

**INFORMATION
TECHNOLOGY
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CHAPTER -1

Overview of Information Technology: Basics

Structure

1.0 Objective

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1.0 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.

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 specific 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 over 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

(Information Technology:Theory) ■ ■ ■ ■ (1.1.3) ■ ■ ■ ■ ■ (Overview of Infor.Tech.: Basics)
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.
- Modern 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 information 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

(Information Technology: Theory) ■ ■ ■ ■ (1.1.7) ■ ■ ■ ■ ■ (Overview of Infor.Tech.: Basics)

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 Self-Check Exercise

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

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CHAPTER-2

INFORMATION TECHNOLOGY: ADVANTAGES & DISADVANTAGES

2.0 Objective

After reading this Chapter, you will be able to:

- Understand the advantages and disadvantages of information technology;
- Implementing information technologies in libraries

Structure

2.1 Introduction

2.2 Advantages of information technology

2.2.1 Globalization

2.2.2 Communication

2.2.3 Cost effectiveness

2.2.4 Bridging the cultural gap

2.2.5 More time

2.2.6 Creation of new jobs

2.3 Disadvantages of information technology

2.3.1 Unemployment

2.3.2 Privacy

2.3.3 Lack of job security

2.3.4 Dominant culture

2.4 Implementing information technologies in libraries

2.4.1 Role of library

2.5 Conclusion

2.6 Self-Check Exercise

2.7 References

2.1 INTRODUCTION

Information Technology has made a major impact on our lives. In everyday life, there is a small role of Information Technology in it. For example, from our communication to our leisure time there is a small role of IT in it. Information technology has been famous in our daily lives ever since the beginning of year 2000. IT has many advantages and disadvantages. Things that were once done manually or by hand have now become computerized operating systems, which simply require a single click of a mouse to get a task completed. With the aid of IT we are not only able to stream line our business processes but we are also able to get constant information in 'real time' that is up to the minute and up to date. The significance of IT can be seen from the fact that it has penetrated almost every aspect of our daily lives from business to leisure and even society. Before we can know about all the advantages and disadvantages of information technology, it is essential that we know what information technology is exactly, and why it has it come to play such an important role in our daily lives. Today information technology involves more than just computer literacy; it also takes into account how computers work and how these computers can further be used not just for information processing but also for communications and problem solving tasks as well.

2.2 ADVANTAGES OF INFORMATION TECHNOLOGY

The followings are the advantages of IT

2.2.1 Globalization

IT has not only brought the world closer together, but it has allowed the world's economy to become a single interdependent system. This means that we can not only share information quickly and efficiently, but we can also bring down barriers of linguistic and geographic boundaries. The world has developed into a global village due to the help of information technology.

2.2.2 Communication

With the emergence of information technology, communication has also become cheaper, quicker, and more efficient. We can now communicate with anyone around the globe by simply text messaging them or sending them an email for an almost instantaneous response. The internet has also opened up face to face direct communication from different parts of the world thanks to the helps of video conferencing.

2.2.3 Cost effectiveness

Information technology has helped to computerize the business process thus streamlining businesses to make them extremely cost effective money making machines. This in turn increases productivity which ultimately gives rise to profits that means better pay and less strenuous working conditions.

2.2.4 Bridging the cultural gap:

Information technology has helped to bridge the cultural gap by helping people from different cultures to communicate with one another, and allow for the exchange of views and ideas, thus increasing awareness and reducing prejudice.

2.2.5 More time

IT has made it possible for businesses to be open 24 x7 all over the globe. This means that a business can be open anytime anywhere, making purchases from different countries easier and more convenient.

2.2.6 Creation of new jobs

Probably the best advantage of information technology is the creation of new and interesting jobs. Computer programmers, Systems analyzers, Hardware and Software developers and Web designers are just some of the many new employment opportunities created with the help of IT.

2.3 DISADVANTAGES OF INFORMATION TECHNOLOGY

The followings are the disadvantages of IT.

2.3.1 Unemployment

While information technology may have streamlined the business process it has also created job redundancies, downsizing and outsourcing. This means that a lot of lower and middle level jobs have been done away with causing more people to become unemployed.

2.3.2 Privacy

Though information technology may have made communication quicker, easier and more convenient, it has also brought along privacy issues. From cell phone signal interceptions to email hacking, people are now worried about their once private information becoming public knowledge.

2.3.3 Lack of job security

Industry experts believe that the internet has made job security a big issue as since technology keeps on changing with each day. This means that one has to be in a constant learning mode, if he or she wishes for their job to be secure.

