.

➢   Convert PCOs, wherever justified, into Public Tele information centers having multimedia capability like ISDN services, remote database access, government and community information systems, etc.

➢   Transform in a time bound manner, the telecommunications sector to a greater competitive environment in both urban and rural areas providing equal opportunities and level playing field for all players.

➢   Strengthen research and development efforts in the country and provide an importance to build world-class manufacturing capabilities.

➢   Achieve efficiency and transparency in spectrum management.

➢   Protect defense and security interests of the country.

➢   Enable Indian telecom companies to become truly global players.

12.4   TELECOMMUNICATION SERVICES

Today tariff for telecommunication services in India is one of the lowest in the world. The Indian consumer has immensely benefited from such lower tariffs which has also been a major factor for explosive growth in the sector. Following is the list of services offered by both GSM and CDMA operators:

- Telephone services
- NSD/ISD services
- Computerized trunk services
- Pay phones
- National & international leased lines circuits
- Telex
- Telegraph services (manual & automatic)
- X-25 based Packer Switched Data Network (NET)
- Gateway Packet Switched Data Services (GPSS)
- Gateway Electronic Data Interchange Service (GEDIS)
- Gateway E-Mail and Store & Forward FAX Service (GEMS-400)
- Concert Packet Service (CPS)
- Satellite based remote area business message network
- Electronic Mail
- Voice
- Audio-text
- Radio paging
- Cellular mobile telephone
- Public mobile radio trunked service
- Video-text
- Video conferencing
- V-SAT
- Internet
- ISDN
- INMARSAT mobile service
- INMARSAT data service
- Home country direct service
- Intelligent Network (IN) services

12.5   GLOBAL TELECOM INDUSTRY: AN OVERVIEW

With the awareness spreading around the world on the Information and Communications Technology (ICT), in the later part of the 20th century countries, especially the developing ones, began to realize the importance of an efficient telecommunication network for the development of the economy.

At the dawn of the 21st century, the developing countries started to make full use o f the technology revolution taking place around the world, with many countries liberalizing the existing stringent policies and regulations. To improve information and telecommunication technology, 189 countries of the UN met at the Fifty-Fifty General Assembly on September 2000. A millennium declaration was made, according to which the countries reaffirmed their commitment to improve the living conditions of poor and downtrodden in the world by adopting intense poverty programmes. One of the targets of this declaration was adherent to "In co-operation with the private sector make available the benefits of new technologies, especially information and communication". The indicators that were to be used for monitoring the progress were:

- Telephone line and cellular subscribers, per 100 units of population.

- Personal computers in use for 100 units of population.
- Internet user per 100 units of population.

Even before the declaration, many developing countries had started liberalizing their internal policiesto enable efficiency as to affordability as and reach ability of telecommunication system. By 1995, most of the low income developing countries of the world, made their economies global, by liberalizing the domestic licensing and important policies on the whole, to facilitate inflow of foreign capital into the infrastructure sector, especially in the telecommunication sector. This resulted in a telecom revaluation, with countries adopting liberalization initiates, experiencing a „never-before" growth in the telephone network, including the penetration levels. Developing countries today account for Developing countries today account for 49% of the total telephone network in the world. While in East Asia (including China) the total teledensity grew at a rapid pace to reach 27.4 in 2002 the teledensity grew at a slower pace in south Asia (Including India), to reach 4.5 in 2002.

This is due to imperfections in government regulatory and licensing policies in the „90s in most of the South Asian countries. While there was imbalanced development in ICT among the developing countries in individual growth in telecom, country-wise also showed a partial development, where the development in other segments apart from cellular was snail-paced. This was due tophenomenal growth in the cellular segment, whose major contribution was toward urban telephony. By the end of 2006, the telecommunication industry had experienced continuous growth, as well as rapid progress in policy and technology development, resulting in an increasingly competitive and networked world. It is true and encouraging that overall, the digital divide has been reduced and continues to shrink. ITU statistics show that over the last
10 years, the digital divide between the developing and the developed countries has been narrowing in termsof fixed telephone lines, mobile subscribers and Internet users. In contrast to the slow fixed line growth, phenomenal growth rates in the mobile sector particularly, have been able to reduce the gap that separates the developed from the developing countries from 27 in 1996, to 4 in 2006. The fixed line gap has been reduced from 11 to 4 during the same period.

12.6 TECHNOLOGY

Global system for Mobile communication (GSM around 80-85 % market share) Code Division Multiple Access (CDMA, AROUND 10-15 % market share are two prevalent mobile communicationtechnologies both technologies have to solve the same problem: to dive the finite Radio Frequency spectrum among multiple users. India primarily follows the GSM mobile system, in the 900MHz and 1800MHz band. The 900MHz band has greater transmission characteristics, thereby enabling lower capex cost for expansion of coverage area, as the number of towers and the base stations required would be lesser than in the 1800MHzband.

12.6.1 TDMA (Time Division Multiple Accesses:
Underlying technology used in GSM's G) does it by chopping up the channel into sequential time slices. Each user of the channel takes turns to transmit and receive signals. In reality, only one person is actually using the channel at a specific moment. This is analogous to time-sharing on a large computer server.

12.6.2 CDMA (Code Division Multiple Access:
Underlying technology used in GSM's 3G and IS-95's 2G) on the other hand, uses a special type ofdigital modulation called spread spectrum which spreads the voice data over

a very wide channel inpseudorandom fashion. The receiver undoes the randomization to collect the bits together and produce the sound.

12.7 ADVANTAGES OF 2G GSM

- GSM is mature and has a more stable network with robust features.
- Less signal deterioration inside buildings.
- Talk time is generally higher in GSM phones due to the pulse nature of transmission.
- The availability of Subscriber Identity Modules allows users to switch networks and handsets at will.
- GSM covers virtually all parts of the world so international roaming is not a problem.
- The much bigger number of subscribers globally creates a better network effect for GSM handset makers, carriers and end users.

12.8 ADVANTAGES OF CDMA

Capacity is CDMA's biggest asset. It can accommodate more users per MHz of bandwidth than any other technology.

- CDMA has no built-in limit to the number of concurrent users.
- CDMA consumes less power and covers large areas so cell size in CDMA is larger.
- CDMA is able to produce a reasonable call with lower signal (cell phone reception) levels. CDMAuses „soft handoff, reducing the likelihood of dropped calls.
- CDMA s variable rate voice coders reduce the rate being transmitted when speaker is not talking, which allows the channel to be packed more efficiently.

12.9 DISADVANTAGES OF 2G GSM

- Pulse nature of TDMA transmission used in 2G interferes with some electronics, especially certainaudio amplifiers. 3G uses W-CDMA now.
- Intellectual property is concentrated among a few industry participants, creating barriers to entry fornew entrants and limiting competition among phone manufacturers.
- GSM has a fixed maximum cell site range of 35 km, which is imposed by technical limitations.

12.10 DISADVANTAGES OF CDMA

- Most technologies are patented and must be licensed from Qualcomm.
- Breathing of base stations, where coverage area shrinks under load.
- As the number of subscribers using a particular site goes up, the range of that site goes down.
- CDMA may not perform well in hilly terrain because CDMA towers interfere with themselves; theyare normally installed on much shorter towers.
- CDMA covers a smaller portion of the world, and CDMA phones are generally unable to roaminternationally.
- Manufacturers are often hesitant to release CDMA devices due to the smaller market,

so featuresare sometimes late in coming to CDMA devices.

- The phones are not portable across providers (Source; www.itu.int.)

12.11   FUTURE GROWTH OPPORTUNITIES OF INDIAN TELECOM SECTOR

As per TRAI, two other associated aspects for market growth are availability of spectrum and availability of resources for network rollout and expansion. The government is currently looking into these two areas. The 79% hike in FDI has been cleared by the government to ensure continuous flow of investments to expand the reach of the mobile operators. To realize full market potential and achieve the forecasts, telecom operators have to work on a segmented approach and focus on the five key strategies given below:

- Mobile in the hand of every urban youth (age group 15 to 24 years).
- Mobile in the hand of every executive/businessman/ skilled worker.
- Mobile in every household with income above Rs. 4000.
- Mobile penetration in every town/village, with a population of over 3,000.
- Mobile Phones affordable and available wherever mobile services available.

12.12   TECHNICAL TERMS
TCIL: Telecommunications consultants India Ltd
TDML: Time Division Multiple Accesses

12.13   SELF ASSESSMENT QUESTIONS

1. Discuss about telecom Technology.
2. What are the services provided by telecom?
3. What are the objectives of national telecom policy

12.14   SUGGESTED READINGS

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LESSON – 13
SATELLITE TECHNOLOGY

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the satellite technology;
- Definition of satellite;
- Types of satellite;
- Indian satellite technology.

**Structure**

13.1 INTRODUCTION

Over the last several years small satellites have emerged as a viable option to carry out any number of missions as technological advances have enhanced the capabilities of spacecraft weighing a few hundred kilograms or less. In recent years, there have been many advances in the miniaturization of electronic and mechanical technologies for space applications. This paper describes the current status and the future trends of small satellite technology. Examples of small satellites making use of current small satellite technologies and future evolutions of small satellite technologies are presented.

Satellites can provide global, ubiquitous and multipoint communications. Not surprisingly, satellite technology has become a flexible and cost-effective solution for domestic and international networks, irrespective of the user's geographic location. Wire line and wireless lack this ability to leap across continents and oceans, often linking some of the world's most remote spots. Satellite technology can thus become a solution for some of the most complicated access problems, connecting cities across a large landmass, where copper or fiber would be cost prohibitive. Bringing broadband to the "last mile" of residences and businesses. Overcoming regulatory issues that make alternative carriers dependent on incumbents. Satellites also have a major role to play in designing, developing and expanding a network. With a satellite and Earth Stations, you can create a network on a permanent or interim basis much more rapidly than "laying cable." An interim station will even let you test a market or provide emergency service prior to a major infrastructure investment. You can also rapidly scale and re-provision a satellite based network to meet increasing and changing needs. The benefits of satellite communications have steadily expanded its usage.

