COURSE GUIDE

LIS 104
INTRODUCTION TO ICT IN LIBRARY AND INFORMATION SERVICES

Course Team Dr. Manir Abdullahi Kamba (Course Writer/ Developer) - Bayero University, Kano

NATIONAL OPEN UNIVERSITY OF NIGERIA

National Open University of Nigeria
Headquarters
University Village
Plot 91, Cadastral Zone
Nnamdi Azikiwe Expressway
Jabi, Abuja

Lagos Office
14/16 Ahmadu Bello Way
Victoria Island, Lagos

e-mail: centralinfo@nou.edu.ng
URL: www.nou.edu.ng

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CONTENTS **PAGE**

INTRODUCTION TO ICT IN LIBRARY AND INFORMATION SERVICES

Welcome to **LIS 104: Introduction to ICT in Library and Information Services**. This Course Guide is a brief description of what the course is about, and the course material will give you the contents of what you are expected to learn in this course. It also contains some general guidelines on the amount of time you are expected to spend on each unit of this course in order to successfully complete the course. There is a separate Assignment File which contains detailed information on tutor-marked assignments that you are expected to answer after each unit.

WHAT YOU WILL LEARN IN THIS COURSE

This course will give you, in brief, the awareness of the importance of Information and Communication Technology (ICT) application to Library and Information Services. The course will introduce you to the role of ICT in library operation, clarifying the following terms/concepts - Information, Communication, Technology, Education, Learning, Information Technology, Information and Communication Technology, Information Technologies such as world-wide-web, the radio, the television, etc. You will also learn about the problems, prospects, and challenges of application of ICT to library services in the developing world with emphasis on introduction to computer and its application to libraries, the Internet, the social media, the law and computer information systems, basic knowledge of programming, etc.

COURSE AIMS

The aim of this course is to prepare you for the application of Information and Communication Technology (ICT) application in the Library and Information Services. This will be achieved by

- Introducing you to Information and Communication Technology (ICT).
- Helping you to appreciate how Information and Communication Technology touches our lives every day in a personal way.
- Outlining Information and Communication Technology application in library operations.
- Clarifying some basic concepts of Information and Communication Technology application in library operations.
- Outlining the problems, prospects, and challenges of Information and Communication Technology application in library operations.

COURSE OBJECTIVES

To achieve the above aims, some general objectives are set for the course. The course is divided into units, and each unit has a specific objective at the beginning. You may want to refer to them during and after you might have completed a unit to check the pace of your progress. The general objectives set below cover the whole course. By meeting these objectives, you should have achieved the aims of the course.

On successful completion of the course, you should be able to

- Define and explain the meaning of Information and Communication Technology (ICT).
- Clarify the following terms/concepts: Information, Communication, Technology, Information and Communication Technology, Information and Communication Technologies, the internet, world-wide-web, social media, etc.
- Describe the Historical Development of ICT
- Describe ICT application in Library Operations and Services.
- Identify factors influencing the use of ICT in library operations
- Outline the problems, prospects, and challenges of application of ICT in library and information services in the developing world.

WORKING THROUGH THE COURSE

To complete this course, you are advised to read each study unit of this study material and read other materials, which may be provided by the National Open University of Nigeria (NOUN). Self-assessment exercises are included in each unit, and you will be required to submit tutor-marked assignments for assignment purposes. There will be a final examination at the end of the course. The course will last for 22 weeks. The course will be divided into learnable units, and you can allocate your own time to the units so that you can complete the course at a record time. You are advised to utilize the opportunity of tutorial sessions for comparing notes and sharing ideas with your colleagues.

COURSE MATERIALS

Major components of the course are:

- The Course Guide
- Study Units
- Assignments
- References/Further Reading
- Presentation Schedule

STUDY UNITS

There are 14study units divided into four modules in this course. The modules and units are presented as follows:

Module 1	**Definition of Concepts and Development of Information and Communication Technology ICT)**
Unit 1	Overview of ICT and Definition of Concepts
Unit 2	Development of ICT in Pre- Electronic and Electronic Era
Unit 3	Types and Components of ICT
Unit 4	ICT and Libraries
Module 2	**ICT Applications in Library Routine Activitiesand Services**
Unit 1	ICT Application to Technical Services
Unit 2	ICT Application to Readers Services
Unit 3	ICT Application to Library and Information Services
Unit 4	ICT Skills for Information Professionals
Module 3	**Library Automation and Internet Resources in Libraries**
Unit 1	Data Communication
Unit 2	Electronic Storage Systems
Unit 3	Internet and Web Technology Resources
Unit 4	Impact of ICT to Library and Information Services
Module 4	**Challenges and Prospects of Application of ICT in Libraries**
Unit 1	Ethical Issues and Consideration for Applying ICT in Libraries
Unit 2	Challenges of ICT Application in Nigerian Libraries

Each unit consists of contents, introduction, statement of objectives, main content, conclusion, summary, tutor-marked assignments, and references. There are activities at every point that will assist you in achieving the stated objectives of the individual units of this course.

PRESENTATION SCHEDULE

Your course materials will spell out the important dates for early and timely completion and submission of your Tutor-Marked Assignments and for attending tutorials. You should bear it in mind that assignments should be submitted at the stipulated time and date. Make sure you do not lag behind in your work.

ASSIGNMENT FILE

There are at least twenty-one assignments in this course, that is, at least one assignment per unit. The assignment file contains all the works you are to submit to your tutor/facilitator for marking. Your assignments are as important as your examinations, and they carry 30% of the scores earmarked for the course.

ASSESSMENT

The assessment method will be two-folds. These are assignments and written examinations. The course materials are prepared to assist you in doing the assignments. You are expected to utilize the information and knowledge from the recommended texts at the end of each unit. The assignments will carry 30% of the total marks while the final examination of about three hours duration will be written at the end of the course, and this will carry 70%.

TUTOR-MARKED ASSIGNMENT (TMA)

The Tutor-Marked Assignment is a continuous assessment component of your course and it accounts for 30% of the total score. You are required to submit at least six TMAs before you are allowed to sit for the end of course examination. Your facilitator will give you the TMAs, and you are expected to return the same to him/her as and when due.

Your assignment file contains the assignment questions for the units in this course. The information and materials contained in your reading, study units, and references will assist you in completing your assignments. You should demonstrate that youhave adequate knowledge of the materials read and that you have equally done further research into other references, which will give you a wider viewpoint as well as provide you a deeper understanding of the subject.

Ensure that each tutor-marked assignment reaches your facilitator on or before the deadline stated in the presentation schedule and assignment file. In case of any unforeseen circumstances that may hinder you from submitting your assignment before the due date, contact your facilitator before the assignment is due to discuss the possibility of an extension. An extension will not be granted after the due date.

FINAL EXAMINATION AND GRADING

The final examination for LIS 104 is about threehour’s duration, and it has a value of 70% of the total marks. The examination questions will reflect the type of self -testing, practice activities, and tutor-marked

assignments/problems that have previously been encountered in the course. All areas of the course will be assessed.

You could form a discussion group with a considerable number of your colleagues and practice or discuss the activities and assignments written in each unit before the examination period.

COURSE MARKING SCHEME

Assessment	**Marks**
Assignment 1-21 (best 3 out of all the assignment submitted)	Three assignment marked, each 10% totalling 30%
Final Examination	70% of Overall Course Score
Total	100% of Course Score

HOW TO GET THE MOST FROM THIS COURSE

1) In distance learning, the study units replace the university lecturer. The advantage is that you can read and work through the course materials at your pace, time, and location, or environment that suits you best. Think of it as reading the lecture instead of listening to the lecturer. Just as the lecturer might give you in-class exercise, this study unit provides appropriate exercises that will keep you abreast of the pace of your progress in the course.

2) Each study unit is designed in a peculiar format that will facilitate your learning. It starts with an introduction to the subject-matter of the unit and how a particular unit is integrated with the other units and the course as a whole. This is followed by the objectives. These objectives will let you know what you should be able to do by the time you have completed the unit. Use the objectives to assess your progress at the end of every unit.

3) The main body of the unit will serve as a roadmap that will guide you through the required reading from other sources. This is usually from either your references or from a reading section.

4) Self-activities are entrenched throughout the units, and going through them religiously will help you to achieve the objectives of the unit and prepare you for the assignment and examination. Equally, go through each self-activity as you come across it in the study unit.

5) You can follow this practical strategy for working through the course. In case you run into a problem, do not hesitate to

telephone your tutor/facilitator or visit the study centre nearest to you. Note that your tutor/facilitator's job is to help you. When you need assistance, do not hesitate to call and ask your tutor/facilitator to provide it.

Read This Course Guide Thoroughly, It Is Your First Assignment.

1) Organize a Study Schedule - Design a 'course overview' to guide you through the course. Take note of the duration of every unit and the assignment related to it. Keep a diary of important information, e. g., details of your tutorials, duration of a semester, when you are to submit your assignment, etc. Map out your own schedule of work for each unit.
2) Once you have mapped out your study schedule, follow it religiously, and stay focused. A major cause of failure is not keeping abreast of the schedule of work. If you get into any difficulty concerning your study, inform your tutor/facilitator on time.

3) Read the introduction and objectives of every unit before working through it.

4) Assemble the study materials. Information about what you need is given at the beginning of each unit. You will always need both the study unit you are working on and one of your textbooks on your desk at the same time.

5) Study critically the course information that will be continuously posted to you and do not fail to visit your Study Centre for up-to-date information.

6) Before the due dates (at least four weeks before the dates), visit your Study Centre for your next required assignment. Be assured that you will learn a lot by doing your assignment to meet the objectives of the course and will definitely help you to pass your examination. Make sure your assignments are submitted not later than the due dates.

7) A revision of each study unit objectives will assist you to confirm whether you have achieved them. In case you are not sure whether you have achieved the objectives, review the study materials, or consult your tutor/ facilitator. When you are sure that you have achieved the unit's objectives, you can proceed to the next unit. Go through the course unit by unit and ensure that you space your study in a manner that you can keep to the schedule.

8) Do not wait until your tutor return the submitted assignment before you proceed to the next unit. Keep to your schedule. When your assignment is returned, take note of your tutor's comments, both on the tutor-marked assignment form and also the written comments on the assignment. Consult your tutor/facilitator if you have any problems or questions.

9) After completing the last unit, review the course, and get prepared for the final examination. Ensure that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed on the Course Guide).

FACILITATION/TUTOR AND TUTORIALS

Facilitation/Tutorials shall be provided in support of this course. You will be notified of the dates, times and locations of these tutorials as well as the names and phone number of your facilitator as soon as you are allocated a tutorial group.

Your tutor/facilitator will mark and comment on your assignment, keep a close watch on your progress, on any difficulties you might encounter and provide assistance to you during the course. Ensure that you submit your tutor-marked assignments to your facilitator before the due date; at least two working days are required. Your assignments will be marked and returned to you as soon as possible. You can contact your facilitator on telephone, e-mail and discuss your problems whenever you need assistance. You may need to contact your facilitator if:

- you do not understand any part of the study or assigned readings
- you have difficulty with the self-tests or activities
- you have a question or problem with an assignment, with your tutor's comments or with the grading of an assignment.

Make it a point of duty to attend your tutorials regularly. This will afford you the opportunity of face-to-face contact with your course facilitator and to ask questions which are instantly answered. You can equally discuss any problem encountered in the course of your study. For maximum benefit from course tutorials, you can prepare a question list before attending them. You will learn a lot from participating in active discussions.

SUMMARY

This course will bring you the importance of Information and Communication Technology (ICT) application to Library and Information Services. At the end of the course, you will achieve the objective if you follow the instructions and do what you are expected to do.

MAIN COURSE

CONTENTS **PAGE**

MODULE 1 DEFINITION OF CONCEPTS AND DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

This module would take you through the development of information and communication technology, the definition of concepts, the need for information and communication technology in the libraries, and also the numerous benefit of information and communication technology to librarians.

Unit 1 Overview of ICT and Definition of Concepts
Unit 2 Development of ICT in Pre-Electronic and Electronic Era
Unit 3 Types and Components of ICT
Unit 4 Information and Communication Technology and the Libraries

UNIT 1 OVERVIEW ICT AND DEFINITION OF CONCEPTS

CONTENTS

1.0 INTRODUCTION

This unit will introduce you to Information and Communication Technology (ICT) and its benefit to libraries.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- explain the meaning of Information and Communication Technology (ICT)

- describe the development of Information and Communication Technology (ICT)
- mention the tools that facilitate the application of Information and Communication Technology (ICT)
- explain why Information and Communication Technology (ICT) is needed in libraries
- enumerate some benefits of Information and Communication Technology (ICT) to libraries

3.0 MAIN CONTENT

3.1 Overview of Information and Communication Technology

Information Technology is the term used to cover a whole range of hardware and software. Information Technology (IT) system processes, stores, and/or transfers (communicates) information. IT merges computing with high-speed communications links carrying data, sound and video. Examples include personal computers, telephones, television, and various handheld devices (Williams and Sawyer, 2005). Computers and communications are the pivots of Information Technology (IT).

The Longman Dictionary of Contemporary English (New Edition)(2000) describes Information Technology (IT) as "the study or use of an electronic process for storing information and making it available." This definition is deficient because it limits the functions that reflect the increasing network of the hardware and software, especially in the area of the internet and the potentials it provides for communication. If we look at the phrase: "storing and making information available," one observes that communication is involved. The message has to be encoded, passed through a medium and decoded for use. Language is involved - coded in verbal and written or embedded in signal, signs, and symbols. Information may take many different forms, such as text, numbers, pictures, sound, video, and multimedia.

To transfer information, Information Technology (IT) systems use computers, telecommunications networks, and other electronic devices. Thus the addition of the word 'communication' is inevitable. Hence, we have Information and Communication Technology (ICT). When information and communication assume drifts away from the orthodox verbal and print media towards the more recent electronic media, the concept is known as Information and Communication Technology (ICT). Thus ICT could be seen as the combination of networks, hardware, and software as well as the means of communication, collaboration, and engagement that enable the processing, management, and exchange of data, information, and knowledge (Ezekoka, 2008). The

term 'ICT' is often referred to 'IT'. The basis of ICT, however, is simply to help improve the way we deal with information in all areas of life. This is an all-embracing description. It marries both the old Information Technology to the new innovation made possible by the communication process to enhance effective information and communication network. The development in technology has turned the world into a global village, and information is now being processed at breakneck speed width highly sophisticated equipment.

Through ICT, the whole world is reduced to a unit, and any part of the world could be reached in a split second. Information and Communication Technology (ICT) is vital to human development. It offers a wide range of tool that lead to the change of the library and information services process to an inciting and interactive process centred on users. It accounts for why the world is categorized into developed, developing and under-developed. Access to ICT and utilization of its benefits place some nations above the others. While developed nations are breaking new grounds in terms of technological development, as a result of developed ICT, developing and under-developed nations are grappling with the crumbs of technology. ICT enhances effective network and information processing.