The technology has helped to computerize the business process thus streamlining businesses to make them extremely cost effective money making machines. This in turn increases productivity which ultimately gives rise to profits that means better pay and less strenuous working conditions.

2.3.4 Dominant culture

While information technology may have made the world a global village, it has also contributed to one culture dominating another weaker one. For example it is now argued that how US influences under developed countries all over the world now act, dress and behave.

2.4 IMPLEMENTING INFORMATION TECHNOLOGIES IN LIBRARIES

According to John Bushman, the implementation of information technology requires librarians to ask two basic questions:

- ** Why is the technology good for libraries, librarians, or the public?
- ** Where will the technology lead us?

It is the librarian's duty to ask these questions and become involved in finding the answers. All technological advances need to be approached critically, with the knowledge that they may have both social and political consequences. Librarians need to be able to evaluate technologies to determine whether a given technology

will harm or help the library and its community. Funding, getting the public involved with the change in technology, getting them to deal with the positive and negative effects of change, and making sure the librarians are able to handle the pressures are all ways of becoming involved with finding the answers about information technology and the future of libraries.

2.4.1 Role of Libraries

In the modern knowledge society libraries have a new role and there are various types of library models. In the modern society, where the use of electronic services and Web-based information sources constantly increases, libraries are managed in a more democratic way, have more flexible communication system and work organization, and their service development is based on the quality and user-orientation of services. In the modern knowledge society libraries have a new role and there are various types of library models. These are as follows:

- i. traditional library as a memory institution
- ii. library as a learning and research centre
- iii. library as a cultural and communication centre
- iv. electronic library
- v. digital library
- vi. virtual library as library without walls

Libraries had been performed many important roles in the past agrarian and industrial societies. But those roles were limited in scope. In the 21st century, libraries have to perform pivotal roles in disseminating and sharing the culture of knowledge. In this age of knowledge libraries should be repositories of all of the knowledge and information accumulated by human kind. They will have to store all kinds and forms of material and information and disseminate beyond the geographical boundaries. Today's advanced information technology is enabling libraries to accomplish this immense task (Singh & Nazim, 2008).

2.5 CONCLUSION

While information technology may have streamlined the business process it has also created job redundancies, downsizing and outsourcing. IT has to be carefully managed so that the disadvantages do not overcome the advantages. People have to use Information the right way to make maximum use out of it.

2.6 SELF-CHECK EXERCISES

1. What are the advantages of IT?
2. What are the disadvantages of IT?
3. Discuss the Impact of Information Technology and Role of Libraries.

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CHAPTER-3

COMPONENTS OF INFORMATION TECHNOLOGY: HARDWARE

Structure

3.0 Objective

3.1 Introduction

3.2 Hardware

 3.2.1 Input Devices

 3.2.2 Output Devices

3.3 Software

 3.3.1 Application Software

 3.3.2 System Software

3.4 Procedure

3.5 Data

3.6 People

3.7 Self-Check Exercise

3.8 References

3.0 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.

3.1 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:

3.2 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 take 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 what those 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.

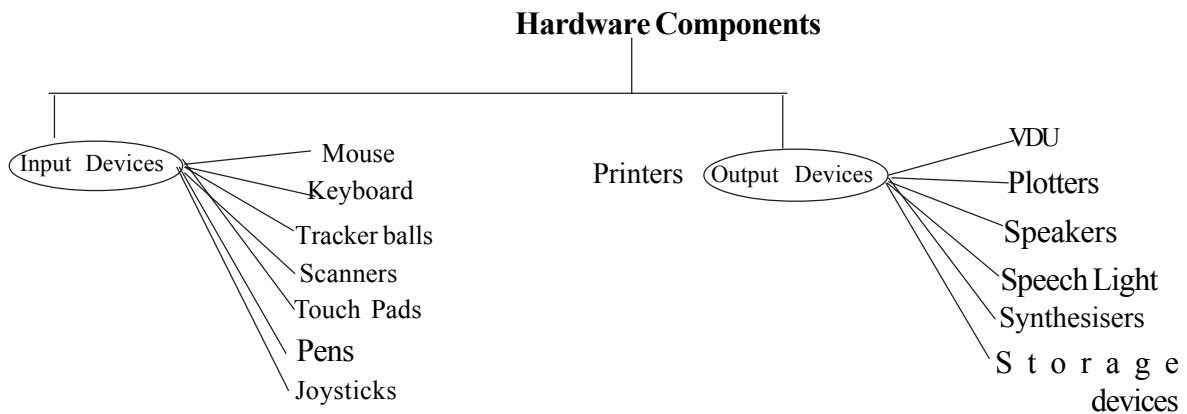
Hardware Components

3.2.1 Input Devices – “How to tell it what to do”

A keyboard and mouse are the standard way to interact with the computer. Other devices include joysticks and game pads used primarily for games.