Today, satellites' diverse purposes encompass wide area network communication, cellular backhaul, Internet trunking, television broadcasting and rural telephony. Satellites are also on the frontiers of such advanced applications as telemedicine, distance learning, Voice over Internet Protocol (VoIP) and video on demand (VOD). Intelsat has created this Primer to provide an introduction to the technology used in satellite networks. Our intention is help you understand, in general terms, why and how satellite technology might meet your needs. For more information, we invite you to talk to our experts and discuss your specific requirements. We hope this introductory material will be useful to you in meeting the challenges ahead in your network

13.2 WHAT IS A SATELLITE?

An object in an orbit is called a satellite. A satellite can be natural, like the Moon, or human (or extraterrestrial?) -made. Satellites can travel around planets or around stars such as our Sun. All the planets are satellites around the Sun. Almost every ship launched from Earth can be considered a satellite, as it is orbiting either the Earth or the Sun. Even though a space probe is going "out" from the Earth to Jupiter, it is still in orbit around the Sun, so it is still a satellite.
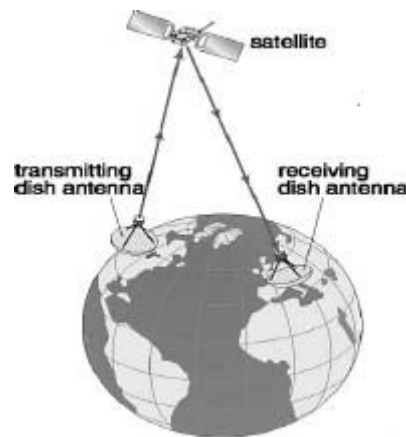
Communications satellites receive, amplify, and transmit radio signals between dish antennas that may be hundreds of miles apart.

13.3   DEFINITION OF SATELLITE

A small body in orbit around a larger body. See Note at moon. An object launched to orbit Earth or another celestial body. Satellites are used for research, communications, weather information, and navigation. The first artificial Earth satellite was Sputnik 1, launched by the Soviet Union in October 1957; the first successful American satellite was launched in January 1958.

13.4   TYPES AND USES OF SATELLITES

Satellites can be classified by their functions. Satellites are launched into space to do a specific job. The type of satellite that is launched to monitor cloud patterns for a weather station will be different than a satellite launched to send television signals across Canada. The satellite must be designed specifically to fulfill its function.

Below are the names of nine different types of satellites.
1. Astronomy satellites - Hubble Space Telescope
2. Atmospheric Studies satellites - Polar
3. Communications satellites - Anik E
4. Navigation satellites - Navstar
5. Reconaissance satellites - Kennan, Big Bird, Lacrosse
6. Remote Sensing satellites - Radarsat
7. Search and Rescue satellites - Cospas-Sarsat
8. Space Exploration satellites - Galileo
9. Weather satellites - Meteosat

13.4.1 Astronomy Satellite

An astronomy satellite is basically a really big telescope floating in space. Because it is in orbit above the Earth, the satellite's vision is not clouded by the gases that make up the Earth's atmosphere, and its infrared imaging equipment is not confused by the heat of the Earth. Astronomy satellites, therefore, can "see" into space up to ten times better than a telescope of similar strength on Earth. Can you guess what kinds of things an astronomy satellite would be looking at?

These are some pictures taken by the astronomy satellite Hubble of stellar phenomena like supernovas, distant galaxies, black holes, and quasars:
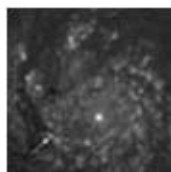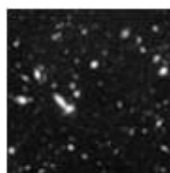
Supernova   Distant galaxies   Black hole   Quasar
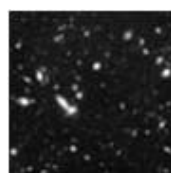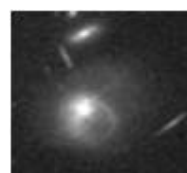
By analyzing the electromagnetic spectrum, the different wavelengths of light (for example, ultraviolet, x-ray, visible spectrum, microwaves, and gamma rays) make a picture of something far away in space. So, the pictures that come from Hubble and other astronomy satellites are not photographs from a regular camera, but images created from the analysis of electromagnetic waves - the waves that make up the light spectrum.

Astronomy satellites have many different applications:

- they can be used to make star maps

- they can be used to study mysterious phenomena such as black holes and quasars

- they can be used to take pictures of the planets in the solar system

- they can be used to make maps of different planetary surfaces

Astronomy satellites are different from space exploration satellites because they collect their data from Earth orbit. Space exploration satellites are really probes that are sent out into deep space. The Hubble Space Telescope is an example of an astronomy satellite.

13.4.2 Atmospheric Studies satellites – Polar

Atmospheric studies satellites were some of the very first satellites launched into space. They generally have pretty low Earth orbits so that they can study the Earth's atmosphere. Alouette, the first satellite launched by Canada, was also the world's first atmospheric studies satellite. The purpose of Alouette was to study the Earth's ionosphere (a charged layer of the atmosphere). Canadian scientists were trying to learn more about the aurora borealis, or northern lights - disturbances of the ionosphere in the atmosphere which create brilliant lights in the northern skies at night, but disturb radio communications. A more recent example of a satellite studying the atmosphere is NASA's Polar satellite.

13.4.3 Communications satellites - Anik E

It is difficult to go through a day without using a communications satellite at least once. Do you know when you used a communications satellite today? Did you watch T.V.? Did you make a long distance phone call, use a cellular phone, a fax machine, a pager, or even listen to the radio? Well, if you did, you probably used a communications satellite, either directly or indirectly.

Communications satellites allow radio, television, and telephone transmissions to be sent live anywhere in the world. Before satellites, transmissions were difficult or impossible at long distances. The signals, which travel in straight lines, could not bend around the round Earth to reach a destination far away. Because satellites are in orbit, the signals can be sent instantaneously into space and then redirected to another satellite or directly to their destination.

The satellite can have a passive role in communications like bouncing signals from the Earth back to another location on the Earth; on the other hand, some satellites carry electronic devices called transponders for receiving, amplifying, and re-broadcasting signals to the Earth.

Communications satellites are often in geostationary orbit. At the high orbital altitude of 35,800 kilometers, a geostationary satellite orbits the Earth in the same amount of time it takes the Earth to revolve once. From Earth, therefore, the satellite appears to be stationary, always above the same area of the Earth. The area to which it can transmit is called a satellite's footprint. For example, many Canadian communications satellites have a footprint which covers most of Canada.

Communications satellties can also be in highly elliptical orbits. This type of orbit is roughly egg- shaped, with the Earth near the top of the egg. In a highly elliptical orbit, the satellite's velocity changes depending on where it is in its orbital path. When the satellite is in the part of its orbit that's close to the Earth, it moves faster because the Earth's gravitational pull is stronger. This means that a communications satellite can be over the region of the Earth that it is communicating with for the long part of its orbit. It will only be out of contact with that region when it quickly zips close by the Earth.

13.4.4 Navigation satellites – Navstar

Satellites for navigation were developed in the late 1950's as a direct result of ships needing to know exactly where they were at any given time. In the middle of the ocean or out of sight of land, you can't find out your position accurately just by looking out the window.

The idea of using satellites for navigation began with the launch of Sputnik 1 on October 4, 1957. Scientists at Johns Hopkins University's Applied Physics Laboratory monitored that satellite. They noticed that when the transmitted radio frequency was plotted on a graph, a pattern developed. This pattern was recognizable to scientists, and it is known as the doppler effect. The doppler effect is an apparent change of radio frequency as something that emits a signal in the form of waves passes by. Since the satellite was emitting a signal, scientists were able to show that the doppler curve described the orbit of the satellite.

Today, most navigation systems use time and distance to determine location. Early on, scientists recognized the principle that, given the velocity and the time required for a radio signal to be transmitted between two points, the distance between the two points can be computed. The calculation must be done precisely, and the clocks in the satellite and in the ground-based receiver must be telling exactly the same time - they must be synchronized. If they are, the time it takes for a signal to travel can be measured and then multiplied by the exact speed of light to obtain the distance between the two positions. The Navstar satellites are examples of satellites that use this principle.

13.4.5 Reconnaissance satellites - Kennan, Big Bird, Lacrosse

These days, you hear a lot about satellites for communications and scientific research.

Some satellites, though, have far less public uses. Reconnaissance satellites are used to spy on other countries. They provide intelligence information on the military activities of foreign countries. These satellites can even detect missile launches or nuclear explosions in space. Reconnaissance satellites can pick up and record radio and radar transmissions while passing over a country. Finally, they can be used as an orbital weapon by placing warheads on a low orbit satellite to be launched at a ground target. (This is not a recommended or frequent use of satellites.)

There are basically four types of reconnaisance satellites. First, there are the optical-imaging satellites that have light sensors that detect missile launches and "see" enemy weapons on the ground. Next are the radar-imaging satellites. They are able to observe the Earth using radar technology through cloud cover. Third, there are signals-intelligence or ferret satellites that are essentially super-sophisticated radio receivers that capture the radio and microwave transmissions emitted from any country on Earth. Finally, there are the relay satellites that make military satellite communications around the globe much faster by transmitting data from spy satellites to stations on Earth.

Starting in the 1960's, the United States began launching many series of reconaissance satellites. The first series was called Discover, and as these satellites circled the Earth in polar orbits, they took pictures. The next series of U.S. spy satellites was given the code name Keyhole, or KH for short. They mostly did routine surveillance or weapons targeting. In a low, 80-mile orbit, they either took wide-area pictures of large land masses or took close-up pictures of special interest objects.

KH-9 was a noteworthy satellite from that series. Weighing 30, 000 pounds, it was nicknamed Big Bird because of its extraordinarily large size. Big Bird, however, was unable to penetrate the thick cloud cover that often obscured the areas it was targeting. Sophisticated for its time, the camera used by Big Bird took area-surveillance images and close-up photos. In 1976, KH-11, code-named Kennan, was launched. From Kennan's sun-synchronous orbit, the sun was at a constant angle with respect to objects on Earth. This choice of orbit helped to detect the movement and size of objects observed by Kennan by using the shadows recorded from space. Kennan also used a special piece of technology called a charge-coupled device (CCD) to obtain images.