3.2 Needs for Information and Communication Technology in Libraries

ICT was needed in the libraries immediately after the Second World War, a huge amount of information in the form of books and other printed material had been produced, which has resulted in exponential growth of information. There is now information pollution instead of an information explosion. The libraries have found it very difficult to acquire, arrange and disseminate the information in traditional ways. So libraries are compelled to plan, organize and communicate the huge information according to the needs of users with the help of information and communication technology (ICT) the information is no longer confined to books and document in the custody of individual or educational institutions, now it has embraced audio-visual, digital, multimedia with color motion and three dimensions features, etc. Application of modern technology via computer and communication are bringing all these to the doorstep of the people. There are various electronics/digital/computer-based information which is available for the libraries like online and offline resources example e-journals, e-books, e-databases, compact disk (CDs/DVDs), and the Internet and due to this development in current scenario application of information and communication technology (ICT) seems must for libraries. The creation of databases is the foremost step in the application of ICT in libraries. For the creation of the databases, the library needsto have suitable

software package, keeping in mind the day to day activities of libraries via, acquisition, cataloguing, circulation, serials control, OPAC, administration, indexing, abstracting, e-book, e-journals, e-databases, current activities services (CAS) and selective dissemination of information (SDI), etc. to cope up with the current technological development and fulfilling the thirst of the users.

To this regard, various factors have contributed to bringing about change from traditional to ICT based library operations.
Basically, ICT is needed in libraries for the following two main reasons:

In terms of various problems faced by traditional library systems:

The manual performances of library functions were getting difficult because of the following main reasons:

- The size of recorded information is ever-growing, whereas space available in the disposal of each library is limited. No library can think of getting additional space every year, although the collection will grow continuously;
- Due to knowledge explosion, the society is faced with multifaceted and multidimensional information to such an extent that not only its storage has created a challenge, but the organization of this bulk of information has also become unwieldy;
- Library operations, due to potential growth of information, could take many hours to perform manually;
- Due to the information explosion, all sorts of housekeeping jobs and information works can be performed manually with less effective and less accuracy.

In terms of various facilities provided by computers and related technologies:

The advantages of using computers and other telecommunication media and devices in managing libraries are manifold.

Some of the advantages are as follows:

- **Speed:** A computer can carry out an instruction in less than a millionth of second. Searching of information,compilation of bibliographiesand preparation of current awareness bulletins, indexing, and sorting can be processed by a computer in a few hours.
- **Storage:** Human brain can store pieces of information to some limitation, whereas computers can store voluminousdata.

- **Accuracy:** Computers can perform various functions of ICT based libraries very accurately.
- **Reliability:** Computers and all related technologies have a long life if maintained properly. The data gathered in it arereliable.
- **Repetitiveness:** A computer can be used repetitively to process information.
- **Compactness:** The present-day computers are laptop/waptop/palmtop, which do not occupy more space.

Given the above reasons, many factors which have contributed to the application/use of information and communication technology (ICT) in libraries are:

- Rapid growth in the information output and its usage has made it impossible to store and organize information using conventional methods. Presently most of the information or documents are available in a machine-readable format; therefore, the application of information and communication technology (ICT) is necessary.
- It is no longer possible for any library to collect all the published information or documents. So with the help of information and communication technology (ICT) resource sharing can be done easily.
- By using modern information and communication technology (ICT) in the libraries, the efficiency of the staff can be increased, and better-advanced services may be provided to the users
- Implementation of barcodes and RFID based services; libraries can satisfy a maximum number of users in avery short span of time.
- Due to information, a literature search using manual methods is a difficult, tedious, and time-consuming job, whereas computerized storage and retrieval of information make it faster and efficient.
- Now in libraries, it is very difficult to provide interlibrary loan, translation, anticipatory services, including preparation and annotated lists, abstract, bulletin board, news summaries, employment alert, and other information retrieval services manually. Whereas with the help of information and communication technology (ICT) above mentioned, library services could be provided in very less time.

3.3 Benefits of Information and Communication Technology (ICT) in Libraries

The computer remains the focal point of Information and Communication Technology (ICT) because it refers to the range of tools and techniques that are computer-basedd. Hence the benefits of ICT

centre round the benefits derived from the use of the computer. The following benefits could be derived from the utilization and integration of ICT into library operations.

Fast, Accurate and Direct Exchange of Information

Information or message goes electronically to the receiver. A large number of people are linked up through the internet and websites. There is no fear of loss of items or undelivered packages when the network functions properly. On-line banking, e-learning, e-registration, etc. are examples of benefits derived from ICT.

Rapid Information Processing

ICT offers **benefits** because it allows collecting, storing, accessing, sharing, and analysing effective **information,**and this gives SCvisibility and allows the data analysis and decisions made to maximize profitability. The computer can sort or search through a huge amount of information. The computer can send message or data in 1 byte (or character) at a time. This is called asynchronous transmission and it can equally send or process data in block. This is called synchronous transmission. Both small data and a huge one can be transmitted within a specified time.

Easy Handling of Large Amount of Information

Libraries and Information centres are now taking advantage of the benefits that ICT offers. Most libraries and information centres have computerized their systems for use at various units and in various routine operations of the libraries, which are no longer handled manually. ICT has made networking possible and has reduced the bottleneck of accessing, organising and retrieval of information and other related functions. Today most library operations, services, and administration no longer need to be on the necks of librarians to be battling with the manual process of information handling. In the same vein, individual users can access information resources and services anywhere at any time. Librarians can help their users at various locations at the same time. This is done through teleconferencing or videoconferencing. This is a very vital improvement that ICT offers in Distance Learning.

Increase Availability of Information

The continuing rapid advance of Information Technologies has, in reality, made access to knowledge easier and importantly much more readily available to the wider population and around the world. There is greater access to a variety of information sources. Users, Librarians, and people from other works of life can surf the internet for information

related to their needs and other related matters as a result of development in science and technology.

Improved Quality of Instruction

The use of ICT in libraries has paved the way for a more user-centered approach to library operations and services. ICT improves the quality of services provided by increasing the desire of the user to explore, discover, and create unique solutions to their problems. The librarians, on the other hand, is no longer seen as the primary source of information, but with the use of ICT, he is now viewed as a support, collaborator, and facilitator to users as they learn to gather and evaluate the information for themselves.

In essence, the use of ICT changes the roles of both librarians and users in the library business. Information services could be presented through multimedia equipment, thus raining the standard or the quality of presentation. Through the use of ICT, a quick and concise presentation is enhanced.

ICT is Systematic

ICT applies the principles of a systems approach to information processing to service delivery. This conserves the librarians' time and broadens users' access to information. Librarians do not need to stay all night in the libraries and bookshops to serve as gatekeepers as they used to source for adequate and current books; rather, they can browse the internet and get current texts.

ICT Extends Human Experience

The human experience could be extended when dealing with materials that are not in the immediate environment of the user or, on the other hand, when dealing with materials that could be injurious to the life of the users, for example, a wild animal like a lion cannot be brought into the libraries live a film rather or video can present it live in the class or a zoo could be networked to the libraries through the internet. Clinical students in a College of Medicine in Nigeria could have access to a live surgical operation being performed in a hospital in the United States of America through internet connectivity. Teleconferencing, webhosting, videoconferencing, etc. are examples of ways by which ICT can extend the human experience.

ICT Helps To Overcome Physical Limitation

Through ICT, a lot of practices and procedures in all forms of endeavours have changed. Devices such as mobile phones, digital cameras, PDAs, games consoles and MP3 players are gaining ground among the users. Exposure to these materials is changing the situation among the users who have greater access to information and equally interact with modern equipment that can aid their learning.

With the availability of satellite, internet connection, world-wide-web, etc., the whole world is turned to a global village. Users in developed countries and some institutions in developing countries no longer have the barrier of distance to contact their libraries. Distance learning students do not need to leave their homes, offices before they can access their libraries and information resources. They even stand a better chance than users who have to wait for the physical libraries before they could proceed. With the utilization of ICT, users and librarians can interact any time any day regardless of the location once they are connected to the net.

3.4 Definition of Concepts

General Terms/Concepts Used in Information and Communication Technology

Information and Communication Technology (ICT) has become a common-place because it is the 'driving force' of our time. We are in the Information Age, where so much information is available everywhere all the time. This is having some untold effects on human beings. One of the effects is that of **information overload**. There is information overload when the volume of available information far exceeds the amount of time needed to absorb it. There is a need to clarify some of the terms/concepts used in Information and Communication Technology (ICT) in order to assess its impact on libraries, learning, and education.

Terms/Concepts of Information and Communication Technology (ICT)

For a better understanding of the concept of ICT, there is a need to clarify some of the commonly used terms. These terms are the first categories to be cleared because they are interrelated.

Information

When you are curious about something, you make enquiries, and you get some results. These results, when stored or compiled, they help you to confirm or reject your assertions or help you make decisions. These results are facts or details that tell you something about a situation, person, or events. These details could guide you to decide whether a person or a situation is wrong.

The Longman Dictionary of Contemporary English (19) described information as "facts or details that tell you something about a situation, person, events, etc." In terms of technology relating to computers, information is described as "data that have been summarized or otherwise manipulated for use in decision making. e.g., total votes cast for each candidate, which are used to decide who won (Williams and Sawyer, 2005). In essence, Information is, therefore, the facts or detail that are summarized or manipulated for decision making.

Communication

Communication could be seen as a complex phenomenon without which no human activity is complete. It is basic to everyday existence because through communication, we can acquire knowledge to conquer our environment. If this knowledge is impaired, human beings could be reduced to robots because both the mental and physical alertness will be impaired. The giant stride made in technology is as a result of an improved communication system.

Communication means different things to different people. To a broadcaster or a teacher, it could mean the sharing of ideas between two or more people, the transmitting of information from the source (sender) to the destination (receiver). To a technology-biased person, as described by O'Leary and O'Leary (2005), it could mean the process of sharing data, programmes, information between two or more computers. Communication could be verbal or non-verbal. It could occur between two animals, man and lower animals, between man and machine, animal and machine, and between machine and machine (Ogunmilade, 1984; Amoo, Ayodele and Egbowon, 2005).

Technology

Technology dates back to the beginning of man's history. It is a means of applying solution to problems encountered. The Early Man invented fire to keep himself warm, cook, and preserve his food. Technology means several things to several people. It is scientific. This informed the definition of Galbraith (1967) which described technology as "the systematic application of scientific or other organized knowledge to

practical task." Akanbi (1988) also described technology as " an application of scientific knowledge and principles about human learning, communication and management to the solution of problems in teaching and learning. The process of applying a means that could solve the problems or needs of man is technology. This is intrinsically related to the culture and needs of man. Thus we have print technology, wood technology, textile technology, educational technology, etc.

Information Technology

Information technology(IT) is the use of any computers, storage, networking, and other physical devices, infrastructure andprocesses to create, process, store, secure, and exchange all forms of electronic data. "IT" is the common term for the entire spectrum of technologies for information processing, including software, hardware, communications technologies, and related services. In general, IT does not include embedded technologies that do not generate data for enterprise use.

Communication Technology

It is a system used to exchange messages and information in electronic format. Revolutionary changes have been seen in communication because different types of information such as personal message, letter, article, computer programming files, pictures, sound, etc. are possible to send or receive from any corner of the world within some fraction of second. At present, this is the most useful tool for different types of communication (personal, official communication, etc.). This tool can be used to provide the required information at the right time. At present, Libraries are using this live tool to serve the library users; through this, renewal or return (check-in) of library materials is basically asked. It can also be considered as a medium for faster information.

SELF-ASSESSMENT EXERCISE

i. What type of media would you use to present several instructions to people at the same time?
ii. Explain two benefits of ICT.

4.0 CONCLUSION

Information and Communication Technology (ICT) has transformed the means by which information is processed bringing up to date every world events and areas of personal interest and also further learning. Information Technology (IT) is used to cover a wide range of hardware and software. Information and Communication Technology (ICT) is preferred to Information Technology (IT) because the transference of information involves the use of computer, telecommunication networks,

and other devices. This brings about the importation of the word 'communication'. Thus we have ICT. There are benefits derived from ICT which could be harnessed for teaching and learning. Notable among these are its being fast and accurate, rapid information processing, increased availability of information, to mention a few.

5.0 SUMMARY

In this unit, you have learned:

i. the meaning of the development of ICT
ii. why ICT is preferred to IT
iii. some benefits of ICT

6.0 REFERENCES/FURTHER READING

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UNIT 2 DEVELOPMENT OF ICT IN PRE-ELECTRONIC AND ELECTRONIC ERA

CONTENTS

1.0 INTRODUCTION

This unit will introduce you to the development of ICT from pre-electronic to the electronic era.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- explain the stages of ICT development
- discuss the ICT in pre-electronic era
- discuss the ICT in the electronic era.

3.0 MAIN CONTENT

3.1 Information and Communication Technology and Libraries

Today, the vital activities of libraries comprise collection development, reference services management, document delivery service, access to organised collections held by the library and assist users in information search and retrieval which are carefully handled by manual process. With the advent of ICT there is the basic essentiality of information and communication technology to manage the huge collection of library. It is indispensable to use modern technology to make library services faster. Libraries are facing a new generation of online users who are technologically savvy and integrate information access and use in all

spheres of their lives to an unprecedented degree. Gradually, generation is changing with the time and the present generation's library users are too passionate with the technology. It is well known that all the success depends upon the satisfaction of the library users. So, in the present scenario, the quickest library service is more approachable through the world-wide-web and internet (Berners-Lee, Cailliau, Groff, & Pollermann, 1992). To provide information to the 'right users' at 'any time', from 'anywhere' in the 'right way' (Fischer, 2012) is possible using web based technological settings.

Tremendous development has been seen in the field of Library & Information Science due to the faster growth in technology. In past few decades, with the use of internet and technology, the library work has become very fast. To satisfy the needs of library users, speed and accuracy is the most two important dimension. Basically, Information and Communication Technology (ICT) enhances the workflow of the library which helps reducing manual work, with this, it proliferates the library services. One of the most prominent advantages of ICT is to provide ICT-based information services to meet the users' demands (Woodward, 2009). Emerging ICTs have changed traditional libraries into knowledge centres and librarians function more like consulting information engineers or knowledge managers (Sampath, Kumar & Biradar, 2010). The modern technology has carried momentous changes in different aspects of library management. From housekeeping operation to users management, have been largely achieved through the applications of internet and library software. Basically, ICT is used in libraries, efforts to provide various services, such as - access to OPAC, library databases, automated circulation of library materials, etc. Hence, ICT services have greatly impacted on each sphere of academic library activity as well as giving an opportunity to provide value-added information services and access to a wide variety of digital-based information resources to its users (Ghuloum, 2012). Nowadays, information technology (IT) is widely used in different sectors; it is also extensively adopted in the field of library and information services to reduce costs, enhance operational efficiency, and most importantly to improve service quality and customer experience (Law, Leung, & Buhalis, 2009). One of the remarkable achievements of Information and Communication Technology in Libraries is the development of Information systems.