3.2.2 Output Devices – “How it shows you what it is doing”

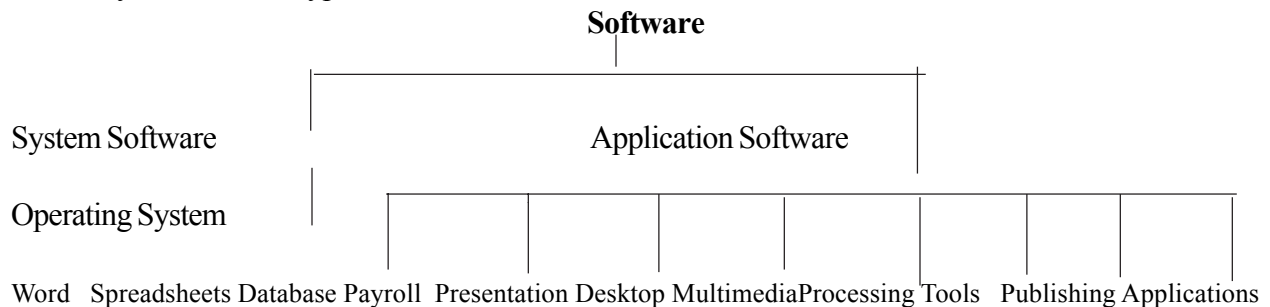
The monitor (the screen) is how the computer sends information back to you. A printer is also an output device.





3.3 Software

The software is the instructions that makes the computer work. Software is held either on your computers 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:



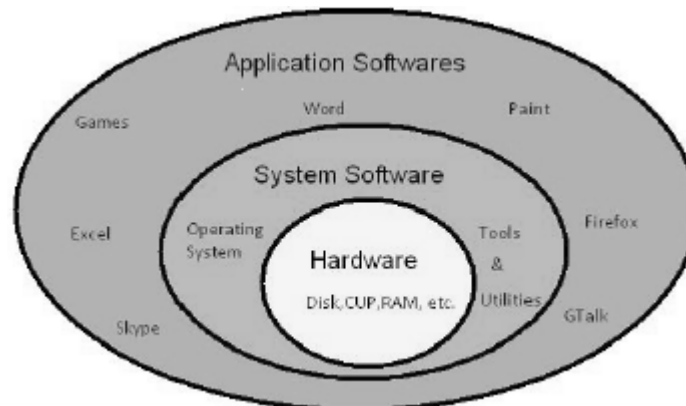
3.3.1 System Software:

- 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.

3.3.2 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).



3.4 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.

3.5 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 in situ 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.

3.6 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.

3.7 Self-Check Exercise

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

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CHAPTER-4

APPLICATION OF INFORMATION COMMUNICATION TECHNOLOGY

Structure

- 4.0 Objective
- 4.1 Introduction
- 4.2 Concept of ICT
- 4.3 Definitions
- 4.4 ICT and Libraries
- 4.5 ICT Enabled Conventional Library and Information Services
 - 4.5.1 Online public access catalogue and user services
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 - 4.5.8 Audiovisual Services
- 4.6 Customer Relations and User Education
- 4.7 Internet Access
- 4.8 Access to Web Based Resources
 - 4.8.1 E-Journals:
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 - 4.8.3 Electronic Theses and Dissertations (ETD):
 - 4.8.4 Patents:
 - 4.8.5 Course Material:
 - 4.8.6 Subject Gateways
- 4.9 Digital Library and Archives
- 4.10 Impact of Information Communication Technology on Libraries
- 4.11 Self-Check Exercise
- 4.12 References

4.0 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

4.1 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.

4.2 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)

4.3 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).

4.4 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.

4.5 ICT Enabled Conventional Library and Information Services

4.5.1 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.

4.5.2 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 press clippings, 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 involved in 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.

4.5.3 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.

4.5.4 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.

4.5.5 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 publishing sites 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-newsletters 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.

4.5.6 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.

4.5.7 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.

4.5.8 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.

4.6 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

4.7 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.

4.8 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 discomfort in reading on the screen, problems in internet access and speed, poor infrastructure, lack of sufficient skills to use the digital resources, and perceptual 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.

4.8.1 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 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.

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.

4.10 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 or a 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, serials control, cataloguing and circulation control. In recent times, even the related topics such as information retrieval, 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.

4.11 Self-Check Exercise

1. Explain the concept of ICT.
2. Describe ICT enabled library services.
3. Write any two definitions of ICT.