13.4.6 Remote Sensing satellites – Radarsat

Remote sensing is observing and measuring our environment from a distance. So, remote sensing satellites are usually put into space to monitor resources important for humans. For example, remote sensing satellites might track animal migration, locate mineral deposits, watch agricultural crops for weather damage, or see how fast the forests are being cut down.

All of these things can be done best from space because a satellite in orbit can normally take photographs of large expanses of land all over the world. Since these satellites are able to take photographs and observe areas all over the globe, the satellite is able to monitor areas in which the climate is very harsh, or which are nearly impossible to reach by land. Canada's main remote sensing satellite, Radarsat, does just that.

13.4.7 Search and Rescue satellites - Cospas-Sarsat

Sure satellites can transmit radio and television signals, but can they save lives too? Of course they can! Search and rescue satellites are designed to provide a way for vessels at sea and in the air to communicate from remote areas. These satellites can detect and locate emergency

beacons carried by ships, aircrafts, or individuals in remote or dangerous places.

The first rescue aided by spacecraft was in September of 1982 when a Soviet satellite, Cosmos- 1383, detected a distress beacon from a pair of small airplanes that had crashed. The satellite was able to give rescuers the location of the two downed planes; they were the airplanes of a young man and the young man's father who had set out looking for his son's plane crash site.

The idea of search and rescue satellites comes from weather satellite programmes. Meteosat, for example, monitors weather patterns by direct observation, but it also analyzes signals sent out from buoys floating in the ocean. Those buoys collect local weather information and transmit that to the satellite. The satellite then uses the Doppler Effect to find out where that particular buoy is. This mechanism is similar to the technology now used for search and rescue.

Satellites equipped with search and rescue equipment fly over a beacon that is releasing an emergency signal. Using mathematical calculations involving the Doppler Effect, scientists can translate that signal into coordinates, and determine the location of the distress signal within four kilometres.

In 1974, Canada made it law that all aircraft must carry a beacon called an Emergency Locator Transmitter (ELT). After the ELT came the Emergency Position Indicating Radio Beacon (EPIRB). EPIRB's are automatic, self-powered, very portable, completely waterproof, and they float. The newest search and rescue system is the Cospas-Sarsat system. It is an international search and rescue system made up of a network of satellites in space, and control centres on Earth-ground stations, mission control centres, and rescue coordination centres.

The Sarsat system was developed in a joint effort by the United States, Canada, and France. The Cospas system was developed by the Soviet Union. These four nations banded together in 1979 to form Cospas-Sarsat. In 1982, the first Cospas-Sarsat satellite was launched, and by 1984 the system was declared fully operational. From there, the Cospas-Sarsat organization continued to grow. The four original member nations have now been joined by 25 other nations that operate 28 ground stations and 15 mission control centres worldwide. In the eyes of the countries using this system, Cospas-Sarsat has very much helped search and rescue efforts.

13.4.8   Space Exploration satellites – Galileo

Space exploration satellites are not really satellites at all; they are properly known as space probes. A satellite is defined as something that's orbiting something else, but space probes instead travel deep into the solar system. However, they are similar to orbiting satellites in design and function.

On their journeys, space probes send back detailed pictures and other data of faraway planets and other stellar phenomena. Space exploration satellites are responsible for many of astronomy's most important achievements. Jupiter's rings, for example, were discovered by a space exploration satellite.

Space exploration satellites must be built to last because it takes so long for the satellites to reach their destinations. Space exploration satellites are different from astronomy satellites because they do not operate from Earth orbit; they are actually sent out into deep space on their own. An example of a space exploration satellite is NASA's Galileo.

13.4.9   Weather satellites - Meteosat

Because of weather satellite technology and communications satellite technology, one can find out the weather anywhere in the world any time of the day. There are television stations that carry weather information all day long. Meteorologists use weather satellites for many things, and they rely on images from satellites. Here are a few examples of those uses:

- Radiation measurements from the earth's surface and atmosphere give information on amounts of heat and energy being released from the Earth and the Earth's atmosphere.
- People who fish for a living can find out valuable information about the temperature of the sea from measurements that satellites make.
- Satellites monitor the amount of snow in winter, the movement of ice fields in the Arctic and Antarctic, and the depth of the ocean.
- Infrared sensors on satellites examine crop conditions, areas of deforestation and regions of drought.
- Some satellites have a water vapour sensor that can measure and describe how much water vapour is in different parts of the atmosphere.
- Satellites can detect volcanic eruptions and the motion of ash clouds.
- During the winter, satellites monitor freezing air as it moves south towards Florida and Texas, allowing weather forecasters to warn growers of upcoming low temperatures.
- Satellites receive environmental information from remote data collection platforms on the surface of the Earth. These include transmitters floating in the water called buoys, gauges of river levels and conditions, automatic weather stations, stations that measure earthquake and tidal wave conditions, and ships. This information, sent to the satellite from the ground, is then relayed from the satellite to a central receiving station back on Earth.

There are two basic types of weather satellites: those in geostationary orbit and those in polar orbit. Orbiting very high above the Earth, at an altitude of 35,800 kilometres (the orbital altitude), geostationary satellites orbit the Earth in the same amount of time it takes the Earth to revolve once. From Earth, therefore, the satellite appears to stay still, always above the same area of the Earth. This orbit allows the satellite to monitor the same region all the time. Geostationary satellites usually measure in "real time", meaning they transmit photographs to the receiving system on the ground as soon as the camera takes the picture.

A series of photographs from these satellites can be displayed in sequence to produce a movie showing cloud movement. This allows forecasters to watch the progress of large weather systems such as fronts, storms, and hurricanes. Forecasters can also find out the wind direction and speed by monitoring cloud movement.

The other basic type of weather satellite is polar orbiting. This type of satellite orbits in a path that closely follows the Earth's meridian lines, passing over the north and south poles once each revolution. As the Earth rotates to the east beneath the satellite, each pass of the satellite monitors a narrow area running from north to south, to the west of the previous pass. These 'strips' can be pieced together to produce a picture of a larger area.

Polar satellites circle at a much lower altitude at about 850 km. This means that polar satellites can photograph clouds from closer than the high altitude geostationary satellites. Polar satellites, therefore, provide more detailed information about violent storms and cloud systems. To find out more about an example of a weather satellite, Meteosat,

13.5   THE BENEFITS OF USING SATELLITE

Communications satellites have distinct benefits over terrestrial alternatives:

13.5.1 Ubiquitous Coverage:

A small group or constellation of satellites can cover virtually all of the inhabited Earth's surface. Even one satellite can cover a much vaster number of potential subscribers than any terrestrial network.

13.5.2 Consistent Quality of Service (QoS):

Essentially, satellites can deliver consistent quality of service to an almost infinite number of locations, regardless of geography. Whereas terrestrial IP networks are often a mixture of different networks and topologies, with different levels of congestion and latency, the predictability of satellite networks provides a constant, uniform QoS. In a terrestrial packet network, variations in the level of congestion and latency can cause problems such as packet "jitter," requiring large equipment buffers to avoid degradation of the voice quality. On the other hand, the predictability of satellite latency levels provides a much more consistent

13.5.3 Infrastructure Building:

Satellite service can be offered in areas where there is no terrestrial infrastructure and the costs of deploying a fiber or microwave network are prohibitive. It can also support services in areas where existing infrastructure is outdated or insufficient.

13.5.4 Cost Predictability:

Satellite communication is distance insensitive, thus providing cost predictability.

13.5.5 Traffic Bypass:

Satellite can provide additional bandwidth to divert traffic from congested areas, to provide overflow during peak usage periods and to provide redundancy in the case of terrestrial network outages. By being wholly independent of a wire line infrastructure, satellite is the only "truly diverse" communication alternative.

13.5.6 Scalability and Reconfigurability:

Satellite connections and Earth Stations are extremely scalable. In contrast to terrestrial alternatives, they can be deployed quickly and inexpensively, enabling rapid network build-out. You can easily reconfigure satellite networks to match changing user demand. Satellite ground equipment also provides unparalleled flexibility because you can install it on an interim basis, to test new markets or to keep communications going in an emergency. As demand increases or an emergency stabilizes, you can re-deploy the equipment to another area and, for a new market, replace the satellite network with a permanent terrestrial presence. As an emergency stabilizes, you can re-deploy the equipment to another area.

13.5.7 Temporary Network Solutions:

For temporary locations, or mobile applications, such as news gathering, homeland

security or military activities, satellite can often provide the only practical solution for getting necessary information out.

13.5.8 Total Network Management:

Satellite can provide a single-tier, end-to-end backbone infrastructure. Meanwhile, terrestrial facilities may be managed by multiple organizations. From this perspective, satellites also provide a "truly private" network, entirely under the operator's control.

13.5.9 A Long-Term Solution for the Last Mile:

The biggest problem with the last mile is getting the high-bandwidth capabilities available in the long-distance networks to the residence or small business. Network operators "over-built" the long-distance arena (a relatively easy equipment task) without improving capacity for the access arena between central office and home. By being independent of terrestrial equipment factors, satellite can provide cost-effective multipoint access, either to the CO or directly to the home.

13.5.10 Rapid Provisioning of New Services:

Since satellite solutions can be set up quickly, you can be fast-to market with new services. For the most part, you can re-point or expand services electronically without the customary "truck rolls" of traditional terrestrial networks. As a result, you can decrease capital expenditures while realizing revenues earlier. Of course, all communications satellite networks are not alike. To realize these general advantages, it is helpful to know the elements of satellite architecture. While the structure of a communications satellite remains the same, its capacity and frequency bands will vary according to your needs.