Information System

An Information System consists of five parts namely: people, procedures, software, hardware and data. Connectivity allows computers to connect and share information, thereby greatly expanding the capability and usefulness of an information system (O'Leary and O'Leary, 2005).

Over two decades ago in Nigeria, most people had little to do directly with computers. Even though they filled out computerized forms, took computerized tests, and paid computerized bills, the real work with computers was handled by specialists - programmers, data entry clerks, and computer operators. The advent of microcomputers has made it easy for nearly everyone to use a computer. It is now possible:

- for authors to write, artists to draw, engineers, and scientists to calculate and measure distance, length, and quantity through the use of computers. All these and more are done by students and businessmen.
- for a new learning system to develop. People who work odd hours or travel frequently may take courses on the web that do not need to fall within the usual time of a quarter or a semester.
- to have new ways to communicate, to find people with similar interest, and to buy goods. Everywhere in contemporary terms, we have all kinds of people using electronic mail (e-mail), electronic commerce (e-commerce), and the internet to meet and to share ideas and products.

How do individual, including you, use Information and Communication Technology (ICT)? Recently, many interesting and practical uses of ICT have surfaced and they really impacted positively on the lives of people. These developments have made personal lives richer and more interesting, and they include applications ranging from recording digital video clips to creating personalized websites.

It is pertinent to remind competent end users that an information system is made up of five parts, namely: people, procedure, software, hardware, and data. In addition, they need to have a clear understanding of connectivity, the wireless revolution, the internet, the web and the role played by Information and Communication Technology in their professional lives.

People

People are the essential part of Information System. It is easy to overlook people but they are obviously the essential part of the system. The sole aim of an information system is to make people or end-users more productive. That includes you. People are end-users; you can use the computer to make yourself more productive. Technology has made a positive impact on people. It is equally important to recognize its negative or potentially negative impact. To effectively implement information technology, it is worthwhile considering how to maximize its positive effects while minimizing its negative effects. The significant areas of concern include

- **Privacy:** Identifying the threats to personal privacy and how one could protect himself against such.
- **Security:** This concerns the control of access to sensitive information and how one can secure hardware and software.
- **Ergonomics:** This is about the issue of risks of technology, which may be physical like eye strain, backache, etc. ormental risks, which include noise and electronic monitoring.
- **Environment:** The ranging question is: What can individuals and organizations do to minimize the impact oftechnology on our environment?

Procedure

These are rules and guidelines to follow when using software, hardware, and data. They are written for computer operators. They are also documented in manuals written by computer professionals. For an information system to function correctly, it has to follow specified rules or guidelines.

Software

This is the invisible part of a computer system. This refers to all programmes that can be used on a particular system. It provides step-by-step instructions to control the computer or to convert data into information. Software can be categorized into Systems Software and Application Software.

Systems Software

Systems software controls the computer systems. It is a collective name for the programmes that contribute to the control and performance of the computer system. Systems software can be sub-divided into Operating Systems, Translators, and Utilities.

Operating Systems

These are major software required by all computers. No computer can function without them because the computer cannot understand your instructions. The operating system is a set of programmes designed to manage the resources efficiently of the computer system. It performs supervisory functions on input and output operations, communicates with the computer operator, and allocates the computer's resources which allow the operation of the computer to progress smoothly with minimum intervention (Eyitayo, Eyitayo and Akeju, 2008). The operating system contributes to the control and performance of the system. Notable examples are MS - DOS - Microsoft Desk Operating System: commonly known as DOS, is used with a single microcomputer.

NOVELL - is used in a network environment where many computers are linked together to share resources.

UNIX - is also used in a multi-user environment where a big computer is available to many people at the same time.
Window Operating System - this is used with a single microcomputer or in a network environment. It makes the use of the computer easier as you do not need to recall or remember any command. Its graphical interface enables the user to have fun while communicating with the computer.

Application Software

This includes general and special-purpose applications. The general-purpose is also referred to as basic applications that focus on specific disciplines and occupations. These include graphics, audio and video, multimedia, web authoring, and artificial intelligence programmes. Applications software is used with systems software to perform specific tasks given to the computer by the user (Eyitayo, Eyitayo and Akeju, 2008). Applications software can only work effectively if used in conjunction with the appropriate systems software.

Hardware

Hardware is the physical equipment in an information system. This consists of the typical equipment controlled by software, and it processes data to create information. These include keyboard, mouse, monitor, systems unit, and other devices. Information is referred to as data that has been processed in a way that makes it meaningful and useful to the person that receives it.

Data

Data are facts, events, activities, and transactions that are recorded. They are raw materials from which information is produced. In other words, data are unprocessed facts or raw facts and figures that are processed into information. Processing data creates information. Users need data to create useful information.

Data are facts or observations about people, places, things, and events. The physical view focuses on the actual format and location of data. The logical view focuses on the meaning and content of data.

Data was initially limited to numbers, letters, and symbols that the keyboards recorded but it is richer, and it includes:

- audio captured, interpreted, and saved using microphones and voice recognition.
- music captured from the Internet, from MIDI devices, and other sources.
- photographs captured by digital cameras, edited by image editing software, and shared with others over the Internet.
- video captured by digital video cameras, TV tuner cards, and Webcams. The four common file types are document files, worksheet files, database files, and presentation files. We shall discuss each of them.

Document files

Document files are created by word processors to save documents such as memos, term papers, letters, etc.

Worksheet files

Worksheet files are types of files created by electronic spreadsheet to analyze budgets and to predict sales, etc.

Database files

The database files are created by database management programmes to contain highly structured and organized data. A typical example is an employee database file that might contain all the workers' names, social security numbers, and other relevant information.

Presentation files

These types of files are created by presentation graphic programmes to save presentation materials. Such files contain audience handouts, speaker notes, and electronic slides.

SELF-ASSESSMENT EXERCISE

i. Name the components of the Information System
ii. What are the components of software

Connectivity

This is a concept related to using computer networks to link people and resources. It describes the ability of end-users to share information with other users. Through connectivity, computer networks make it possible for computers to be connected to share data and resources. For example, a microcomputer can be connected by telephone or other telecommunications links to other computers and information sources

almost anywhere. This type of connection can link you to the world larger than computers and the Internet.

The Wireless Revolution

There is a dramatic change in connectivity and communications through the widespread use of mobile or wireless telephones. Students, teachers, parents talks and communicate with these devices. The wireless technology allows individuals to stay connected with one another from almost anywhere at any time.

The digital convergence, that is, the merger of computer and communications, is a revolution because wireless technology was originally intended for voice communication, but it is now widely used to support all kinds of communication, especially computer communication. One can share a high-speed printer, share data files, and collaborate on working documents with a nearby co-worker without being connected by cables or telephones. There are some wireless technology that allows individuals to connect to the Internet and share information almost anywhere in the world.

3.2 Development of Information and Communication Technology (ICT)

Technology evolved through different ages. The Stone Age was the beginning of the development of technology. Man was able to get fire (light) through the spark of stones that provided light, and he no longer ate his food raw. He used fire to preserve his meat. The Stone Age evolved into the Iron Age, which saw the emergence of fabrication of farm implements and weapons of war like hoes, cutlass, arrows, spears, sword, etc. The Middle Age was the age when writing was developed, and people used feathers as pen. The Industrial Age was the next age to the Middle Age. The Industrial Age witnessed the fabrication of machines for manufacturing and weapons of war. As a result of development in technology, there is the introduction or the emergence of the Electronic Age. This age involves the use of computers and the internet. As a result of this development, there is the desire to know more and to get information acquired or to be broken into units as a result of the rate at which individual is bombarded with various information.

We are in the Information Age when so much information is available all the time. This is having untold effects on the human being. One of the results is *information overload.* Williams and Sawyer (2005) reported that the International Data Corporation (IDC) made a forecast

that by the year 2005, more than 36 billion person-to-person e-mails would be sent daily. Already, according to Williams and Sawyer (2005), the average business user reportedly spends more than 2 hours daily dealing with e-mails. They stressed further that people would use the brain less for memorizing because familiar phone numbers are being stored on speed- dial cell phones, pocket computers, and electronic databases are increasing our dependence on the computer. There is an upsurge in 'multitasking' activity: people are now highly skilled, and they can perform several tasks at once, such as doing homework while talking on the phone, watching television, answering e-mail, and surfing the world-wide-web. Group of people can do things together in business, politics, journalism, etc. without knowing each other through the use of smart mobile devices. These trends pose a challenge to how one learns and manages information. This is the importance of Information and Communication Technology. In essence, ICT enables you to learn through the harnessing of the benefits of developments in technology that transcend space and time.

The general purpose of information is to present accurate and clearly an event that is new to the hearer or listener to enhance his knowledge or understanding. This message is passed across in a manner that will change or structure the attitude or action of the audience. In other words, there is a combination of two major activities (information and communication), which produces a new trend.

Information and communication are linked to the senses; hence all the materials used to convey messages are broadly categorized into audio (materials that appeal to the sense of sound), visual (materials that appeal to sight), and audiovisual (materials that combine sight and sound). These trends dictate the types of materials that are being developed to convey information and communication. Technology evolved through the Stone Age, Iron Age, Middle Age, Industrial Age, and the Electronic Age. The Electronic Age witnessed the use of computer, and this age has undergone a lot of transformation. This is the age that evolves into the Information Age. The computer is the main tool that is used to manipulate events in this age.

Today, almost every job or profession requires computer skills. Some are ordinary jobs where computers are used as ordinary tools, while some are specialized jobs that require advanced computer training for professional careers. Information and Communication Technology (ICT) has made the use of computer in all facet of endeavour inevitable. For instance:

- In hotel Business, the clerk needs a computer to deal with reservation problems; guests who have online problems need someone to attend to them.

- Law enforcement officers need knowledge of computer to check out stolen cars, criminal records, etc. Equally, knowledge of computers will help solve fraud, accounting illegalities, etc.
- Computers are used in entertainment. They are useful and are used for budgets, payroll, and ticketing. Computers are also used for creating cinematic special effects.
- In public presentations, computers are used for the presentation of lectures, special features, etc.

Information and Communication Technology is clearly changing old jobs and inventing new ones. To enhance this trend, practitioners need to combine traditional education with training in computers and communication.

3.3 Information and Communication Technology in Pre-Electronic and Electronic Era

The development of Information Technology (IT) spanned a number of centuries. A summary of this development is presented below.

- **4000-1200 BCE**
  Inhabitants of the first known civilization in Sumer kept records of commercial transactions on clay tablets.
- **3000 BCE**
  Abacus was invented in Babylon
- **1621 CE**
  The slide rule was invented by Edmund Gunter.
- **1642**
  First mechanical adding machine was invented by Blaise Pascal.
- **1666**
  The first mechanical calculator that can add and subtract was invented by Samuel Morland. EDT 811
- **1801**
  A linked sequence of punched cards controls the weaving patterns in Jacquard's loom.
- **1820** The first man-produced calculator, the Thomas Arithometer.
- **1829**
- **1833**
- **1843**
- **1844**
- **1854**

George Boole published "An Investigation on the Laws of Thought," a system for symbolic and logical reasoning that will become the basis for computer design.

- **1876**

- **1890**

- **1895**

- **1907**

- **1920-1921**

The word "robot," derived bro the Czech word for compulsory labour, is used to mean humanlike machine.

- **1924**

T. J. Watson renames Hollerith's machine company founded in 1896, to International Business Machine (IBM).

- **1927**

- **1930**

- **1944**

First electro-mechanical computer (Mark I)

- **1945**

John von Newman introduces the concept of a stored programme.

- **1946**

First programmable electronic computer in the United States (ENIAC)

- **1952**

- **1964**

- **1967**

- **1969**

- **1970**

- **1971**

- **1975**

- **1976**

- **1978**

$5^1/_4$" floppy disk; Atari home videogame.

- **1981**

IBM introduces personal computer.

- **1982**

- **1984**
- **1993**
- **1994**

Apple and IBM introduced PCs with full-motion video built-in; wireless data transmission for small portable computers; first web browser invented.

(Culled from Williams B. K. and Sawyer, S. C. (2005). Using Information Technology: A Practical Introduction to
Computer and Communications. Boston: McGraw Hill. Pp 22-27).

The timeline above gives us the development in Information and Communication Technology (ICT)from localized technology to global technology. From the above trends and development, it obvious to note that, ICT is the integration of information processing, computing and communication technologies. ICT is changing the way we learn, work and live in society and are often spoken of in a particular context, such as in education, health care, or libraries. A good way to think about ICT is to consider all the uses of digital technology that already exist to help individuals, businesses and organizations use information. ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form and is concerned with these products. Importantly, it is also concerned with the way these different uses can work with each other—for example, personal computers, digital television, email, robots.

A look at what we use at home, in the office, in school, or at any business or social function finds many devices equipped with computer chips. They include access cards, mobile phones, point of sales scanner, medical instruments, TV remote controls, microwaves ovens, DVD players, digital cameras, PDAs, etc.

IT defines as Information Technology, which consists of study, design, advance development, accomplishment, support, or administration of computer foundation information system, mostly software application and computer hardware. Information technology works with the use of electronic computers and computer software to renovate, defend, development, and broadcast and other information. Information technology has overstuffed to cover many features of computing and technology, and this word is more familiar than ever before. Information technology subjects can be quite large, encompassing many fields. IT professionals perform different types of responsibilities that range from installing applications to designing complex computer networks.

IT professional's responsibilities are data management, networking, database, software design, computer hardware, management and administration of the whole system. IT (Information Technology) is a combined word of computer and communications or "InfoTech". Information Technology illustrates any technology which helps to manufacture, manipulate, accumulate, communicate, or broadcast information. Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communications Technology).

The term "information technology" evolved in the 1970s. Its basic concept, however, can be traced to the World War II alliance of the military and industry in the development of electronics, computers, and information theory. After the 1940s, the military remained the major source of research and development funding for the expansion of automation to replace manpower with machine power. Since the 1950s, four generations of computers have evolved. Each generation reflected a change to the hardware of decreased size but increased capabilities to control computer operations. The first generation used vacuum tubes, the second used transistors, the third used integrated circuits, and the fourth used integrated circuits on a single computer chip. Advances in artificial intelligence that will minimize the need for complex programming characterize the fifth generation of computers, still in the experimental stage.