13.6 INDIAN SATELLITES IN BRIEF

For the past four decades, ISRO has launched more than 65 satellites for various scientific and technological applications like mobile communications, Direct-to-Home services, eteorological observations, telemedicine, tele-education, disaster warning, radio networking, search and rescue operations, remote sensing and scientific studies of the space.

ISRO has established two major space systems, the Indian National Satellite System (INSAT) series for communication, television broadcasting and meteorological services which is Geo-Stationary Satellites, and Indian Remote Sensing Satellites (IRS) system for resources monitoring and management which is Earth Observation Satellites.

ISRO has launched many Experimental Satellites which are generally small comparing to INSAT or IRS and Space Missions to explore the space.

13.7 INDIAN INSTALLED SATELLITES

Satellite	Launch Date	Launch Vehicle	Type of Satellite
SARAL	25.02.2013	PSLV-C20	Earth Observation Satellite
GSAT-10	29.09.2012	Ariane-5VA-209	Geo-Stationary Satellite
RISAT-1	26.04.2012	PSLV-C19	Earth Observation Satellite

Jugnu	12.10.2011	PSLV-C18	Experimental / Small Satellite
SRMSat	12.10.2011	PSLV-C18	Experimental / Small Satellite
Megha-Tropiques	12.10.2011	PSLV-C18	Earth Observation Satellite
GSAT-12	15.07.2011	PSLV-C17	Geo-Stationary Satellite
GSAT-8	21.05.2011	Ariane-5VA-202	Geo-Stationary Satellite
RESOURCESAT-2	20.04.2011	PSLV-C16	Earth Observation Satellite
YOUTHSAT	20.04.2011	PSLV-C16	Experimental / Small Satellite
GSAT-5P	25.12.2010	GSLV-F06	Geo-Stationary Satellite
STUDSAT	12.07.2010	PSLV-C15	Experimental / Small Satellite
CARTOSAT-2B	12.07.2010	PSLV-C15	Earth Observation Satellite
GSAT-4	15.04.2010	GSLV-D3	Geo-Stationary Satellite
Oceansat-2	23.09.2009	PSLV-C14	Earth Observation Satellite
ANUSAT	20.04.2009	PSLV-C12	Experimental / Small Satellite
RISAT-2	20.04.2009	PSLV-C12	Earth Observation Satellite
Chandrayaan-1	22.10.2008	PSLV-C11	Space Mission
CARTOSAT - 2A	28.04.2008	PSLV-C9	Earth Observation Satellite
IMS-1	28.04.2008	PSLV-C9	Earth Observation Satellite
INSAT-4B	12.03.2007	Ariane-5ECA	Geo-Stationary Satellite
CARTOSAT - 2	10.01.2007	PSLV-C7	Earth Observation Satellite
SRE - 1	10.01.2007	PSLV-C7	Experimental / Small Satellite
INSAT-4CR	02.09.2007	GSLV-F04	Geo-Stationary Satellite
INSAT-4C	10.07.2006	GSLV-F02	Geo-Stationary Satellite
INSAT-4A	22.12.2005	Ariane-5GS	Geo-Stationary Satellite
HAMSAT	05.05.2005	PSLV-C6	Experimental / Small Satellite
CARTOSAT-1	05.05.2005	PSLV-C6	Earth Observation Satellite
EDUSAT (GSAT-3)	20.09.2004	GSLV-F01	Geo-Stationary Satellite
Resourcesat-1(IRS-P6)	17.10.2003	PSLV-C5	Earth Observation Satellite
INSAT-3A	10.04.2003	Ariane-5G	Geo-Stationary Satellite
INSAT-3E	28.09.2003	Ariane-5G	Geo-Stationary Satellite
GSAT-2	08.05.2003	GSLV-D2	Geo-Stationary Satellite
KALPANA-1(METSAT)	12.09.2002	PSLV-C4	Geo-Stationary Satellite
INSAT-3C	24.01.2002	Ariane-42L H10-3	Geo-Stationary Satellite
Technology Experiment Satellite(TES)	22.10.2001	PSLV-C3Earth	Earth Observation Satellite
GSAT-1	18.04.2001	GSLV-D1	Geo-Stationary Satellite
INSAT-3B	22.03.2000	Ariane-5G	Geo-Stationary Satellite
Oceansat(IRS-P4)	26.05.1999	PSLV-C2	Earth Observation Satellite

INSAT-2E	03.04.1999	Ariane-42P H10-3	Geo-Stationary Satellite
INSAT-2DT	January 1998	Ariane-44L H10	Geo-Stationary Satellite
IRS-1D	29.09.1997	PSLV-C1	Earth Observation Satellite
INSAT-2D	04.06.1997	Ariane-44L H10-3	Geo-Stationary Satellite
IRS-P3	21.03.1996	PSLV-D3	Earth Observation Satellite
IRS-1C	28.12.1995	Molniya	Earth Observation Satellite
INSAT-2B	23.07.1993	Ariane-44L H10+	Geo-Stationary Satellite
INSAT-2A	10.07.1992	Ariane-44L H10	Geo-Stationary Satellite
Stretched Rohini Satellite Series (SROSS-C)	20.05.1992	ASLV	Space Mission
IRS-1B	29.08.1991	Vostok	Earth Observation Satellite
INSAT-ID	12.06.1990	Delta 4925	Geo-Stationary Satellite
INSAT-1C	21.07.1988	Ariane-3	Geo-Stationary Satellite
Stretched Rohini Statellite Series (SROSS-2)	13.07.1988	ASLV	Earth Observation Satellite
IRS-1A	17.03.1988	Vostok	Earth Observation Satellite
Stretched Rohini Statellite Series (SROSS-1)	24.03.1987	ASLV	Space Mission
INSAT-1B	30.08.1983	Shuttle [PAM-D]	Geo-Stationary Satellite
Rohini (RS-D2)	17.04.1983	SLV-3	Earth Observation Satellite
INSAT-1A	10.04.1982	Delta 3910 PAM-D	Geo-Stationary Satellite
Bhaskara-II	20.11.1981	C-1 Intercosmos	Earth Observation
Ariane Passenger Payload Experiment (APPLE)	19.06.1981	Satellite Ariane-1(V-3)	Geo-Stationary Satellite
Rohini (RS-D1)	31.05.1981	SLV-3	Earth Observation Satellite
Rohini (RS-1)	18.07.1980	SLV-3	Experimental / Small Satellite
Rohini Technology Payload (RTP)	10.08.1979	SLV-3	Experimental/SmallSatellite
Bhaskara-I	07.06.1979	C-1 Intercos/mos	Earth Observation Satellite
Aryabhata	19.04.1975	C-1 Intercosmos	Experimental / Small Satellite

13.8 TECHNICAL TERMS

QOS: Quality of Service

VOLP: Video on Demand

CCD: Charge-Coupled Device

ELT: Emergency Locator Transmitter.

13.10 SELF ASSESSMENT QUESTIONS

1. What is satellite?
2. Enumerate the types of satellite.
3. Discuss in brief about Indian Satellite.

13.11 SUGGESTED READINGS

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LESSON – 14
REPROGRAPHIC TECHNOLOGY AND e-PUBLISHING

AIM AND OBJECTIVES

After reading this Chapter, you will be able to:
- Understand the reprography technology;
- Basic reprographic methods;
- Use of reprographic;
- Types of printing process.
- E-Publishing-Advantages & Disadvantages
- E-Books & E-Journals

Structure

14.1   INTRODUCTION

Reprography, a very old concept in libraries and information centres, was originally intended to cover document reproduction techniques by photography viz., microfilming, photostating, and contact copying with silver halide papers. Presently this includes a very wide range of methods, materials, processes and equipments used for document reproduction. Initially, micrography was used to save space and for archival purposes, however, now its uses have increased manifold. Reprography is now an insparable part of information centres and libraries as well as users and plays an important role in communicating the recorded knowledge. Several photographic processes have been devised for producing copies. From the advent of the written word, the desirability of copies for duplicates has spurred the efforts of man. It includes the invention of photography (1849-Frenchman, L.G.M. Dagurre and an Englishman, W.H.F. Talbold), Photostat (1900-France, Abbe Rena Graffin), and photocopying (1938, American, Chester F. Carlson), Micrography (1939-59), Polygraphy (1804), Hawkins, typewriter, Silver halide diazomethod, blue printing and brown printing, and electrofax (1954).

The advent of the new system of reprography came into being in 1950, with reproduction (producing a fresh) and photograph, the technique to produce images (1-3). Reprography has evolved over the years through the desire and need to document and distribute information. Sophisticated electromic techniquesled to the process of reprograpy in 1976, and the 1980-90s marked the advent for possible revoluntionary changes during which digital Xeroxing with colour, zoom, sorting, stapling facilities had arrived. Reomte browsing and tele-delivery of documents will be used in future.

14.2   REPROGRAPHIC
A material is said to be reprographic if it has undergone the process of reproduction by photographic, mechanical or electronic means. Some of these methods include scanning, photocopying, which is sometimes referred to as xerography, photography and digital printing.

In addition to above meaning of reprographic there are few meanings of reprographicsare given below:

- ➢ Reprographics generally refers to methods of copying or reproducing documents that includexerography and scanning. The term applies to both soft and hard copy reproduction.
- ➢ Reprographics is a general term used to refer to multiple methods of reproducing content both physical and digital which include xerography, photography, scanning and digital printing.
- ➢ Reprographics is a main term that encompasses multiple methods of reproducing content, such as photography, scanning and digital printing. It applies to both physical soft copy and hard copyreproductions of documents and images.
- ➢ Reprographics refers to a process of reproducing, reprinting or copying graphic material especiallyby mechanical, photographic, or electronic means. It usually encompasses multiple methods of reproducing content, such as scanning, photography, xerography and digital printing.

14.3 BASIC REPROGRAPHIC METHODS

Some possible choices for reproduction will generally be available:
(1) carbon paper,
(2) automated typewriters,
(3) copiers,
(4) duplicators, and

14.3.1 Carbon Paper

Although carbon paper or copying film is not as popular as it once was, estimated costs are less than one-half that of photocopying machines. Carbon packs used in conjunction with text-editing typewriters are especially useful because the machines play back (print) copy that has already been corrected.

Another timesaver is specially treated paper known as carbonless copy paper that imprints without using a separate sheet of carbon paper. This type of copy paper is frequently used for multicopy forms, In determining whether to use carbon paper, office professionals should weigh the costs of the time needed to correct carbons against the slightly higher costs of copies from copying machines.

14.3.2 Automated Typewriters

Automated typewriters can automatically play back previously recorded copy that has been stored in the form of machine memory, cassettes, paper, or magnetic cards and tapes. Depending on the speed of the printing equipment used, originally typed documents can be turned out in seconds.

When evaluating the use of an automated typewriter, remember that the higher cost of typed copy must beweighed against the benefits typed copy gives. In such applications as fund-raising campaigns or meetings, the recipient of the letter will value the personalized touch that originallytyped copyprovides.

14.3.4   Copiers

Because a copier is a machine that reproduces copies directly from an original document, the copies are commonly referred to as photocopies. While some machines must be fed (the copy must be inserted into the machine), other machines can copy such documents as pages from books when the original is laid ontop of the machine.

The copying process, like photography, is based on the sensitivity of a surface (either in the machine or in the copying paper or master) to light or heat radiation. The light or heat in the machine reacts with chemicals, either in the machine or in the paper or master, to produce an image.

Dry-process copiers operate with dry chemicals only, while wet-process copiers operate with liquid chemicals. Most copy machines today use a dry process, such as an electrostatic process or thermography; while some older machines use a wet process, such as diffusion transfer or stabilization. The diazo process can be either dry or wet.

Electrostatic Processes

There are two common electrostatic processes: the transfer process, also known as the xerographic process, which is used in plain-paper copiers (PPCs), and the direct image process, also known as the Electrofax process, which is used in coated-paper copiers (CPCs). A fine black powder, called toner, forms the image on a copy made by either electrostatic process.

14.3.4   Duplicating Processes

The "duplication" category of reproduction includes spirit, stencil, and offset processes. Although spirit and stencil were the most popular processes of the fifties and sixties, the seventies saw copiers taking over. Convenience copiers became favored for low-volume duplicating, and copier-duplicators gained as the favored duplication processes for large jobs. Stencil and offset processes, however, continue to be economical alternatives for high-quality copy especially with the introduction of convenient tabletop models.

14.3.4.1   Spirit Duplicating

The spirit duplication process is also referred to as the liquid or fluid process, hectograph, Azograph, and "ditto." The master can be prepared by thermography, typed, written, or drawn on. The master set contains a carbon like covered transfer sheet which is placed face up behind the master, creating a reverse image of the material to be reproduced. When the master is run, the image is printed directly on paper that has been moistened with alcohol (the spirit). The paper removes a portion of the dye from the reverse image on the master to print the correct image. The reproduced copy is usually purple, though black, blue, red, and green master sets are available.

Spirit duplicating is rarely used in business offices today for three reasons:
1. The copy is not as clear as that of other processes.
2. "Ditto" copies cannot be easily reproduced by copying machines because the print is not dark or sharp enough
 i. .3. The process is messy—dye from the transfer sheet and master is easily

rubbed off on typewriters,hands, and furniture.

The process, however, is economical and is therefore used by some educational institutions that want to provide faculty and staff with a fast, economical means of duplicating. Masters are easy to prepare, and the machine is small and easy to operate. Business use would be restricted to internal memos that would not need to be copied further.

14.3.4.2   Stencil Duplicating

The stencil process, also known as mimeographing, is more versatile than the spirit process. Typically, the master for the stencil process-is-a -wax-covered-sheet-oil fibrous material, though it may also be plastic or metal. The master may be prepared by using any of four different methods thermography, facsimile stencil copying, embossed plate printing, or direct cutting.A thermal stencil master is prepared by using a thermographic machine (in the same way that a thermal spirit master is made). The facsimile stencil imager or scanner is a separate machine, which transfers the image from an original to the stencil. Embossed plate printing is a commercial process, though some centralized reprographics departments have this capability.

A directly prepared stencil master is typed with a disengaged ribbon by using the stencil setting on the typewriter. A sharp, pointed instrument called a stylus can be used to make nontypewritten images on the master. When the master is "cut," wax fibers are separated or opened, leaving the fiber backing intact. The ink then flows through the fiber backing onto the paper and prints each copy. The use of different colored ink produces black or colored print. The ink is available either in liquid or paste form, and the paper has a rougher, more absorbent surface than that used in the spirit process.

Because of its more simplified, cleaner operations, businesses that used the spirit duplicating process in the past are now using stencil duplicating. Stencil duplicating, which has always been less expensive than offset, is now also competing in quality with the newer tabletop offset duplicators.

14.3.4.3   Offset Duplicating

Offset machines require a trained operator because the ink and water used in the process have to be carefully mixed and because the machine must be cleaned regularly. For these reasons, offset equipment is usually located in a centralized reprographics department. *Although offset masters can be prepared in various ways, the two major types are•* Direct imaging: Typewriting or imprinting directly on the master• Imaging on prcwn.iitive masters; Using aluminum-based or plastic paper sensitized with a coating that accepts a photographic image.

14.4   MICROGRAPHIC

The production, handling and use of microfilm and microfiche. Images are created by cameras or by COM units that accept computer output directly. The documents are magnified for human viewing by readers, some of which can automatically locate a page using indexing techniques.

14.5   THE ANALOG ADVANTAGE

Microfiche and microfilm have always been an economical alternative for high-volume data and picture storage. Although optical discs have superseded fiche and film for most archival storage, film is still the only medium that can survive continual upgrading of electronic technologies. Storage devices generally remain compatible with only one or two generations of media. At some point, new drives cannot read older cartridges. However, film is analog and can always be read by magnifying it.

In some cases, digital data are converted to microfilm so they can be preserved and accessed decades into the future without regard to the changing digital formats that are bound to occur over time.

14.6 HISTORY OF PRINTING TECHNOLOGY

Printing was invented by the Chinese in the 6th century. The oldest book still in existence is the scripture of the Wu Zetian (dated at approximately 684 A.D.). Although revolutionary at the time, it was produced using very basic woodblock printing techniques. There are reports of earlier print works, in the form of other religious Chinese scriptures, around half a century before, but there aren't any surviving examples of these. The most ancient printed book in existence is the Chinese 'Diamond Sutra' (dated approximately 868 A.D.). It was produced using a new type of printing technology of the time known as block printing.

The Chinese were also the first country to print currency. In the 10th Century they used copperplate technology to print the first printed notes. This was to commemorate the throne in 1023 of the Song Dynasty. Many historians believe that European printing technology derived directly from the Chinese, however, there's little in the way of hard evidence to support this. A German inventor, Johann Gutenberg, was the first to bring printing technology to Europe. In 1440, he invented what is known today as the Guttenberg press. Its design was based on a rather rudimentary wine press that used oil-based inks.

The invention of the European printing press spurred the startup of many commercial printers, resulting in mass newspaper and book production. This revolution in the printing industry was a turning point in global communication and the spreading of the written word. The 18th century gave us some noteworthy advances in printing technology. The most important being 'relief etching' (invented by William Blake in 1788), and 'lithography' (invented by Alois Senefelder in 1798). During the 19th Century we saw the invention of larger-scale more robust presses, which were far faster and more reliable. The introduction of the personal computer in the 20th century gave birth to personal printing and advanced print technologies, such as laser printers and ink-jet printers. Commercial printing during the 20th and 21st century evolved considerably. Print shops are now able to print huge runs very quickly, using offset printing, or offset lithography as its otherwise known.

14.7 TYPES OF PRINTING PROCESS

There are now several ways of printing that publishers could choose from. Here are some of the well-known printing processes.

14.7.1 Offset Lithography

Famously known as Offset printing this process is considered the most cost-effective that is why many in the industry prefer this process. This also allows publishers to print high quantity of prints in faster time because the printing machine is very quick and easy top set up as long as plates are already available. Basically in offset printing, the roller plates are run through

water and then ink. Ink adheres to areas with images (including texts and designs) while water on the white spaces of the layout. It is then pressed to a rubber plate before pressing on a paper. One of the major drawbacks of this printing process is the plate. Once a layout is already made into a plate, omissions cannot be easily changed.

14.7.2 *Letterpress*

This is the original process done by Gutenberg. Although it is clearly more advanced than the original press, the process is still the same. The image being printed is higher than the surface of the plate which will be pressed on the paper. With the technology becoming more advance, this process is becoming less famous and obsolete.

14.7.3 *Digital Printing*

I you will be printing a layout full of images you might want your prints to be of high quality so that the images won't get blurry. The printing process that you should do is digital printing. This process is the most favored today because of its high quality prints and quick printing process from computer directly to the printer. Plates are not needed on digital printing so it needs lesser man power. This process however is expensive because of the ink and paper used by the printer. The colors can also be difficult to adjust or predict since the colors of the image to be printed might be different on the computer monitor.

14.7.4 *Engraving*

Most of company letterhead and stationery are still printed using this method. The images printed on the paper are raised or engraved creating a more defined and attractive image. This however is only used for corporate logos or formal party invitations because it is very expensive and strenuous process.

14.7.5 *Electrostatic Printing*

Just like the xerography process or dry photocopying invented by Chester Carlson, electrostatic printing invented by Georg Christoph Lichtenberg in 1778, does not need ink or plates to print. In this process, the paper is coated with zinc oxide which acts as insulator in the dark and conductor if exposed to light. This process is mainly used for short run printing just like geographical maps and is becoming famous because it is prints faster than inkjet printers.