The first commercial computer was the UNIVAC I, developed by John Eckert and John W. Mauchly in 1951. It was used by the Census Bureau to predict the outcome of the 1952 presidential election. For the next twenty-five years, mainframe computers were used in large corporations to do calculations and manipulate large amounts of information stored in databases. Supercomputers were used in science and engineering, for designing aircraft and nuclear reactors, and for predicting worldwide weather patterns.

Minicomputers came on to the scene in the early 1980s in small businesses, manufacturing plants, and factories.

In 1975, the Massachusetts Institute of Technology developed microcomputers. In 1976, Tandy Corporation's first Radio Shack microcomputer followed; the Apple microcomputer was introduced in 1977. The market for microcomputers increased dramatically when IBM introduced the first personal computer in the fall of 1981. Because of dramatic improvements in computer components and manufacturing, personal computers today do more than the largest computers of the mid-1960s at about a thousandth of the cost.

Computers today are divided into four categories by size, cost, and processing ability. They are supercomputer, mainframe, minicomputer, and microcomputer, more commonly known as a personal computer. Personal computer categories include desktop, network, laptop, and handheld.

Types of Computer

A computer is a programmable, multiuse machine that accepts data - raw facts and figures- and processes, or manipulates its information we can use. It is an all-purpose machine. From the alarm clock to the TV remote control, your handheldcalculator, your mobile telephone, the traffic light, your portable CD players are all examples of computers.

Computer comes in various sizes, and it can be put to any number of uses. In the 1950s and 1960s, computers were enormous machines affordable only by institutions. Today, they come in a variety of shapes and sizes that can be classified according to their processing power.

Supercomputers

These are high-capacity machines with thousands of possessors that can perform more than several trillion calculations per second. They are the most expensive but the fastest computers available. They are special high-capacity computers used by very large organizations. For example, NASA uses supercomputers to track and control space exploration.

Mainframe Computers

They are the only type of computer available until the late 1960s. They vary in sizes from small, to medium, to large, depending on their use. Small mainframes are often called *midsize computers.* They used to be called *minicomputers.* The term is seldom used today. They are used by large organizations such as banks, airlines, insurance companies, etc, for processing millions of transactions. Users access mainframe computers by means of a *terminal.* This has a display screen and a keyboard and can input and output data but cannot by itself process data. Mainframes process billions of instruct per second.

Mainframe computers occupy specially wired, air-conditioned rooms. They are not as powerful as supercomputers, but they are capable of great processing speeds and data storage.

Workstations

This was introduced in the early 1980s. Workstations are expensive, powerful personal computers usually used for complex scientific, mathematical, and engineering calculations and for computer-aided design (CAD) and computer manufacturing. They are comparable to midsize mainframes in capacity. They are used to design airplane fuselages, drug prescription, and movie special effects. The graphic capabilities endeared them to movie makers.

Microcomputers

They are also called personal computers (PCs). They can fit next to a desktop or on a desktop or can be carried around. They can stand alone or be connected to a computer network, such as a local area network (LAN). A local area network (LAN) connects, usually by a special cable, a group of desktop PCs and other devices, such as printers, in an office or a building.

There are several types of microcomputers: desktop PCs, tower PCs, notebooks (laptops), and personal digital assistants - handheld computers or palmtops.

Desktops PCs are microcomputers whose case or main housing sits on a desk, with a keyboard in front and monitor often ontop.

Tower PCs are microcomputers whose case sits as a "tower," often on the floor beside a desk, thus freeing up desk surfacespace.

Notebook Computers *(laptop computers)*are lightweight computers with built-in monitor, keyboard, hard-disk drive batteryand AC adapter that can be plugged into an electric outlet, and they weigh between 1.8 to 9 pounds.

Personal Digital Assistants (PDAs),*also called handheld computers or palmtops,*combine personal organization tools -schedule planners, address books, etc. - with ability, in some cases, to send e-mails and faxes. Some PDA, are touch-sensitivee while some are capable of being connected to desktop computers for sending and receiving information.

Microcontrollers

They are also called embedded computers. They are tiny, specialized microprocessors installed in "smart" appliances and automobiles. They are used for blood pressure monitors, airbag sensors for water and air, and vibration sensors.

Basics Operation of Computer

It is pertinent that you know how computers work. You are not going to be asked to build a computer for yourself or go into the nitty-gritty of computer operation but it is important that you know the basic operation of a computer to enable you apply it in the teaching-learning situation and other related applications. You have already learned that computer aids learning.

There are three basic key concepts about how a computer works.

Computer Processes Data into Information

Data are raw facts and figures processed into information, e.g., the number of candidates offered admission. *Information* isdata that has been summarized or manipulated for use in decision-making, e.g., the total number of students for each department required to determine financial allocation for the departments in the faculty.

Difference between Hardware and Software

The hardware consists of machines and equipment in a computer system. These include the keyboard, the monitor, the printer andthe 'box' - the computer or the processing device. Without software, the hardware is of no use.

Software or *programmes,* consists of all electronic instructions that tell the computer how to perform a task. Theseinstructions are from software developers that come in the form of a package (such as compact disk) that will be accepted by the computer, e.g., Microsoft windows and office XP.

All Computers Follow Four Basic Operations

Regardless of type and size, all computers follow the same basic operations. These are (1) Input, (2) Processing, (3) Storage and (4) Output and recent addition of (5) Communication.

Input Operation

Input is whatever that is put into a computer system. It is a kind of data - letter, shapes, colour, symbols, sounds, or whatever raw material needs processing. Words or numbers typed on a keyboard are considered as data. The results of students typed on the computer are data.

Processing Operation

Processing is the manipulation that a computer does to transform data into information. For example, when a computer adds 3

+ 5 to get 8 is an act of processing. When a teacher wants to know if male students perform better than female students in a course and he uses the computer to add and compare their scores, this is an act of processing. The processing is done by the central processing unit - frequently called the CPU and also called Systems Unit - a device consisting of electronic circuitry that executes instructions to process data.

Storage Operation

There are two types - temporary and permanent storage. They are equally called primary and secondary storage. *PrimaryStorage*, or *memory*, is the internal circuitry that temporarily holds data waiting to be processed. *Secondary storage* refers tothe devices and media that store data or information permanently. Examples are disk (diskette), Compact Disk (CD), flash drive, etc. Storage also holds the software - computer programmes.

Output Operation

Output is whatever is output from ("put out of") the computer system - the results of processing, usually information, e.g., number of pictures displayed on a screen, words printed on a paper in a printer, sound of music from the loudspeakers, etc.

Communication Operation

Today, most computers have communication abilities, which offers extension ability. In other words, communication extends the power of the computer. With wired or wireless communications connections, data may be input from afar, processed in a remote area, stored in several different locations, and output in other places.

The knowledge of these basic concepts is very vital to computer application in learning. It will enable researchers and teachers to gather relevant materials, process them, store them, and retrieve them for further processing.

SELF- ASSESSMENT EXERCISES

i. List the three basic key concepts that describe how the computer works.
ii. List the basic operations of a computer.

4.0 CONCLUSION

In this unit, we traced the development of Information Technology and the computer, which is the driving force. We also examined the link between information technology and communication, which gave rise to the preference of Information and Communication Technology (ICT) instead of Information Technology (IT).

The various stages of development in computers gave rise to miniaturization and portability of computers which make it easier for their adaptability and application in teaching-learning process.

5.0 SUMMARY

In this unit, you have learned about

i. Development of Information and communication technology.
ii. Information and communication Technology in Pre-Electronic and Electronic Era.

In the next unit, we shall examine the use computers.

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UNIT 3 TYPES AND COMPONENTS OF INFORMATION AND COMMUNICATION TECHNOLOGY

CONTENTS

1.0 INTRODUCTION

This Unit will intimate you with the types and components of Information and Communication Technology (ICT). This course does not intend to make you an ICT expert rather help you explore the potentials of ICT and give you a working knowledge of personal computers and some of the common software. It is also meant to encourage you on how you would experiment with ICT. Before you continue, let us look at the objectives.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- clarify the different components/types of ICT.
- explain their relevance in library operations.

3.0 MAIN CONTENT

3.1 Components/Types of Information and Communication Technology

When computer and communications technologies are combined, the result is Information Technology or "InfoTech". (Williams and Sawyer, 2005). Information Technology (IT) is a term used to describe any technology that helps to produce, manipulate, solve, communicate, and/or disseminate information. Information Technology merges with high-speed communications links carrying data, sound, and video.

Typical examples are personal computers, telephones, televisions, appliances, and various handheld devices. The two important parts of Information Technology are *computers* and *communications.*

A computer is a programmable, multiuse machine that accepts data - raw facts and figures- and processes, or manipulates it into information we can use, *for example, summaries, reports, etc. The sole purpose is to speed up problem-solving andincrease productivity. Communications technology or telecommunication technology consists of electromagnetic devices and systems for communicating over long distances.* Typical examples are telephone, radio, broadcast television, cableTV and, most recently, communication among computers - which happens when people "go online" on the Internet. The role of communication technology in Information Technology necessitates the use of the term 'Information and Communication Technology' (ICT), which is preferred to Information Technology (IT).

Videoconferencing

This is a video output in which people in different geographical locations can have a meeting. They can see and hear one another, using computers and communications. This ranges from videophones to group conference rooms with cameras and multimedia equipment to desktop systems with some video cameras, microphones, and speakers.

Audio Conferencing

This is a way of holding a meeting or a discussion in which people are connected to phones. Here people share audio information only. There is no face-to-face interaction. It is only the sounds that are connected. A teacher can have an audio-conference with students no matter where they are located, as long as they are connected.

The Internet

This is the heart of the Information Age. It is called "the mother of all networks." It is a large computer network available to everyone with a microcomputer and a means to connect it. It is a worldwide computer network that connects hundreds of thousands of smaller networks. The network is made up of wires, cables, and satellites. Internet networks link educational, commercial, non-governmental agencies, military as well as individuals.

World-Wide-Web (www)

This is the multimedia aspect of the internet. It is often called the 'web'. It is the media inter-connected system of internet computers (called servers) that support specially formatted documents in multimedia form.

Multimedia

The word is from 'multiple media, ' meaning technology, which presents information in more than one medium such as text, still images, moving images, and sound. It is the sequential or simultaneous use of a variety of media formats in a given presentation or self-studied programme.

3.2 Local Area Network (LAN)

This is a network that allows all the personal computers under the same roof to share the same peripherals. It connects, usually by cables, a group of desktop PCs and other devices, such as printers, in an office or a building. It could also be the networking of home appliances, linking stereos, lights, heating systems, phones, etc.

Radio

The radio is system of sending and receiving spoken messages by using electronic signals. It is common with pilots and security personnel. It is also used in the educational system. It is a system of broadcasting information and programmes that people listen to. It is equally used for instructional purposes in the classroom.

Television

Television is the system of broadcasting pictures and sounds by electronic signals. It appeals to the senses of sight and sound. It is an audiovisual material, and it can be used for both entertaining and instruction.

Teleconferencing

This is the use of television video and sound technology as well as computer networks (including the internet) to enable people in different locations to see, hear, and talk with one another.

Mobile Devices

'Mobile' is formed from the word 'mobility' meaning the tendency to move between places, ability to travel from one place to another. Mobile devices can be described as learning devices that are not hindered by space and time. Mobile devices are portable, easily connected, active, and can be used at any location.

Information and Communication Technology (ICT) has turned the world into a global village. To move with the pace of development, learning devices also have to be universally connected and mobile. Thus we have

devices like 'mobile phones' which could be used for both learning and communication.

Asynchronous Transmission

This method is used with most computers. It is also called start-stop transmission. Data is sent in 1 byte (or character) at a time in asynchronous transmission. Each string of bits that make up the byte is bracketed, or marked-off, with special control bits. A 'start' bit represents the beginning of a character, and a 'stop' bit represents its end. The transmission of only 1 byte at a time makes the method a relatively slow one. As a result, this transmission method is not used whenever a great amount of data is involved. The only advantage it has is that data could be transmitted whenever it is convenient for the sender.

Synchronous Transmission

This mode sends data in blocks instead of the start and stops bits; rather, it uses the start and stop bit pattern called *synch bytes*, which are transmitted at the beginning and end of the blocks. These start and end bit patterns synchronize internal clocks in the sending and receiving devices so that they are in tune with each other. This is rarely used with microcomputers because it is more complicated and more expensive than asynchronous transmission. It equally requires careful timing between sending and receiving equipment. It is appropriate for computer systems that need to transmit great qualities of data quickly. Other terms/concepts that you will come across in this course that are not discussed among the concepts will be explained as you go along.

Micrographic & reprographic technology: These technologies are still widely used technology in libraries globally.Most of the research libraries have reprographic machines and provide photocopies of any document on demand. Microform is a generic term for all information carriers which use microfilm or similar optical media (including study) for the high-density recording and storage of optically encoded information in the form of microimages of the printed document, bit patterns or holograms.

Networking Technology: The important function of network is to interconnect computers and othercommunication devices so that data can be transferred from one location to another instantly. Networks allow many users materials held by a library or group of libraries. It is a computerized library catalogue available to the public. Most OPACs are accessible over the Internet to users all over the world.

Library management software package: Software consists of the step-by-step instructions that tell the computerwhat to do. In a University Library, the most common computer software used are library

automation software, database management software, antivirus software, and application software. Many software packages for various applications in the field of library & information services and management are CDS/ISIS, SOUL, LIBSYS, KOHA, etc. used for automation purposes. LIBRARY RETRIEVAL SYSTEMS: This involves using Compact Disc Read-Only Memory (CDROM) technological mechanism of acquisition of specialized CD-ROM databases in various courses such as sciences, law, technology, agriculture, social sciences, medicine, humanities, etc. They are available commercially.

Bar-coding technology: A barcode reader (or barcode scanner) is an electronic device for reading printed barcodes.
Using barcode equipment for circulation and stock verification is becoming more common, efficient, and time saver.

Fax (facsimile transmission/Telefax): It is used in some academic libraries for document delivery and otherscholarly communications. It is a method of converting an image into electronic signals that can be transmitted over a communication link and converted back into an image at the receiving end.

Open Source Software (OSS): Open Source Software or the OSS is freely available computer software, which allows altering the source code and customizing the software to anyone & for any purpose. In the last few years, we have seen the development of a number of ILS products in the open-source world such as Integrated Library Systems (ILSs) like Koha;Digital library software, like Greenstone; Digital Repository Software, like DSpace; Content Management Software, like Moodle, etc.

Printing Technology: A printer is a device that converts computer output into printed images. There are a number of different kinds of printers used in the library such as Dot Matrix Printers, Laser printer, Inkjet, Bubble-Jet, etc.

Web Technology: The World Wide Web was developed in 1989 by Tim Berner Lee, and by 1995 web has expanded to global proportions. The World Wide Web (WWW) is a client server-based, distributed hypertext, and multimedia information system on the Internet

Storage Technology: Optical disc storage technology is the most recent computer technology to enter the library community. CD ROM developed in 1985 has the ability to represent various media such as text, graphics and animation, video clips, and sound files into a digital environment. Digital video disk or versatile digital disk (DVD) is the next generation of CD. The main feature of DVD is the compression

technology and storing data on multi-layer sides, stores 17 GB data is currently the only credible, true multimedia format.

RFID Technology: RFID (Radio Frequency Identification) is the latest technology being used in modern libraries to prevent theft of the library materials. Radio frequency identification is a term used for technologies utilizing radio waves for identifying individual items automatically. It is the fastest, easiest, most efficient way to track, locate & manage library materials and being used in the libraries for automatic check-in and check-out circulation process and also in stock management. It is an emerging, more effective, convenient, and cost-efficient technology in library automation and security. RFID is used very similar to bar codes. Developments in RFID technology continue to yield larger memory capacities, wider reading ranges, and faster processing.

4.0 CONCLUSION

In this unit, some terms/concepts relating to Information and Communication Technology (ICT) and their clarification will enable you to have a deep understanding of what ICT stands for. Some are general and some are associated with computers and telecommunications.

5.0 SUMMARY

In this unit, you have:

i. learned more terms/concepts in ICT
ii. learned the meaning or clarification of these terms/concepts.
iii. learned some general terms/concepts in ICT
iv. explained and clarified these terms/concepts as they relate to the library.

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UNIT 4 INFORMATION AND COMMUNICATION TECHNOLOGY AND LIBRARIES

CONTENTS

1.0 INTRODUCTION

This Unit will intimate you with the significance and importance of Information and Communication Technology (ICT) to libraries. This unit does not intend to make you an ICT expert rather to help you explore the potentials of ICT and give you a working knowledge of what ICT can do to facilitate the information service provision in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you will be able to:

- discuss the significance of ICT to libraries
- state the importance of ICT to libraries
- mention the advantages and disadvantages of ICT application to libraries.

3.0 MAIN CONTENT

3.1 Significance and Importance of Information and Communication Technology to Libraries

The application of ICT has drastically transformed the way of collection, storage, and retrieval of information in libraries. Particularly, the internet has completely transformed the traditional libraries into digital libraries. Using the internet, information may be accessed from

anywhere in the universe. The arrival and proliferation of electronic resources and digital libraries have already influenced the way users use print resources and traditional libraries. It has also sparked a new wave of literature on the perception and preference of print and electronic resources (Ziming Liu, 2006). The digital age has a tremendous change in the way of information is stored and accessed. “Many new terms viz., “digital libraries”; “libraries without walls”; “virtual libraries” are emerging to describe the libraries of present-day age. A digital library is popularly viewed as an electronic version of library where storage is in digital form, allowing direct communication to obtain material and copyright it from a master version (Burns, 1984).

As the world is growing technologically, library operations in various locations in the world are no longer how they use to be. Libraries in India since the beginning of the 21st century have started making efforts to metamorphose from being institutions driven by manual processes into modern ones where operations are in part or wholly dependent on ICT applications. The versatility of ICT driven library operations that would adequately and efficiently meet the information needs of patrons has been widely acknowledged in extant literature to the extent that most academic libraries in India are positively inclined towards computerizing their operations. Although none of the academic libraries in the country has completely been automated or computerized, many are at varied and deferring stages of adaptation in having their operations ICT driven or ICT dependent. Academic libraries are libraries that are attached to post-secondary institutions and they are as varied and distinctive as the institutions they are established to serve providing information services to faculty members, students, researchers and other scholarly inclined persons. Academic libraries can be categorized into university libraries and non-university libraries (Aina, 2004). Universities libraries are the best developed type of academic libraries in India; they are better funded compared with other types of libraries, they provide the type of information services that could be found elsewhere in the world.

Academic libraries in India make use of ICT as tools to meet the information need of users who in this contextare students and faculty staff. Academic libraries are established to support the objectives of their parent institutions which are to promote teaching, learning and research. Therefore, academic libraries are expected to serve the students, lecturers and other members of the academic community. To meet the information need of users, academic libraries provide various services such as user education (orientation/instruction services), inter-library loan/connection services, abstracting and indexing services, referral services and circulation services. Other services provided include library book loan, reference services, photocopying, online

services, compilation of reading list and bibliographies, e-mail, internet connectivity, CD-Researching and publishing(Ifidon, 2006). ICT in libraries has changed the mode of information storage and retrieval, acquisition, cataloguing and classification, circulation of materials, serials control, management statistics and administrative activities such as budgeting. This achieved the provision of more efficient information services to the users and the overall improvement in the performance of the libraries and other related information institution (Chisenga, 1999). Librarians, therefore, are encouraged to soil themselves with the challenges of grabbing this opportunity of learning the new skills to use the multimedia in information packaging, repackaging and delivery for optimal service delivery in the 21st century.

ICT has impacted on every sphere of academic library activity especially in the form of the library collection development strategies, library building and consortia. ICT presents an opportunity to provide value-added information services and access to a wide variety of digital based information resources to their clients. Furthermore, academic libraries are also using modern ICTs to automate their core functions, implement efficient and effective library cooperation and resource sharing networks, implement management information systems, develop institutional repositories of digital local contents, and digital libraries: and initiate ICT based capacity building programs for library users.

Information and Communication Technology (ICT) has brought unprecedented changes and transformation to academic library and information services, conventional library and information services such as OPAC, users' services, reference services, bibliographic services, current awareness services, Document delivery, interlibrary loan, audio visual services and customer relations can be provided more efficiently and effectively using ICT, as they offer convenient time, place, cost effectiveness, faster and most-up-to-date dissemination and end users involvement in the library and information services process. The impact of ICT characterized on information services by changes in format, contents and method of production and contents and method of production and delivery of information products. Emergence of internet as the largest repository of information and knowledge, changed role of library and information science professionals from intermediary to facilitator, new tools for dissemination of information and shift from physical to virtual services environment and extinction of some conventional information services and emergence of new and innovation web based.

Now-a-days, collection of library is not confined to physical boundaries that require the user to visit the library. Printed collections have become more expensive and not easily accessible to the users due to lack of time. The technological encroachments have led to tremendous changes in the process of information. In IT era, no library can encounter the

requirements of users with printed sources of information. Today people use the information as a primary source of information. The internet can be used for efficient retrieval and meeting information needs. ICT based resources are now considered as being of great importance to all types of libraries and they are reducing a large share of library budgets. They are used in abundance. These resources have solved the problem of space.

Academic libraries play significant role in supporting research in all subjects. Ahmad and Fatima stated that availability of online resources have changed the way the services academic libraries now provide to their users. It has changed the traditional practices of libraries in delivery of information to the users. Now users can have access to a variety of information and scholarly journals online.

Information resources available in libraries are limited, but those available through the web are enormous. Today the library's e-resources include e-journals, e-books, e-reference works, scholarly database, e-conference proceedings, e-thesis/dissertations etc. Among these e-journals as well as aggregated e-journal databases from the major chunk of digital collections in libraries and they are growing at a phenomenal rate. "E journals are the electronic equivalents of their print counterparts and they possess numerous additional features. E-journals are often referred to interchangeably as electronic serials, online journals and electronic periodicals." (Sreekumar, 2010). No single library can afford to procure all journals of a single discipline. Scientific and scholarly journals are being published in many media: CD-ROM, floppy disk, internet. CD-ROM and internet are used for dissemination of e-journal. CD-ROM can be handled just like the conventional form. Many journals are available free of cost over internet. Publishers are using internet as medium to publish. Many e -journal publishers are publishing e-journals and providing it to users through their websites, e.g., Elsevier, American Chemical Society, H.W. Wilson, Academic Press, Springer, Oxford University Press and others. Many of open access journals are online, free of cost, and free from copyrights and restrictions.

The application of information technology in library and Information centers has developed in the western countries since the 1940's. In the 1960's the use of information technology has been started in the developing countries and that too is in different stages. The rapid development of Information and communication technology has made a special impact on the method of information acquisition, Processing, Storing & dissemination of information. The invention of the Internet has brought a major change in the scenario of library and information services. Due to this impact of information technology, it has created challenges and opportunities for the information professional around the world.

The importance of Information and communication Technology is very huge for the library and information work. Libraries have undergone rapid transformation upon the introduction of new technologies from the old conventional method which is shown in the form of table 1.

Table1: Development in Information activities (Kumar, 2003)

Sl. No	**Information activity**	**Conventional method**	**New Technology**
1.	Generate, originate	Writing, Typing	
2.	Preserve, store	Manuscript, Paper print media	
3.	Process	Classification, Cataloguing, Indexing	
4.	Retrieval	Catalogues, Indexes	
5.	Disseminate/ communicate	List, Bibliographies, Abstracts, Hard copies	
6.	Destroy	Physical weeding	
			Word processing, Text editing, Character recognition, voice recognition.
			Electronic publishing, magnetic storage, Videotext, Tele-text, Computer disk, Rom
			Electronic data processing, Artificial intelligence, Expert system
			Database management system ,Information retrieval off-line, On-line.
			Electronic mail, Electronic document delivery, Computer conferencing, Telefacsimile, View data
			Magnetic eraser, Optical erasers, Reuse the medium

Kumar (2003) has rightly identified the issues in regards to IT used in the libraries. He has underlined the different information activities by some conventional methods and adoption of new technology.

3.2 Advantages of ICT in Libraries

There are many advantages of ICT application in libraries. Some important points are cited below:

- Easy to collect different library resources
- Collaboration & creation of Library network
- Avoids time-consuming effort done by the librarian
- Increases the range of services offered
- Less time consuming
- Efficiency can be increased
- Easy & speedy access to information
- Improves the quality of library service
- Increase in the knowledge & experience
- Integration within the organization
- Improvement in the status of libraries
- Improvement in the communication facilities
- Remote access by users
- 24x 7 service can be offered
- Access to unlimited information from different sources
- More up to date information
- The flexibility of Information to the users
- Workload reduce of library staff
- Combining data from different sources

3.3 Disadvantages of ICT in Libraries

Though this can be ignored, a few points can be raised as disadvantages factors on the use of IT in the libraries. They are:

- Lack of trained Library and Information Science professionals to handle IT devices;
- Establishment cost;
- Other recurring expenditure;
- Lack of infrastructure and above all;
- Rapid growth and development of IT devices and their implementation in the automated environment.

4.0 CONCLUSION

In this unit, the significance and importance of Information and Communication Technology to Libraries was discussed.

5.0 SUMMARY

In this unit, you have:

i. learned the advantages of ICT in Libraries
ii. learned the disadvantages of ICT in Libraries.

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MODULE 2 ICT APPLICATION IN LIBRARY ROUTINE ACTIVITIES AND SERVICES

The library is a unique environment, where information is sourced for and feedbacks are gotten. If you had visited any library before, you would notice the librarians are sectioned in different unit. Depending on the purpose of your visit to the library, you would be referred to a particular unit where you would be attended to. In the library, we have the serials section, circulation section, reference services, current awareness, archives section to mention but are few. For these sections in the library to function properly and be able to give adequate response to your query they need the application of information and communication technology (ICT). This module will introduce you to the ICT application in library routine activities and services.

Unit 1 ICT application to Technical Services
Unit 2 ICT application to Readers Services
Unit 3 ICT application to Library Resources and Services
Unit 4 ICT skills for Information Professionals

UNIT 1 ICT APPLICATION TO TECHNICAL SERVICES

CONTENTS

1.0 INTRODUCTION

This Unit will intimate you with the awareness of the ICT application to technical services in libraries. This unit does not intend to make you an ICT expert rather to help you explore the potentials of ICT and give you a working knowledge of what ICT can do to facilitate the technical services in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to understand:

- The application of ICT to technical services.
- The relevance of ICT to technical services
- The advantages and disadvantages of ICT application to technical services

3.0 MAIN CONTENT

3.1 ICT Application to Technical Services

Information and Communications Technology (ICT) have transformed Library and Information Services globally. The Internet has provided universal access to information. Technological innovation has dramatically increased the rate of conversion of knowledge, information and data into electronic format. Developments in the software arena has generated powerful knowledge management software which has transformed the way knowledge is organized, stored, accessed and retrieved (Tam & Robertson, 2002:2). Libraries have always been repositories of learning resources. From earliest time, they have provided access to information for scholars and researchers. The constantly increasing amount of information been generated and published, the expanding formats of information storage and retrieval, and ever changing education and research needs of library users make it difficult for any library to be an effective learning resources.

The primary role of the library is to provide information service to support the educational, recreation, cultural, economic and technological endeavours of members in their respective communities. The National Policy on Education (2004) identified the library as one of the most important aspect of educational support services, although not visible, technical services is considered the central department to the library, its operations and services are so crucial that it is safe to say that a library without technical services department is dead. Technical services department activities require not only special training to accomplish but also a good understanding is needed to use most of its services. Each of the functions of the technical services department plays a major role in the effective and smooth running of the library, this call for taking to cognizance the difference between library routines and technical services.

Technical services in libraries have been identified as “service involving the operations and techniques for acquiring, recording and preserving materials (Tauber, 1954). Tauber goes on to define “service” as all the work connected with some activity such as acquisitions.

Technical services are those services that provide access to information existing in some published form (Horny, 1980). She divided access into two components:

a. Physical: This is created through the process of acquiring, organizing and labelling information packages.

b. Bibliographic Access: This requires the creation of the descriptive and subject tags that allow the eventual users to select the information package needed.

According to (J. Barkett, S. Ritchie & A. Standley, 1978), technical services in the library include:

- Acquisition of library resources
- Cataloguing and Classification
- Serials
- Preservation of materials
- Authority Control:
- Bibliographic Control

Rana (2009) opines that ICT holds the key to the success of modernizing information services. Applications of ICT are numerous but mainly it is used in converting the existing paper-print records in the entire process of storage, retrieval and dissemination. UNESCO defines Information Technology as "The scientific, technological and engineering disciplines and the managerial techniques used in information handling and processing; their applications; computers and their interaction with men and machines and associated social, economic and cultural matters" (Peltu,1982)1. In short ICT on LIS means as the application of computers and communication technologies to the acquisition, organization, storage, retrieval and dissemination of information process. Convergence of computer and communication technologies and their subsequent application to library and information activities has changed the philosophy of information from unitary to universal access. Cockrane (1992) identified the following reasons for the introduction of ICT in libraries:

i The failure of the existing traditional methods to cope effectively with ever increasing volume in the library.
ii To allow for easy integration of various activities in the library.
iii Increase in library activities that are organization and services.