14.8 e-PUBLISHING

14.8.1 Introduction

Electronic publishing (also referred to as ePublishing or digital publishing) includes the digital publication of e-books, EPUBs, Digital Magazines (also sometimes known as electronic articles), and the development of digital libraries and catalogues. Electronic publishing has become common in scientific publishing where it has been argued that peer-reviewed scientific journals are in the process of being replaced by electronic publishing. It is also becoming common to distribute books, magazines, and newspapers to consumers through tablet reading devices, a market that is growing by millions each year generated by online vendors such as Apple's iTunes bookstore, Amazon's bookstore for Kindle, and books in the Android Market. Market research suggests that half of all magazine and newspaper circulation will be via digital delivery by the end of 2015 and that half of all reading in the United States will be done without paper by 2015. Although distribution via the Internet (also known as online publishing or web publishing when in the form of a website) is nowadays strongly associated with electronic publishing, there are many non network electronic publications such as Encyclopedias on

CD and DVD, as well as technical and reference publications relied on by mobile users and others without reliable and high speed access to a network. Electronic publishing is also being used in the field of test-preparation in developed as well as in developing economies for student education (thus partly replacing conventional books) - for it enables content and analytics combined for the benefit of students. The use of electronic publishing for textbooks may become more prevalent with iBooks from Apple Inc. and Apple's negotiation with the three largest textbook suppliers in the U.S.

Electronic publishing is increasingly popular in works of fiction as well as with scientific articles. Electronic publishers are able to provide quick gratification for late-night readers, books that customers might not be able to find in standard book retailers (erotica is especially popular in eBook format and books by new authors that would be unlikely to be profitable for traditional publishers. While the term "electronic publishing" is primarily used today to refer to the current offerings of online and web-based publishers, the term has a history of being used to describe the development of new forms of production, distribution, and user interaction in regard to computer-based production of text and other interactive media.

14.8.2 History of E-Publishing

The history of electronic publishing (e-publishing) is very short if compared with traditional forms of publishing, but full of important events. The very ûrst e-publication came in the 1980s in the form of plaintext e-mails. They were sent to the subscriber via a mailing list. Of course plain text was a rather poor style of presentation and no ûgures or pictures were available. Also tables and formulas were rather complicated and very diûcult to handle in a proper way. In addition, users (read mainly libraries) were committed to archiving the issues locally, thus multiplying the eûorts on all sites. This distribution path was abandoned as soon as new tools became available in the late 1980s and early 1990s.

Later CD-ROMs appeared to be a much more eûective medium for epublishing. Excellent quality, pictures, ûgures, low-cost support, and long life. This kind of publication was rather successful for a number of years and, for particular publications (encyclopaedias, dictionaries, atlases, handbooks,), is still in use. The CD-ROM has a high reliability allowing the use of many diûerent formats. However, CD-ROMs soon became unmanageable for libraries when each CD-ROM required the installation of a special client (software to read the CD-ROM) for each publication. Libraries invented various tools (CD-ROM LANs) to multiply the access and to avoid the huge maintenance work involved in installing, maintaining up-to-date, and de-installing the clients.

Then finally in the years 1994–95 appeared the very ûrst e-journals. The ûrst e-journal to be distributed was Electronics Letters Online by IEE (Institution of Electrical Engineers). IEE distributed the journal via OCLC. OCLC invented a client, called Guidon, to be installed on the reader's station. Guidon was an excellent tool, with a very rich functionality, unfortunately not Web-based. It became obsolete as soon as the Web was chosen for the distribution of e-journals. Web distribution started in 1995–96 and was an immediate success. It was possible to use the rich format PDF, Portable Data Format, to embed links in the text and to start to use multimedia tools. Now e-publications are already prepared for downloading into PDAs, Personal Digital Assistants; it is a sort of e-book device already present in our pockets for other uses. A long history in a few years.

14.8.3 Characteristics of Electronic Publishing

The aims of those publishing electronically may be very much the same as those publishing in book form one needs only to scan the World Wide Web for a short time to discover this fact. We can find pages of humras well as pages of information, and, as already noted, the Web novel is not unknown. Electronic publishing has very specific non-book characteristics that distinguishes it from print publication:

- ➢ electronic publications can be produced and disseminated very rapidly - once a page of text has been coded with HTML tags it can be published immediately - the book takes much longer to produce and distribute;
- ➢ if correction is necessary, an electronic text can be updated or corrected with the same immediacy, whereas a book must either go through a second edition, or, if the error is caught in time, have an erratum slip inserted;
- ➢ electronic publication can be made collaborative and interactive, involving either several "authors" or authors and readers;
- ➢ electronic publications can be disseminated world-wide without the need for separate rights negotiations for different countries and without the costs of distribution or reprinting;
- ➢ where an electronic publication is charged for, the producer does not incur the costs associated with retail bookselling, that is, there are no "middleman" costs;
- ➢ through effective, electronic interaction with the buyer or user of an electronic publication, the producer can collect valuable market-research data very cheaply;

But, on the other hand:
- ➢ electronic publishing still reaches only a minority of potential users or customers - even though this minority may constitute most of the market for some products (e.g., financial business information, scholarly communications), and much of the majority is in the developing world, where usage is likely to be slow to emerge;
- ➢ electronic publishing demands access to relatively advanced technology on the part of both the producer and the consumer of information or entertainment - even the base level of provision is still expensive for the ordinary citizen;
- ➢ mobile computers, notebooks and smaller, are either too big or have screens that are too small, or otherwise inadequate, for use across the full range of environments in which a book can be read;
- ➢ the technology is still, to a significant degree, user-unfriendly to many people;
- ➢ the technology consumes a greater amount of energy in its use than the book;

14.8.4 Advantages and Disadvantages of E-Publishing

Electronic Publishing has many advantages:

Products are easy to produce and edit Products can be made available immediately on the Internet Content can be very rich
   a) Video
   b) Audio
   c) Animation
   d) Text
   e) Graphics
   f) Simulations

g) Computer Programs
h) Can utilize resources on the Internet

Content is easy to navigate due to hyperlinks Product can be used on many devices:

a) Computer
b) Smart Phone
c) Tablet media players (iPad, Kindle, etc)
d)

Electronic Publishing has some disadvantages:

1. A computer or other electronic device is required for use
2. Electronic media is easier to steal
   a) Securing media is possible but more expensive
   b) Consumers are more likely to pirate media than traditionally published materials
3. Sales of electronic media are weaker than traditional forms
4. Some consumers prefer traditionally published material
   a) Technological fears
   b) Difficulties in viewing content
5. Interoperability adds new challenges

14.8.6   E-publishing Models

We can recognise today three diûerent models for e-publishing: traditional, alternative, and subversive. All the most important publishers like Elsevier, Springer, Kluwer, IOP, APS, etc. use the traditional model. Publishers like HighWire, the European Journal of Comparative Law, JHEP Journal of High Energy Physics, etc. use the alternative model. The subversive model is used by other publishing initiatives like arXiv (earlier at Los Alamos National Laboratories, now at Cornell University), Australian Journal of Human Rights, the European Legal Research Archive, etc.

14.8.7   General Advantages of E-journals

Before discussing in length the characteristics of the three models, it is perhaps useful to summarise the advantages of e-journals over their previous paper editions. In addition to the fundamental feature of the electronic availability of the full-text, there are a number of other important features that generate added value to the e-edition. Almost all publishers oûer to subscribers to their journal e-editions some or all of these additional services:
  ➢ ETOC, electronic table of content and abstracts.
  ➢ A pointer direct to the latest issue.
  ➢ An alerting mechanism set to receive messages via e-mail for new articles matching a predeûneproûle.
  ➢ A pointer to the list of papers accepted for publication in future issues.
  ➢ A pointer to the list of articles currently in press.

The libraries' OPACs, On Line Public Access Catalogues, exploit these new services making all the links available to the readers. The maintenance of these links is a challenging new task for librarians.

14.8.8   Traditional Model

Almost all publishers currently have their journals available in an electronic edition (there are more than 11,000 titles registered including scholarly ejournals) in parallel, or not, to their paper edition. The preparation of an e-edition is very close to that of a traditional paper edition. In fact most paper editions were already prepared in electronic form for printing. The e-editions can be distributed basically in two ways: remotely accessible on the publishers' servers or sent (via ground mail (on CDs or tapes) or by electronic ûletransfer) to the library site where it can be uploaded, stored, and used locally.

This form of e-publishing is in general very well accepted because of the existence of a parallel, well-established paper edition supported by solid quality control, peer review, and legal deposit procedures. E- publishing technology is now sophisticated enough to oûer an excellent level of readability even on the screen. The e-edition tends not only to parallel the paper edition but can often add its own values (colour, multimedia, dynamic links, software distribution, etc.) using the features oûered by the network technology. When the two editions start to diverge one can even ask if the two editions are not actually two diûerent publications.

Several publishers were, at the beginning, afraid of having their publications electronically available because of the ease of transferring ûles from one place to another in identical copies. So they tried to make access diûcult and in any case solidly connected to the paper edition subscription. It was common practice to subscribe to an e-journal contract with a threeyear rolling window. The access was guaranteed in e-form for three years and afterwords the reader had to rely on the paper edition.Luckily, publishers eventually became more conûdent and abandoned the concept of the rolling window moving, at a diûerent pace and in steps, towards the idea of a 'permanent' e-archive of their publications.More recently, October 2001, Elsevier announced the full electronic availability of their retrospective collection of 1200 journals for December 2002.A giant step towards a fully electronic reader environment. APS and IOP, among others, already reached such a result some time ago. This is an extraordinary event for the scientiûc information world.

For the publishers not yet able to make all their retrospective publications electronically available, twodiûerent projects, JSTOR in the USA and DIEPER in Europe, are ready to create the conditions to make electronic versions of selected journals. Currently the number of titles converted is not very large but it could increase rather quickly. As all published articles become electronically available, there are new ways tomanage them. We can consider the articles as a large database and search them via their metadata and, recently, also via their full-text. We can also imagine moving all the articles into a large unique pot and transforming all the references into electronic links. The reader's environment will be enhanced at a much better access level. This expanded linking capability can be reached using new tools made available by the CERN Library and also by the non-proût organisation CrossRef.

The above articles' reorganisation is called the journals' de-structuring. This is opposed to another newpossibility called re-structuring. Re-structuring is the possibility to select and reuse the published articles in new journals with diûerent coverage. There are now new journals totally composed of articles already published in other journals. The new journals, generally freely available only in electronic edition, are called overlay (or virtual) journals. In this new category there were several announcements made by APS/AIP (four new free titles) and IOP (one new free title) inSeptember 2001.