Concept of Technical Services

Technical services can be considered as one of the oldest aspects of librarianship. Services involving the operations and techniques for acquiring, recording and preserving materials are among the oldest aspects of librarianship (Tauber, 1954). The term “technical services” is comparatively recent in origin as (Turtle, 1976) traces the history of technical services in academic and research libraries from 1876 to 1976. The concept of technical services including acquisition and processing functions was first proposed in published form in paper by (Coney, 1939) at the University of Chicago. Major technical services functions given by (J. Barkett, S. Ritchie & A. Standley, 1978) include:

Acquisition of library resources: The technical service offered in the library begins with acquisition of library resourcesi.e. acquisition is the starting point for technical services. “Stock” in this context includes all kinds of resources both print and non-print used for satisfaction of information needs. Stock acquisition is usually exclusive to professional librarians Acquisition of library stock usually involves an acquisition policy. The acquisition policy is a stated course of action used in selection of materials to be acquired; this is usually agreed upon (Barkett, Ritchie & Standley 1978).

Cataloguing and Classification: The cataloguing and classification services are the major organization functions that areperformed in the technical services. The important factor here is “Making available” (Barkett, Ritchie & Standley, 1978). After acquisition, materials become unorganized and patrons will definitely find it difficult to retrieve the material. Cataloguing and classification through its techniques make it possible for information retrieval, as the aim of every library is to obtain preserve and make available the resources.

Serials: A serial is defined in AACR2 as “a publication in any medium issued in successive parts bearing numerical orchronological designators and intended to be continued indefinitely. Serials in technical services department include journals, articles, government periodicals, memoirs. Technical services also deal in the acquisition, cataloguing (using kardex cards).

Preservation of materials: Preservation of materials is seen as the activities involved in keeping library materials. Morrow (1979) provides and an excellent outline. Although not specifically a formula for developing policy, Darling and Webster (1987), provides a step by step review of typical preservation needs within a library: -Care and handling of materials

- Guidelines for binding and preservation

- Need for disaster planning
- A cautionary statement about acquiring material in need for repair
- The need for staff education
- Desirable environmental conditions.

A major part of preservation of materials is Bindery. In some libraries, bindery consists of a unit under the technical services department. A large proportion of a university library intake is of foreign or old materials, this often involves binding or resources (Thompson, 1932). According to Morrow (1979), there is no standard organization for binding operations in libraries.

Authority Control: Library authority files are a record of the authorized or established form of heading or access pointsused in the catalogue. Authority record contains the established form of the heading, cross references made in relation to the heading, sources searched for verification of the heading (J. Barkett, S. Ritchie & A. Standley, 1978).

Bibliographic Control: As we enter the 1990s bibliographic control is in a state of transition in most academic library asmany are involved in implementing online system and rapidly moving from card catalogue to the online catalogue. Bibliographic control is one of the major functions of the technical services department as they are in charge of preparation of catalogues which contain bibliographic information (J. Barkett, S. Ritchie & A. Standley, 1978).

3.2 Application of ICT on Technical Services

Nwankwo (2006), opines that ICTs application to library works and services could be seen as the best way that could be used to assist researchers to adequately solve their literature need for effective research activities. This, according to the writer, is because the application of ICT to library operations greatly helps in the provision of efficient reference and information services, the utilization of network operations such as cataloguing, authority control, inter library loans and co-operation and in the participation of international bibliographic project.

The use of ICT has impacted on technical services according to Igbeka (2008), Adebisi (2009) and Uwaifo (2010) in the following ways:

1. Online Public Access Catalogue (OPAC): It is the computer form of library catalogue to access materials in the library.
2. Storage Capacity: Digital libraries have the potential to store much more information, since it requires very little space to contain it.

3. Preservation and Conservation: An exact copy of the original can be made any number of times without any degradation in quality.

3.3 Cataloguing and Classification

Cataloguing and classification is another technical service where ICT has been utilized in libraries. The changes brought to cataloguing and classification by application of ICT is considerable, as pointed out by Ajibero (2006). According to the author, the application of ICT in library cataloguing and classification has enabled the production of Machine Readable Catalogues (MARC), Online Computer Library Centre (OCLC), and Online Public Access Catalogue (OPAC). All of these, according to him have transformed the cataloguing system and is allowing libraries to look into national and international networks in other to fast track their cataloguing processes. On the other hand, Imo (2007) argued that ICT has not changed the way the cataloguer does his work, but instead it has accentuated the need for the cataloguer to be tactically and technically sound. The author, however, contended that ICT has facilitated the production and availability of Machine Readable Catalogues of libraries universally.

Cataloguing

Online Public Access Catalogue (OPAC) is a great relief to users of the library catalogue in the sense that, different users can search for the same information at the same time using different terminals which is impossible through the traditional card catalogue. Also, users can search the online library catalogue through ISSN, ISBN, and combination of title and author etc. Overdue notices are generated and sent to users through their e-mails.

The card catalogue which was replaced in the early 1990s has itself been replaced with a Web-based interface. This means that the maintenance of the information, typically handled by library support staff, has to be accurate and the level of sophistication and technical expertise to handle the amount of information added to the library's own knowledge base increases yearly as the capacity to store and access information has increased. Also important to note, the online catalogue is accessible from anywhere as it is a web-based catalogue.

There has always been awareness among librarians that without cataloguing and classification, the goal of making materials and information resources available would have been difficult. The advent and use of ICT has made it possible for remote libraries to access the huge databases of big libraries in developed countries for the purpose of adopting or adapting their bibliographic data for their own library use; and indeed the online catalogues have transformed the landscape of

cataloguing and classification (Adeleke Olorunsola, 2010). With the help of Internet and different web-sources, the cataloguing and classification work has been stress-free. The organisation like Library of Congress (LC) has made the work possible to classify or catalogue a resource in the minimal time. The LC online catalogue is a database of records representing the vast collection of materials held by the Library of Congress.

The online catalogue provides cross-references, notes and circulation status, as well as information about library materials still in the acquisition stage. LC catalogue records' information of different resources (books, serials, manuscripts, cartographic materials, computer files, sound recordings, music, etc.) are publicly available and it can be easily used for importing or copying data. All the functions of cataloguing have become possible through the use of library automation software. Importing bibliographic records from trusted online sites such as 'OCLC World Cat', 'Trove - National Library of Australia' have reduced a huge amount of time for cataloguing. Importing metadata through MARC format has made easy to the process of cataloguing and make it available as soon as possible to the users. Resources such as book, microfiche, audio, videocassettes, CDs, pamphletsare catalogued through importing bibliographic records; required fields are edited manually as per the library requirement. Automation software gives update to the user about the progress of the library materials. After the processing of books or any requested materials, the automatic reminder is sent to the users about the availability of books.

Classification: With the technological development, the classification work has been possible through online tool. There aremany online catalogue records available from where one can get the whole bibliographic record of the library resources. Along with the record, we can also get the classification number in the catalogue record. British Library catalogue, Trove-National Library of Australia's catalogue, Library of Congress's online catalogue can be used to search the catalogue record and data can be copied for own catalogue preparation. These libraries provide classification details in their catalogue record, but there are also some online resources where library resources/materials can be classified. OCLC classify, LOC classification web and WebDewey are the examples of online classification tools.

3.4 Acquisition of Library Resources

The utilities in ICTs have become dependable sources that enable libraries to verify and validate new titles, place orders, and also make payment to publishers and booksellers. Information resources selection, in the context of ICT application, also involves matters to do with site licenses and making decisions between stand-alone CD-ROM work stations and networked CD-ROM subscription. Librarians in-charge of acquisition must have knowledge of how to purchase gateway access to

commercial vendors, how to integrate electronic resources into collection development policies and decide whether to buy print or electronic versions of resources. They are also required to make decisions about either procuring a resource or accessing it through another channel (Blake and Suprenant, as cited by Spacey, 2003). The fore-going discussion on the use of ICT in acquisition/collection development processes in libraries would greatly impact public libraries in Nigeria when they are introduced in their operations.

With the help of web, acquisition work has become very much simplified. Order placing, duplication checking, price checking etc. are done very effectively using ICT technique. Receiving suggestions or demands and placing the order for purchasing library materials have become easy through the online. As publishers and vendors are available through the website, such as Amazon, Flipkart, Infibeam, etc. the quantity of workload has reduced and due to this, the time can be saved and make it applicable to the other services. Invoices can be downloaded from the Websites that make service faster and avoids postal delay. E-mail helps in sending reminders to the publishers, vendors and even to the borrowers of the books (Antherjanam & Sheeja, 2008). Online bookshops and publisher's websites save the time of the librarians. For the procurement of journals, order is placed in the prescribed format to the publishers through Internet. Invoices can be downloaded from the websites that makes service faster and avoids postal delay. E-mail helps in sending reminders to the publishers, vendors and even to the borrowers of the books. IT also helps in the process of the serial control in the university library. It helps in preparing union list of serials and helps in circulating via e-mail to the branch libraries. It Provides alert service to the users including the staff. List of new additions in the library is compiled and E-mailed to user community regularly. This service is the major impact of ICT in technical section.

Collection Development

Collection development can be defined as the selection and acquisition of library materials based on current and potential user needs. Collection management goes beyond this. It is concerned with managing the utilization, storage and accessibility of a collection. Collection development can thus be seen as a subdivision of collection management (Singh, 2004:1). Although, ICT in its capacity aids collection development by providing a wider range of information resources to choose from, it also impacts the collection development process of library negatively.

Academic librarians find themselves in an era of unparalleled access to information. The latest edition of Uhlrich's has indicated the availability of more than 172 000 journal titles. Although this appears to be a most

ideal situation it is not because the financial resources available in acquisitions departments have not necessarily increased. The sheer volume of information available also makes selection of the most suitable information a complex task (Fisher, 2003). The impact of electronic resources has made collection management a very complex and challenging task. There are budgetary constraints, numerous formats, ever changing user needs. Collection management implies involvement in tasks such as analysis of needs, negotiation of contracts and evaluation of resources (Singh, 2004).

Digital preservation of data

One of the major costs facing the academic library is the cost related to the conversion and preservation of information in digital format. This does not include the cost relating to the annotation for indexing purposes and the cost of conversion of audio-visual material. One of the problems with converting records into digital image is the fact that the technology used to store these pages as a digital photograph results in large files which have storage implications and place demands on band-with (Wood & Walther, 2000).

Funding allocated to preservation of digital material is generally inadequate. This has to do with expectations that the costs of digital preservation over length of time might be very high. It is also difficult to forecast cost in terms of how long to retain digital material in an archive and computer architectures needed to access material (Lavoie & Dempsey, 2004). Preservation of digital materials poses many challenges. It is further complicated by the fact that computer technology changes at an unprecedented rate.

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.

Serial Control: Serials or periodicals are the backbone of the library. Automated serials management gives quickestinformation access about the particular resources. Below mentioned tasks can be accomplished through the software for serial control:

- Current holdings status
- Tracing missing *volume and issue*
- Preparation of budget for periodical subscription
- Preparation of periodicals list and its verification
- Online Letters to publishers, vendors, etc.
- Processing of online electronic magazines and receiving copies of the periodicals
- Preparation of New arrivals

ICT has eventually been introduced in serials control and management in libraries. Serials represent a very complex world and it is not surprising that automation was slow to play a significant role in its management and control (De Kamp, 1983). The author described the function of software designed for handling serial publications in libraries by Swets and Zeitlinger B.V. (a company that is into production of computer software for service oriented outfits). He discussed the process involved in handling serials through automation, which touched on ordering, cataloguing, claiming, financial control, reporting, check-in, routing, duplicate issue storage and dispersal, management reports and others. In the same vein, Chizoba (2011) stated that the application of ICT in serials management facilitates the search for information, both current and retrospective. He further stated that ICT also facilitates routine work in serials management to do with recording and checking orders, verifying payments, renewal of subscription of titles of journals, sending claim notices for unreceived serials issues and related activities.

In the serial unit those ICTs applied are based on the functions performed within the unit. These functions are synonymous with the functions performed in the library therefore; ICT facilities used in the serials unit though with considerations to the special nature of serials. Some of these ICT facilities as outlined by (Afolabi and Abidoye, 2011) and (Mishra and Mishra, 2014) are: computer bar-coding technology, database services, electronic books, electronic journal, networking technology, chat services, electronic resources (CD-ROMs), indexing and abstracting services, document scanning services, bulletin board services, Online Public Access Catalogue (OPAC), library management software package, RFID (Radio Frequency Identification, printing technology, Internet facility, video conferencing, electronic mail (e-mail), storage technology, the list is as exhaustive as the application of ICTs to library services can be. In the serials unit ICT facilities can be for the following services: subscription control, procurement process, order preparation, fund analysis and accounting. They can also be used

for bibliographic file control, cataloguing of new serials, preparation of serials record entries and transaction control, serials additions, changes and deletions, servicing request for serials publication, binding control file, missing issues and holdings accession of want list (Alabi 1993), (Oketunji 2001), (Agbaje 2002) and (Oni 2004). Other services according to (Islam and Islam, 2007) include CD-ROM searching, online searching, online networking, photocopying, online information services and database searching services. According to (Woodward 1999) serial functions are: checking in/receipt, claiming, routing, binding, ordering and subscription renewal, financial control, management reports, union lists, online user access and circulation. These according to him are the routine services in serials unit that can be delivered using the ICTs.

A great impact ICT is making in serial unit is the wide accessibility to e-journals and online databases such as Agora, Hinari, EBSCOhost and a few others. This process involved in the acquisition and processing of serials publications online by placing serials collection on Online Public Access Catalogue (OPAC) in order to facilitate access to the publications in the serial unit. Tiwari (2011) on the other hand asserted that ICT is making its impact on serials control through the production of automated versions of bibliographical serial publications. Notable among such publications, according to him is: Ulrich's International Periodicals Directory, published by R.R. Bowker. Similarly, he added that the International Serials Data System (ISDS) and the International Centre for the Registration of Serials are charged with the responsibility for the establishment and maintenance of a comprehensive machine readable registry of bibliographic information about serials published throughout the world. The author further stated that in the United States, the Library of Congress has developed a MARC format for serial publications and participates in the CONSER programme which creates and maintains a high-quality machine-readable database of serial publications. Through systems developed by vendors, he further added, libraries are taking advantage of this database in managing the local collections of serial publications.

4.0 CONCLUSION

Despite the challenges facing the availability and usability of ICTs in Nigerian libraries, librarians and authorities in various institutions must find means of making the facilities and resources discussed in this paper available to their users. It may be noted that if the libraries are provided with the various ICT facilities by the various authorizes with adequate funds cum power supply, users and staff of the libraries will utilize the resources. Staffs that are not ICT complaint may be shown the way out if they refused to change for better. Technical services although coming

with its challenges, has impacted technical services in positive ways. The 21st century library undoubtedly cannot do without ICT and its components.

5.0 SUMMARY

In this unit, you have:

i. learned the concept of technical services
ii. learned the digital preservation of data.