14.8.9   The Disadvantages of the Traditional Model

The main disadvantages of the publications using a traditional approach to the electronic edition are the increased costs for the libraries. At the beginning (1995–98) the e-editions were sold with the addition of three diûerent fees to the normal price of the paper edition. The electronic content fee was a percentage (5– 15%) of the paper edition price to account for the increased value of an electronic publication. The platform fee was a lump sum depending on the size of the library's reader community; this sum compensated the cost of the use of the publisher's server and electronic facilities.

• The attrition fee was the most diûcult to understand. It was a sort of penalty for libraries with multiple paper subscriptions to the same journal. The fee was applicable to those libraries that, acquiring a licence for the e-edition of that journal, dared to cancel the multiple subscriptions!
In addition, publishers are not easily inclined to make discounts for those few libraries willing to buy the e-edition only. Of course all the above costs were rather unacceptable for libraries because they were charged with additional costs without any increase in literature coverage while maintaining all the very resource- consuming tasks (check-in, handling, claiming, shelving, binding, re-shelving, etc.) related to the paper editions of their journal collections. In the last period (2000 and onwards) we have observed a substantial simpliûcation with the e-edition subscription contracts. Platform and attrition fees tend to disappear merging into a unique electronic content fee. The model of platform and attrition fees should evolve in a more objective measure: real usage. They will be completely replaced when real usage statistics are standardised. The platform fee remains in the form of the recurrent question: "How many professional users has your library?" The attrition fee remains visible when publishers are not ready to accept cancellations when a library joins a consortium.

14.8.10   Emergence of the E-book

Another form of electronic publication is the electronic book or e-book. It is necessary to distinguish between the e-book content and the e-book device. The e-book devices are a larger form of current PDAs with extended reading features, both hardware and software. The e-book device is not yet available in convincing, cheap, and practical conûgurations. The e-book content can be delivered in various forms: via the Internet, via CD-ROM or via special dispensers in bookshops and stores. For the moment the e-book content is rapidly progressing via the Web only. The other forms are not yet really popular.

The combination of a suitable e-book device with e-book contents should be a very interesting application for professional books like maintenance manuals (cars, aircraft, computers), handbooks in medicine, encyclopaedias, dictionaries, even schoolbooks. Surprisingly publishers are rather pushing for the use of e- book devices for novels where they do not add any advantage (except, perhaps, the weight) over the traditional printed book.

14.8.11   E-publishing and the Web Economy

We believe that e-publishing is a very interesting facet of the Web economy; it is certainly one of the few that continues to progress even after the disappointment of the Web economy in general. E-publishing is in a healthy situation and there are still areas to be fully investigated and plenty of room for further progress. The beneûts oûered by e-publishing over the Web are positive for readers, authors, and publishers. The beneûts are also enhanced by the decreasing costs in the basic services related to the Web economy: telecommunications, computer processing power, disk storage space, large availability

of free software tools, etc.

The main beneûts generated are:
• ***For readers:*** easier and greater access, quicker delivery, enormous navigational freedomamong linked documents;
• ***For libraries:*** reduced paper processing, shelving, re-shelving, binding,storing, risk of damage and losses;
• ***For publishers:*** enlarged audience, simpliûed editorial tasks.
It is rather challenging to express conclusions in such a shifting environment. However, our day-to-day life spent in scientiûc libraries in dealing more and more with e-publishing and its usage, leads us to say that therewill be more emphasis on the role of pre-publishing (grey literature self-archiving).There will be a dramatic contraction of traditional scientiûc publications available in paper editions. In the future only a few weeklywidely diûused journals will remain available, in research environments, also in a paper edition.There will be an exponential growth of non-commercial e-publications (ejournals, e-book contents,e-proceedings)particularly where the authors are available (large research labs) and where the e-publishing technology is already in use.

14.9   SELF ASSESSMENT QUESTIONS

1. What is Reprography?Discuss the various methods of reprography ?
2. Discuss about e-publishing.
3. Explain e-publishing models.
4. What are the advantages & disadvantages of e-publishing?

14.10   SUGGESTED READINGS

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5. http://210.46.97.180/zonghe/book/197-office%20procedure/ Chapter6.htm#THE_FUNCTION_OF_REPROGR APHICS
6. http://printingparadise.wordpress.com/2012/04/12/5-types-of-printing-process/
7. Julianne Pepitone, *CNN Money*, April 19, 2011.
8. Rebecca McPheters, *Advertising Age*, January 13, 2012.
9. Dale Maunu and Norbert Hildebrand, *Insight Media*, October, 2010. As reported byRichard Hart, *ABC 7 News*, November 21, 2010.
10. LeadIIT a Subscription based E-Publishing model
11. Yinka Adegoke, *Yahoo News*, January 19, 2012.
12. A good example of this use of the term can be found in the work of Walter Bender andhis Electronic Publishing Research Group at the MIT Media Lab.
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14. http://villaolmo.mib.infn.it/Manuscripts/10_generalities/pettenati.pdf
15. http://informationr.net/ir/3-2/paper39.html

LESSON - 15
APPLICATION SOFTWARE: MS OFFICE

AIMS AND OBJECTIVES

After reading this Chapter, you will be able to:

- Understand the application software;
- Common types of application software packages;
- Use of software packages;
- Types of software.

Structure

15.1   INTRODUCTION

Application software is all the computer software that causes a computer to perform useful tasks (compare with Computer viruses) beyond the running of the computer itself. A specific instance of such software is called a software application, application or app. The term is used to contrast such software with system software, which manages and integrates a computer's capabilities but does not directly perform tasks that benefit the user. The system software serves the application, which in turn serves the user.

Examples include enterprise software, accounting software, office suites, graphics software and media players. Many application programs deal principally with documents. Applications may be bundled with the computer and its system software or published separately, and can be coded as university projects. Application software applies the power of a particular computing platform or system software to a particular purpose. Some applications are available in versions for several different platforms; others have narrower requirements and are thus called, for example, a Geography application for Windows or an Android application for education or Linux gaming. Sometimes a new and popular application arises which only runs on one platform, increasing the desirability of that platform.

15.2   WHAT IS APPLICATION SOFTWARE

Computer software is the set of instructions and data that tells a computer what to do and how to do it. Software provides instructions to your computer's hardware. Without it, your PC or Mac would be little more than a large paperweight. But software actually comes in three main types: system software, programming software and application software. System software includes all the stuff that make up a computer's operating system (OS), including device drivers, configuration files and other key system components. This is the software that tells the computer's hardware what to do and provides a foundation for the system. Programming software, or middleware, works much like the plumbing in your home by invisibly keeping things running behind the scenes.

Application software, however, is the most important type for computer users because it is used to achieve many of the tasks that make us turn to our computers in the first place, such as word processing, Web browsing and data crunching. Application software applies the power of system software. This is why when downloading software, you have to find a version that fits with your running operating system (OS). In essence, that software draws on the OS to create a Word document, spreadsheet or PowerPoint presentation.

15.3   BASICS OF APPLICATION SOFTWARE

15.3.1   *Definition*

An application software system is a large program which is usually designed and developed for a specific purpose with an easy to use interface. It is intended to perform a specific task.

15.3.2   *The application software Interface*

The interface is usually a set of menus in a graphical environment. See figures below. An application software consists of several components. Each components realizes various functions. Each function performs a specific task. The components and the functions are mirrored by the application menus through the different options that are provided to the users. As can be seen below, each item in the bar menu or a drop-down menu may constitute a component of the application software. Consequently, each item of a drop-down menu reflects a function that performs a specific task. All the tasks (i.e., all functions given in below figure of the various application software systems, it is observed that the interfaces share common design in look and content.

15.3.3   *Application software Distribution and Licensing*

Application software can be obtained or distributed in different forms:

  ➢ Commercial of the shelf (COTS) or packaged software
  ➢ Shareware
  ➢ Freeware
  ➢ Public-domain software
  ➢ Customized software

The packaged software systems or COTS are the most widely used Larger application software can be built from a combination of the packaged or COTS software to serve the required objectives of the user. This allows for the creation of a customized application to satisfy a given set of requirements. Packaged software systems are mostly commercial. In commercial software, installation in number of computers is specified by the software vendor. User only buys the license to use it. User does not buy the software. A user may not be allowed to install software on more than one machine. A demo version of software may exist for free but demo version does not include all the key components of the software. Related software programs are sometimes sold bundled together. It is called a software suite. An example is MS Office. When you purchases MS Office license you basically purchase the right to install and use MS Word, MS Excel, PowerPoint and Front Page.

The shareware software is application software that is distributed free for a trial period. It is considered as a marketing method to introduce the software to users. In shareware, the distribution license of the software requires a payment.

Freeware is software that is made available for use for an unlimited time at no cost. It is copyrighted. The software license may impose one or more restrictions on the type of use. For

example, restricting its use to personal use, non-commercial use, educational use etc.

Public-domain software is free and can be used without restrictions. It can be used, studied, and modified without restriction. It can also be copied and redistributed in modified or unmodified form either without restriction, or with restrictions only to ensure that end users have the same freedoms as the original authors. Programs in the public domain can be used without restriction as components of other programs.

Customized software systems are created by special modification of an existing software to support certain functions or by writing the application from scratch using a programming tool.

Examples of free application software include: Open office.org suite, Mozilla and firefox web browsers, the GIMP graphics editor, and typesetting and documents preparation systems TeX and LaTeX.

15.4 UNDERSTAND HOW SYSTEM SOFTWARE INTERACTS WITH APPLICATION SOFTWARE

System software consists of programs that control the operations of a computer and its devices. System software serves as the interface between a user, the application software, and the computer's hardware. One type of system software is the operating system. Before application software can be run, the operating system, which contains instructions that coordinate the activities among computer hardware devices, must be loaded from the hard disk into the computer's memory.

15.5 IDENTIFY THE ROLE OF THE USER INTERFACE

The user interface controls how you enter data or instructions and how information displays on the computer screen. Many of today's software programs have a graphical user interface. A graphical user interface (GUI) combines text, graphics, and other visual images to make software easier to use.

15.6 HOW TO START A SOFTWARE APPLICATION

Both the Microsoft Windows and the Apple Macintosh operating systems use the concept of a desktop. The desktop is an on-screen work area with common graphical elements such as icons, buttons, menus, links, windows, and dialog boxes. A software application can be started by clicking its program name on a menu, or list of commands. Clicking the program name instructs the operating system to transfer the program's instructions from a storage medium into memory. Once started, the application displays in a window on the desktop. A window is a rectangular area of the screen that is used to show the program, data, and/or information. At the top of the window is a title bar that contains the window's name.

15.7 IDENTIFY THE WIDELY USED PRODUCTS AND EXPLAIN THE KEY FEATURES OF

➢ Productivity/business software applications

➢ Graphic design/multimedia software applications
➢ Home/personal/educational software applications
➢ Communications software applications

People use productivity software to become more effective and efficient while performing daily activities. Word processing software allows users to create and manipulate documents that contain text and graphics. With word processing software, you can insert clip art into a document; change margins; find and replace text; use a spelling checker to check spelling; place a header and footer at the top and the bottom of a page; and vary font (character design), font size (character scale), and font style (character appearance).

With spreadsheet software, data is organized in rows and columns, which collectively are called a worksheet. The intersection of a row and column, called a cell, can contain a label (text), a value(number), or a formula or function that performs calculations on the data and displays the result.

Database software allows you to create and manage a database. A database is a collection of data organized to allow access, retrieval, and use of that data. A query is used to retrieve data according to specified criteria, which are restrictions the data must meet. Presentation graphics software is used to create presentations that communicate ideas, messages, and other information to a group through a slide show. You can use a clip gallery to enhance your presentation with clip art images, pictures, video clips, and audio clips. A personal information manager (PIM) is software that includes an appointment calendar to schedule activities, an address book to maintain names and addresses, and a notepad to record ideas, reminders, and important information. A software suite is a collection of individual applications sold as a single package.

Project management software allows you to plan, schedule, track, and analyze the progress of a project. Accounting software helps companies record and report their financial transactions.

Power users often use software that allows them to work with graphics and multimedia. Computer-aided design (CAD) software assists in creating engineering, architectural, and scientific designs. Desktop publishing (DTP) software is used to design and produce sophisticated documents. DTP is developed specifically to support page layout, which is the process of arranging text and graphics in a document. Paint software is used to draw graphical images with various on-screen tools. Image editing software provides the capability to modify existing images. Video editing software and audio editing software can be used to modify video and audio segments.

Multimedia authoring software is used to create electronic interactive presentations that can include text, images, video, audio, and animation. Web page authoring software is designed to create Web pages and to organize, manage, and maintain Web sites.

Many software applications are designed specifically for use at home or for personal or educational use. Integrated software combines several productivity software applications that share a similar interface and common features into a single package. Personal finance software is an accounting program that helps pay bills, balance a checkbook, track income and expenses, follow

investments, and evaluate financial plans. Legal software assists in the creation of legal documents and provides legal advice. Tax preparation software guides users through the process of filing federal taxes.

Personal DTP software helps develop conventional documents by asking questions, presenting predefined layouts, and supplying standard text. Photo-editing software is used to edit digital photographs. A clip art/image gallery is a collection of clip art and photographs that can be used in all types of documents. Home design/landscaping software assists with planning or remodeling. Educational software teaches a particular skill and exists for about any subject. Reference software provides valuable and thorough information for all individuals. Entertainment software includes interactive games, videos, and other programs designed to support a hobby or provide amusement. One of the main reasons people use computers is to communicate and share information. E-mail software is used to create, send, receive, forward, store, print, and delete e-mail (electronic mail).

A Web browser is a software application used to access and view Web pages. A chat client is software that allows you to connect to a chat room, which permits users to chat via the computer. A newsreader is a software program used to participate in a newsgroup, which is an online area on the Web where users conduct written discussion about a particular subject. An instant messenger is a software program installed to use instant messaging (IM), a real-time communications service that notifies you when one or more people are online and then allows you to exchange messages or files.

Groupware is a software application that helps groups of people on a network work together and share information. A videoconference is a meeting between two or more geographically separated people who use a network or the Internet to transmit audio and video data.

15.8   IDENTIFY VARIOUS PRODUCTS AVAILABLE AS WEB APPLICATIONS

A Web application is a software application that exists on a Web site. To access the Web application, you visit the Web site that offers the program. Some Web applications are free; for others, you pay for use, service, support, or when a certain action occurs. Web-based training (WBT) is a type of CBT (computer-based training) that uses Internet technology. Many Web sites offer WBT to the general public. An application service provider (ASP) is a third-party organization that manages and distributes software and services on the Web.

15.9   DESCRIBE THE LEARNING AIDS AVAILABLE WITH MANY SOFTWARE APPLICATIONS

Many software applications and Web sites provide learning aids. **Online Help** is the electronic equivalent of a user manual. Usually integrated into an application software package, online Help often is **context-sensitive**, meaning that the Help information is related to the current task being attempted. Most online Help also provide links to Web sites that have a FAQs page. **FAQs** (Frequently Asked Questions) supply answers to common queries. Many books are available to help you learn to use the features of a personal computer application package. A **wizard** is an automated assistant that helps complete a task by asking questions and then

performing actions based on the answers.

15. 10   TYPES OF APPLICATION SOFTWARE

15.10.1   *Classification of Application Software*

Application software are classified according to their application domains. Applications that are used in business or developed for specific business applications are termed, business software application. Examples of such applications include banking software systems, financing software systems such as those that are used to manage the stock market, word processing, account. Other application areas include communications, multimedia and graphics, education, home and personal uses. Below given table lists of examples of various software applications in different domains. There are several application software for each domain listed in the table and many more.

Business	Communication	Home Uses	Education	Multimedia& Graphics	Personal Uses
Banking	Web Browsers	Landscaping	Course	Painting	Word Processing
Financial	E-mail Ho	me design	Course Management	Audio/Video Editing	Database
Accounting	Chatting	Decoration	Presentation Graphics	Web Authoring	Spreadsheet
Word Processing	FTP	----.	Computer Aided Instructions (CAI)	Desktop Publishing	Desktop Publishing
Presentation	Telnet	----	Computer Aied Instructions (CAL)	Computer Aied Design(CAD)	Browsers
Spreadsheet	News group	---	Tutorial	---	Web Publishing
Databases	Messaging	--	--	--	--
Personal info Manager	--	--	--	--	--
Project Management	--	--	--	--	--

15.10.2   *Installed software and Web-based Software*

Software application can also be differentiated as installed software and web-based. Installed software are those that you buy from the market or download from the Internet to your

computer. Thesoftware is physically installed in your computer and runs from your Hard Drive. Usually these kinds ofsoftware come inside a CD case.

Examples are Microsoft Office. On the other hand, Web-based software are run from the Internet. Examples are virus protection and some shareware software that you download from Internet.

Application Software	popular Programs	Domains of Applications
Word Processing	Microsoft Office Word,Corel WordPerfect	Business, home, personal
Spreadsheet	Microsoft Office ExcelCorel Quattro Pro	Business, home, personal
Desktop Publishing	Adobe In Design Adobe PageMakerCorel Ventura	Business, Home, personal Multimedia & graphics
Multimedia authoring	Click2learn.com, Tool book Instructor Macromedia Author ware Macromedia Director	Business, home, personal Multimedia & graphics
Video and audio editing	Adobe Audition Adobe Encore DVDAdobe Premiere Pro Macromedia Sound Edit	Business, home, personal Multimedia & graphics
Presentation graphics	Microsoft Office Power PointPresentations	Business, home, personal Corel
Databases	Microsoft Office Access SQL Server , Oracle, DB2	Business, home, personal
Communication	Internet Explorer Mozilla Firefox, Safari,Opera Netscape Microsoft Outlook, e/POP	Communication
Software	Microsoft Office Openoffice.org Corel WordPerfect OfficeIBM Lotus SmartSuite	Business, home, personal
Paint/image editing	Adobe illustrator Adobe	Business, home, personal Multimedia &

	Photoshop Corel Corel DRAW Macromedia Freehand Corel Painter	graphics
Web page authoring	Adobe Go Live Adobe Live Motion Macromedia Dreamweaver Macromedia Fireworks Macromedia Flash Microsoft Front Page	Business, home, personal
Project management	Microsoft Office Project Primavera SureTrak Project Manager	Business, home, personal
Accounting	Intuit QuickBooks Peachtree Complete Accounting	Business, home, personal
Personal information manager (PIM)	Lotus Organizer Microsoft Office Outlook	Business, Communication
Computer-aided design	Autodesk AutoCAD Quality Plans Chief Architect	Business, Engineering
PDA software	Microsoft Pocket Word Microsoft Pocket Excel Microsoft Pocket Outlook Ultra soft Money Pocket Edition	Mobile Computing

Examples of Application Software

15.11   COMMON TYPES OF APPLICATION SOFTWARE

15.11.1   *Word Processing*

Word Processing an office application that enables user to create, edit, format and print textual document.

Figure.1 Word Processing

15.11.2   Spreadsheet

A program that processes information in the form of tables. Tables cells can hold values or mathematicalformula.

Figure.2 Spreadsheet

15.11.3   Presentation

An application software that allows a user to create visual aid for presentation to communicate ideas, messagesand other information to a group.

Figure.3 Presentation

15.11.4 Graphics Editing

Program that can edit digital representation or non-text information such as drawing, charts and photograph.

Figure.4 Graphics Editing

15.12 TECHNICAL TERMS

IM: Instant Messaging

FAQ: Frequently Asked Questions

15.13 SELF ASSESSMENT QUESTIONS

1. What is software?Explain common types of application software.
2. Write benefits of application software

15.14 SUGGESTED READINGS

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