6.0 REFERENCE/FURTHER READING

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UNIT 2 ICT APPLICATION TO READERS SERVICES

CONTENTS

1.0 INTRODUCTION

This Unit will intimate you with the awareness of the ICT application to readers' service in libraries. This unit does not intend to make you an ICT expert but to help you explore the potentials of ICT and give you a working knowledge of what ICT can do to facilitate the reader services in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- discuss the application of ICT to readers' services.
- discuss the relevance of ICT to circulation unit of the libraries
- state the advantages and disadvantages of ICT application to readers' services.

3.0 MAIN CONTENT

3.1 APPLICATION OF ICT TO READERS' SERVICES

Circulation Services:

Circulation services refer to processes in which library materials are loaned out to library users through lending procedures operating in libraries. It relates to charging and discharging of library materials from users and back to the library over a period of time (Ode and Omokaro, 2002). Various methods of circulation techniques are in use and the most popular is Browne system (Prytherch, 1986) which requires the use of:

a) Readers ticket which determines the number of books that can be borrowed at a time.
b) Book pocket to accommodate book card.

c) Book card which carries details of title, author and call number of book.
d) Date due label on which date by which material must be returned is indicated.

This system allows library staff to loan out library materials and maintains details of who borrowed what and when to return it. Computer technologies can be used to eliminate cumbersome process of charging and discharging in the manual process of circulation. Similarly, maintenance of borrowers list, overdue materials can automatically be done through automated resources. Edoka (2000) listed circulation services to include: registration of users, reserving materials for needy users, short loan services, shelving and shelf-reading, keeping of accurate record of transactions and keeping of necessary statistics.

Circulation control is another fundamental area of library and information science in which ICT is used. The use of manual system in document delivery is not yielding the desired result and has now been replaced by ICT-based document delivery services (Odeh and Akpokurerie, 2011). Core circulation duties involve issuing and renewing resources, reservation of items, charging and discharging of library information resources, fining users who have overdue information sources. ICTs have made these tasks less laborious. The automated system handles these processes with much ease and speed. Data provided by circulation control module of the automated management system enables better management of stock; overdue notices are automatically generated and amount to be paid is immediately known (Odeh and Akpokurerie, 2011). Today, libraries with automated systems can be accessed on the Internet by other libraries. Similarly, documents can be delivered electronically through e-mail to requesting users or libraries. There are several ICT-based document delivery service providers worldwide; a good example of which is the British Document Supply Services (BLDSS).

ICT application in circulation operations enhances the process of lending and locating library information. It also provides up-to-date information on loan services, accurate dissemination of information on overdue items; usage statistics and pre-preparations of printed circulation lists, information on fines and payment from library defaulters (Otolo and Anie, 2009). Similarly, Ezeani (2010) supported the view that task of circulation section of library can be made easier by use of computer technologies. Borrowers can carry out self-issue over Internet in certain libraries. Status of borrower can be ascertained if lending limits have been reached. Borrower is automatically made to see which other items are on loan. Computer could also reveal if requested material is mutilated or out of circulation. Provision can also be made to reserve desired informational materials. Besides, data provided by

computerized circulation system can contribute to effective management of stock. Library at a glance, can also know the amount of fines collected. Invariably, time for sorting of overdue cards is saved.

ICTs have enhanced efficiency and librarians must acquire relevant computer skills and competencies to make their profession and roles relevant in this information-driven age. Brain (2007), Okore and Ekere (2008), Anunobi and Nwabueze (2010) wrote on skills required by librarians to work effectively in the information environment. These skills can be grouped into three areas namely, strong technical skills, information literacy instruction skills and content management skills. Skills could be classified as general professional requirements which could change traditional librarianship. Ezeani and Ekere (2009) also observed that librarians must be versatile in the use of computer technologies as this will encourage diversity and build a foundation for continuous innovative learning. Hence, librarians must re-interpret traditional library skills and explore new ways of utilizing these skills through effective use of computer technologies.

With the application of ICT in circulation services, the use of electronic gadgets such as computer, barcode scanner and the library management software helps to perform circulation routine operations in an easiest and quickest way. After the invention of barcode technology, library transaction has become faster. Nowadays, for any type of communication we depend on the internet, email, telephone, etc. These technologies are also used in the library for the day to day activities of the circulation. Basically, the following duties are performed in the circulation by using ICT:

- Issue, returns
- Overdue reminder
- Renewal
- Reservation of books/documents
- Membership registration
- User guides
- Daily check-in and check-out statistics

Circulation control is another fundamental area of library and information science in which ICT is used. The use of manual system in document delivery is not yielding the desired result and has now been replaced by ICT-based document delivery services (Odeh and Akpokurerie, 2011). Core circulation duties involve issuing and renewing resources, reservation of items, charging and discharging of library information resources, fining users who have overdue information sources. ICTs have made these tasks less laborious. The automated system handles these processes with much ease and speed.

Data provided by circulation control module of the automated management system enables better management of stock; overdue notices are automatically generated and amount to be paid is immediately known (Odeh and Akpokurerie, 2011). The authors indicated that libraries with automated systems can be accessed on the Internet by other libraries. Similarly, documents can be delivered electronically through e-mail to requesting users or libraries. They further stated that there are several ICT-based document delivery service providers worldwide; a good example of which is the British Document Supply Services (BLDSS).

Another dimension of ICT usage in circulation control was highlighted by Olaniyi, Omotosho, Oluwatosin, Towolawi and Grant-Ezeronye (2012), who presented a library readers' desk management system with the use of finger biometric and barcode technology to activities of a library's readers' services. The system is capable of reducing the time spent and errors associated with identification and verification of users and library books as well as charging-in and charging-out of books to library patrons. According to the authors, though Close Circuit Television (CCTV) would also be an important factor ensuring almost total security, biometric scanners like the finger print scan and facial recognition gives security greater edge. They further added that users will no longer need ID cards, yet access will be simple and reliable.

Stock-taking/Verification: The use of the computer in stock verification is the most important. The verification of the stockis carried out with the storage of library through the database in the computer. Stock available in the library is scanned through RFID reader/barcode scanner and data are collected. These collected data are compared with the available data in automation software. In this way, how many books have lost we can find out.

Reference/ ILL Service: By using computer and internet technology, the reference service has become very simple. Various typesof information resources like the encyclopaedia, directories, dictionaries, databases, online library catalogues, maps, biographies, patents and online information resources are available on the internet which can be used to provide required information to the users. In the reference section, queries are answered through the telephone. For ready reference service, library staff uses Internet and E-mail facility. The computer has provided a great promptness to reference section. The role of technology in reference services are as follows:

- Library staffs fulfil the demands of the users through various electronic resources like database, library catalogue database, directories etc.

- In reference service, services are also provided to the users regarding information available on the internet after getting delivered through the computer.

Application of ICTs to reference services is believed to have had tremendous effect on reference services in academic libraries (Oyegade, 2000). Ukachi (2008) enumerated the effects as modification of traditional services, introduction of new services, disintermediation of services and the extension of services to remote users. Ukachi (2008) outlines the internet, online-search, e-query and online public access catalogue as ICT facilities that promote effective reference services in libraries.

The internet is perhaps one of the most important ICT facilities in the provision of reference services. It is the electronic resource that is now having the most significant impact on the services, operations and professional activities of librarians (Ilo and Ifijeh, 2010).First it is more dynamic and far reaching than any other resource used in the library setting. Secondly, it provides a medium of communication that has extended the potential of librarians for interactions beyond the physical library (to users, colleagues, and other professionals), beyond any previous capacity and in a host of new ways. The internet is the most significant telecommunications advance affecting online searching.

The online database is an important reference tool in the modern information system. It can be described as computerized stores of information, which are accessible through the host computer or across computer networks. On-line searching as a reference service is an important service especially as journals and books are now available electronically on the internet. Users and reference librarians can now access required information online. It makes access faster and easier. E-Query Service is a Web-enabled contemporary reference service offered to the registered members of the library mostly through e-mails. Online public access catalogue (OPAC is a most essential need for reference and circulation activities in the library as it makes for easy retrieval of information. It is an important finding tool for information held in the library as well as information held outside the library but available through the web. A web-based OPAC system can be accessed through the internet anytime and anywhere.

The various ICT facilities that are used in reference service are asynchronous and synchronous. Asynchronous reference service involves a time delay between the receiving question and providing answer such as in e-mail reference service. It is similar with e-mail reference service, in which a user sends the query in the form of a message and receives an answer at a later time. Apart from using the medium of e-mail, it also involves the completion of web forms and use

of services such as ‘ask A’ services. The user can ask his/her question even when the library is closed and the reference librarian replies by e-mail, fax or phone at his convenience. Synchronous reference service involves transaction that takes ‘real time’ with immediate response to query, i.e. the interaction between the user and reference librarian is live and that is why it is called ‘real- time-digital-reference service’. The media used in this type of reference service include video conferencing, Voice over Internet Protocol (VoIP), chat reference and digital reference robot. The implications of these for reference service are that in asynchronous reference service it is difficult to judge the urgency of the information, thus urgent queries may be left unattended to; users may have to wait for long periods, which can be stressful; and it is labour intensive. The implications in synchronous reference service are that delivery of information is faster than with e-mail; more urgent questions may not be attended to; errors in typing queries may hamper understanding the information required, etc. (Ominyi, 2011). Ominyi (2011) defined the concepts of reference service, ICT, libraries and information centres, and discusses the challenges posed to reference librarians by the introduction of ICT in libraries. He concluded that the use of ICT in librariesnecessitated a new breed of information professionals who must be well-equipped with IT knowledge and skills to work in present day libraries which are ICT-driven. Public libraries do not have any option to utilizing ICT in providing reference services to users.

4.0 CONCLUSION

Information and Communication Technology has helped to enhance the library system; library operations such as circulation, cataloguing, acquisitions, and serials have changed significantly due to technology. Circulation control is often the first activity a library considers automating. In addition to loan transactions, an automated circulation system can perform the following tasks: tracking of circulation materials, checking for excessive number of books checked out, detecting delinquent borrowers, printing out overdue notices, printing out fine statements, enabling rapid access to location or status of items, preparing statistical data of circulation activities, and providing a multiple branch libraries network support.

Omekwu (2010) stated that the duality operates in traditional and technological paradigms, explaining that the technological paradigm is not limited by time and space but rather seamless, dynamic, interactive and integrative and that Information and Communication Technology (ICT) is the engine that creates the seamless, dynamic, interactive and integrative capacities and possibilities. ICT is a broad term that covers

wide range of technologies. It is the convergence of computers, communication and microelectronic-based techniques.

5.0 SUMMARY

In this unit, you have:

i. Learned the application of ICT to readers' services.
ii. learned the relevance of ICT to circulation unit of the libraries
iii. learned the advantages and disadvantages of ICT application to readers' services

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UNIT 3 ICT APPLICATION TO LIBRARY RESOURCES AND SERVICES

CONTENTS

1.0 INTRODUCTION

In this unit, we shall examine the different types of ICT based resources and services that can be found in libraries.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- discuss ICT based resources
- discuss ICT based services
- describe different types of ICT based services and resources in libraries.

3.0 MAIN CONTENT

3.1 Types of Ict Based Resources and Services In Libraries

Now-a-days, collection of library is not confined to physical boundaries that require the user to visit the library. Printed collections have become more expensive and not easily accessible to the users due to lack of time. The technological encroachments have led to tremendous changes in the process of information. In IT era, no library can encounter the requirements of users with printed sources of information. Today people use the information as a primary source of information. The internet can be used for efficient retrieval and meeting information needs. ICT based resources are now considered as being of great importance to all types of libraries and they are reducing a large share of library budgets. They are used in abundance. These resources have solved the problem of space.

Libraries play significant role in supporting research in all subjects. Availability of online resources has changed the way the services are

provided by the libraries to their users. It has changed the traditional practices of libraries in delivery of information to the users. Now users can have access to a variety of information and scholarly journals online.

Information resources available in libraries are limited, but those available through the web are enormous. Today the library's e-resources include e-journals, e-books, e-reference works, scholarly database, e-conference proceedings, e-thesis/dissertations etc. Among these e-journals as well as aggregated e-journal databases from the major chunk of digital collections in libraries and they are growing at a phenomenal rate. "E journals are the electronic equivalents of their print counterparts and they possess numerous additional features. E-journals are often referred to interchangeably as electronic serials, online journals and electronic periodicals." (Sreekumar, 2010). No single library can afford to procure all journals of a single discipline. Scientific and scholarly journals are being published in many media: CD-ROM, floppy disk, internet. CD-ROM and internet are used for dissemination of e-journal. CD-ROM can be handled just like the conventional form. Many journals are available free of cost over internet. Publishers are using internet as medium to publish. Many e -journal publishers are publishing e-journals and providing it to users through their websites, e.g., Elsevier, American Chemical Society, H.W. Wilson, Academic Press, Springer, Oxford University Press and others. Many of open access journals are online, free of cost, and free from copyrights and restrictions.

ICT Based Resources in Libraries

Electronic Books and Texts: The emergence of e-books came into existence in l970s with Project Gutenberg. Later in the1980s and 1990s book vendors renowned the potentials of providing e -books in CD-ROM form. Reading e-books devices like Rocket e-book were developed in the first part of the millennium. The idea of e-books is not new, these can be read online or offline as different devices like PDAs and pocket-PCs. A good number of e-books are available on interne free of cost such as Bartlebay.com, Books-On-Line.com, free online books (Sharma et al, 2010). E-books are all about mobility and information flow. Digital format e-book content escapes the regular book pages, because, quite simply, the content is no longer bound to the physical book. The contents of the E-book are a digital object that contains the electronic representation of the book, most commonly thought of as trash novel electronic analog. The Library provides access to a variety of electronic books, as well as the other printed works (such as essays, poems, or historical documents). Some of these electronic books and texts are part of large, searchable databases. Most of our main collections for electronic books and texts can be located through the

Library's Electronic Resources page. However, many more individual titles may be located using the Library Catalogue.

Electronic Journals: E-journals are either fee based or open source. Some e-journals are moderately open access. Openaccess journals are scholarly journals that are available to the reader through the Internet without fiscal or any other barrier. Open Access can be distributed in two ways: Green and Gold. Green open access refers to the self-archiving, in which case an author inserts a copy of the scientific production in one or more open access repositories Gold open access, on the other hand, publishes article in a journal to open access that allows free access articles it contains. Stevan Hamad, editor in Chief of Psycoloquy was one that promoted the magazine to access open for the first time. There are a number of drivers to open access. University libraries cannot stock all the titles appropriate to the needs of the research team within the institution because the vast majority of peer reviewed scientific journals. The serials crisis also promotes open access. And the majority of scholarly research is available to anyone with access to the Internet (Meera and Ummer, 2010). The Library has an E-Journals Database to help you find online versions of our journals. The Library also links to electronic versions of journals through Find It!

OPAC and Library Catalogues: Most libraries now provide access to their catalogues from their web sites. Many othersprovide information about their holdings into larger databases such as World Cat or the RLG Union Catalogue. The Library provides links to these catalogues under the "Catalogues" section on its web site.

Digital Reference Sources: Many dictionaries, almanacs, encyclopaedias, and other reference sources are now availableonline in full-text. You can locate these resources through the Library's Database Finder, the Library Catalogue, or through many of the Library's Research Guides by Subject.

Statistical Sources: The Library has access to a variety of subscription databases which provide economic data or statistics.You can locate these resources through the Library's Database Finder, the Library Catalogue, or through many of the Library's Research Guides by Subject. Be aware that there are many statistical sources available in print which cannot be found online.

Sound Recordings: There are only a few Library databases which provide access to sound recordings. If you are lookingfor music online, start at the Music Subject Guide for the resources which are available to the University of Chicago Community.

Online Database and Image Databases (Art, Maps, Medical, etc.): In the 1970s the first databases were made online.These were bibliographic, references and abstracts of articles in the academic and professional literature. Since, there is remarkable growth in scope of online databases. Online and CD-ROM databases cover a vast range of different types of information. The largest number of databases exists in the business sector, followed by science, technology, law, health and life sciences. A huge category fall into one or more of the categories like: bibliographic databases, full-text databases, a directory databases, numeric databases and multimedia databases (Feather and Sturges, 2003). Some databases include graphics or images, such as photos, paintings or maps. You can use the Database Finder page to locate these. The Art Subject Guide also provides extensive information about locating images.

Electronic Thesis and Dissertation databases: Graduate theses and dissertations long time for these years of its scientificwork, education, research and writing has been regarded as the foundation. The research is led by experts in the field and often highly competitive scholarship is funded by grants. Secondary sources of information, such as theses and dissertations in humanities, where the most are particularly useful for researchers. But the vast majority of these works in college and university libraries languish in obscurity. Basic research via the World Wide Web free and open access publication of these documents is the best way to uncover. Although it is not a new idea, the concept of electronic theses and dissertations worldwide increases in college and university campuses, faculty, administrators, graduate students, and librarians realize the value of making information more accessible. Databases of Bibliographic records of Ph.D submitted to various bibliographic records are hosted by INFLIBNET.

An ETD is an electronic document that describes the scholarly works or research of a researcher. ETD provides a technological advanced medium for conveying ideas with less expensive, small space, easy handling, high durability and never collect dust. Some databases of ETD are etd@IISE, Shodhganga@INFLIBNET CENTRE, Ethisis.helsinki.fi/English.htm (Pusapati, 2011).

Blogs and Internet Resources: The term Weblogs or blog was coined by John Barger in 1997. A blog is website whereentries of commentary in journal style are displayed in reverse chronological order. Anyone can express their opinions on internet through blog. Certain blogs activate mainly as news filters, collecting several online sources and adding short comments and internet links. Other blogs concentrate on presenting original material. Numerous blogging programs are either free or inexpensive to use.

On-line Conference Proceedings: Learned societies have felt the need to share knowledge and ideas created at one placeby others working in different places. For this purpose, conferences, meetings, symposia, workshops etc. are conducted. The outcome of these conferences is provided in the form of proceedings in digital form i.e. CD – ROM. These are posted on the conference organizers" websites for the access of all professionals in the world (Satyanarayana, 2007).

Networked electronic information resources: Networked electronic information resources are new vision ofinformation of the future. These are the mainstay and life blood of present day information centers. Libraries are providing their users with access to networked information resources, i.e. databases, electronic scholarly journals, encyclopaedias, public government information, etc., provided by various publishers or suppliers.

3.2 Types of ICT Based Services in Libraries

Libraries are adopting electronic habits, making increasing use of new ICT including computers, the Internet, the Web, Internet, Extranet and other technologies. As a result, library users are placing new demands on their libraries. They require access to the latest information, updated information resources and access to ICT facilities that they could use in their work. Use of ICT in libraries enhances users' satisfaction. It provides numerous benefits to library users. Some of the benefits are:

- Provide speedy and easy access to information;
- Provides remote access to users;
- Provides rounds the clock access to users;
- Provides access to unlimited information from different sources;
- Provides information flexibility to be used by any individual according to his/her requirements;
- Provides increased flexibility;
- Facilitates the reformatting and combining of data from different sources.

Libraries are also providing various ICT-based services to their users, including the following:

Bulletin board service: A Bulletin Board System, or BBS, is a computer system running software that allows users toconnect and log in to the system using a terminal. Once logged in, a user can perform functions such as uploading and downloading software and data, reading news and bulletins, and exchanging messages with other users, either through electronic mail or in public message boards.

Current Awareness & Selective Dissemination Services: A selection of current-awareness services in the form of Table of contents' (TOC) alerts, List of new arrivals of journals and Books, Press Clippings, Research Digest, including Abstracting and Indexing Service have been started by the library. Selective Dissemination of Information refers to tools and resources used to keep a user informed of new resources on specified topics.

Document scanning services: Scanner is important equipment in modernization of library. It is useful for scanning text,image and content pages of books and providing great help for establishing digital and virtual library.

Electronic document delivery services: At present, a document delivery service typically involves a combination ofpaper, digital and electronic media; document delivery is a "hybrid" medium. Libraries are implementing ICT based interlibrary lending system using electronic networks to deliver copies of journal articles and other documents in digital format [mainly in Portable Document Format (PDF)] to library users' desktops

Electronic mail (E-mail): This medium can also be used to send and receive mails. This is commonly and widely used withthe internet facilities. E-mail is very useful for sending messages to and from remote areas with enhanced network. Further, it is also useful in various aspects of library environment. Thus, it may be stated that e-mail may play a significant role in information dissemination services.

Internet and Chat services: Internet as a source of serious subjects of the universe of knowledge has become informationsuper highway and opened the floodgates for scholarly communication. Internet is truncated version of internetworking, which refers to interconnecting two or more computer networks. Internet is described as a worldwide network of computer and people. It is an important tool for global on line services. The emergence of Internet offers very high bandwidth, which will widen the scope for information processing and dissemination as never before. Internet connects universities, colleges, schools and other educational institutions for information sharing and exchange. Access to information through Internet has changed the total scenario of librarianship.

Online chat may refer to any kind of communication over the Internet, which offers an instantaneous transmission of text-based messages from sender to receiver. In Libraries, it can be used for online reference service and real time consulting service. Online chat may address as well point-to-point communications as well as multicast communications from one sender to many receivers.

Database services: A database is an organized collection of data for one or more purposes, usually in digital form. Librariesprovide access to a variety of bibliographical databases and full-text resources that are typically organized to model relevant aspects of reality, in a way that supports processes requiring the information.

Institutional repositories Service: An institutional repository is an online archive for collecting, preserving, anddisseminating digital copies of the intellectual output of an institution, particularly a research institution. For a university, this includes materials such as journal articles, both before (preprints) and after (post prints) undergoing peer review, as well as digital versions of theses and dissertations.

Indexing and abstracting services: An indexing and abstracting service is a service that provides shortening orsummarizing of documents and assigning of descriptors for referencing documents.

Library website: A library website provides a library with a website to offer its services and to tell its story to itscommunity. In most of the library website online catalogue is included. A library web page or Universal Resource Locator (URL) facilitates single window access to various web enabled library services.

Online readers' advisory services: Libraries are implementing Web based versions of readers' advisory services andreference services. It helps to find the right information/reading material for the right person at the right time and provide the best information that matches their needs, interests, and reading level. These include services such as informing users via the Web about new acquisitions, providing reviews and recommendations, providing facilities for readers to interest with the reference staff (Virtual Reference Desks), etc.

Web access to OPACs: Libraries are providing access to web-based Online Public Access Catalogue (OPAC) interfaces.This is making it easier for OPAC users to learn and use these resources since they only have to learn how to use one universal access client, the Web browser.

Networked information resources services: Libraries are providing their users with access to networked informationresources, i.e. databases, electronic scholarly journals, encyclopaedias, public government information, etc. provided by various publishers or suppliers.

Information delivery to users: Library and information users are now getting access to electronic information resourcesfrom the computer desktops in the computer laboratories, internet cafes, offices and even at home. This is resulting in librarians and other information specialists investigating and implementing systems that can deliver customized

information to users' desktop computer environment, irrespective of their geographical location.

Online instructions: Libraries are also implementing online based bibliographic or library use programmes. Theseinclude online tutorials on searching online resources and virtual tours of library collections.

4.0 SUMMARY

In this unit, you have:

i. Learned types of ICT based resources and services in libraries.

5.0 REFERENCE/FURTHER READING

Kumar, P. A. (2017). Impact of information technology on the collection development in university libraries of Assam: a study. Retrieved from: http://hdl.handle.net/10603/180648

UNIT 4 ICT SKILLS FOR INFORMATION PROFESSIONALS

CONTENTS

1.0 INTRODUCTION

This Unit will educate you with the ICT skills required for information professionals to carry out the library operations. This unit does not intend to make you an ICT expert rather to help you explore the potentials of ICT and give you a working knowledge of what ICT skills are needed for information professionals to facilitate the information services provision in libraries. It is also meant to encourage you on how you would experiment the use of ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- state the required of ICT skills necessary for library operations
- mention the ICT competencies required by information professionals.

3.0 MAIN CONTENT

3.1 ICT Skills and Competencies for Information Professionals

The proliferation of Information and Communication Technologies in the last decades has either changed or tailored job responsibilities of most of the professionals including librarians and information officers. This shows that there is a growing demand for ICT knowledge and skills from librarians and information professionals. Thus studies suggest Library and Information Science schools to pay attention to developing ICT knowledge and skills among their students. Research have shown that in the UK, the USA, Australia and Canada there are 38 skills and

qualifications including a number of ICT skills were identified as required for the library and information science jobs.

The listed ICT skills dealt with digital collections, databases, library automation systems, use of software applications (Operating System, Office etc.), design, creation and maintenance of web pages, programming, evaluation of software and hardware technologies, and various other aspects of ICT. The current ICTs are continuously being updated. Thus, library professionals are expected to acquire and develop their ICT skills to cope with the new ICT advancements (Ashcroft and Watts, 2005). The listed ICT skills dealt with digital collections, databases, library automation systems, use of software applications (Operating System, Office etc.), design, creation and maintenance of web pages, programming, evaluation of software and hardware technologies, and various other aspects of ICT. The current ICTs are continuously being updated. Thus, library professionals are expected to acquire and develop their ICT skills to cope with the new ICT advancements (Ashcroft and Watts, 2005).

The new generation librarians grow up with the electronic online environment, which is ubiquitous in their daily lives. The flexibility of younger librarians is more for technology-oriented services compared to their older colleagues, not interested in stereotyped librarianship, more interested in technology-enabled services (Emanuel, 2013). Playing with digital video or video games is more than traditional games, using and connected with friends through email, instant messaging and social networking (Gordon, 2006). Youngsters use technology to listen to music, read books, to take pictures and online shopping (Johnson, 2006) According to Bosque & Lampert, (2009), the two categories of new librarians are as follows.

a) Those who has a high level of technical experience, usually from a previous job in a technology-related industry,
b) Those who struggle with technology

For those who struggle with technology they wish their library school had more hands-on opportunities for technology instruction instead of teaching theoretical applications like:

- Dreamweaver
- Adobe Photoshop
- Computer Networking
- Content Management Systems (CMS)
- File Management Issues
- Image Editing/Scanning
- Integrated Library Systems-Back End N/A

- Linux/Unix
- Microsoft Excel
- Microsoft Word
- PowerPoint
- Relational Databases
- Server Set Up/Maintenance
- Video Editing
- Adobe Flash
- Computer Hardware
- Computer Security
- Course Management Systems (Blackboard, Moodle, etc.)
- HTML > Information Architecture
- Integrated Library Systems-Front End N/A
- Microsoft Access
- Microsoft Windows
- Mobile Devices
- Programming Languages (C++, .Net, etc.)
- Screen Capture Software (Camtasia, Captivate, etc.)
- Video Conferencing
- Web 2.0 (RSS, Blogs, Social Networking, Wikis, etc.)
- Web Programming Languages
- Dreamweaver
- Adobe Flash
- XML

However, challenges in managing information resources in the digital age are leveraging the capability of digital technologies. Application and use of the leading technology are not just for disseminating information, it is more of aligning our libraries and librarianship with the activities and achievements of users. It is already known that educational-content is getting enriched by locally maintained digital repositories, and thereby creates a network of contributors in the field. Many other technologies are enabling libraries users to reusing and enriching content. In fact, libraries are known for aggregating and repackaging of content, keeping users need into consideration. Even the research support systems have come out with many tools, techniques, methods, process, and services to enable researcher. In this digital age, whether older or younger librarians, it is high time to acquire knowledge of appropriate electronic tools, technique, and technology. Many librarians are in need to undergo training of basic use of digital technology, some needICT skills as the combination of computer literacy skills (technical abilities) and information and communication literacy skills (i.e. critical and creative use of information, e.g., searching and evaluating information, exchanging information or transforming ideas into digital content). OECD (2013) defined ICT skills as “the ability to use digital

technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks." This set of skills has been regarded as the core competencies of twenty-first-century learning and skills students must master to participate effectively in the society (Binkley et al., 2012).

3.2 Types of ICT Skills

Email Management and Setup

Being able to effectively and successfully communicate via email is critical to information professionals. This is because you will need to send emails to colleagues, employers, clients, vendors, and so on. Libraries expect their employees to write professional and well-written emails, as well as respond promptly to messages received in their inboxes. Depending on the level of expertise and skills required by the librarian or library staff, you may also need to be able to manage settings or set up email accounts on various work devices. Therefore, the skills required are as follows:

- MS Outlook
- Gmail and G-Suite
- SendinBlue Email
- Groove
- Front
- Zoho Mail
- Written Communication
- Digital Signatures
- Stationary Settings
- Out of the Office Settings
- Spam Settings
- Inbox Management
- Creating Rules

Online Research

Library and information work requires some online research. Whether you are looking up new resources or existing one in a subject or checking out the latest news on the Internet, this shows that the librarian need to be able to sift through all the information online to find what you need. This involves basic online information management skills as follows:

- Search Engine Research
- Checking Sources
- Crediting Sources

- FAQs
- Online Forums

Social Media Management

With the use of ICT in libraries, information services delivery requires the use of social media. Therefore, the more you know about the benefits of and limits to social media, the more you can begin to use that media in valuable ways at work as such skills to the use the following social media are important to librarians. This includes:

- Facebook
- LinkedIn
- Pinterest
- Instagram
- YouTube
- Twitter
- Reddit
- Social Media Groups

Online Collaboration

Online collaboration is a broad category that refers to any means of sharing information with your co-workers (or supervisors, or clients) online. This includes adding a meeting to a shared online calendar, providing feedback on a document through a web-based document application, and holding an online video conference with colleagues. To achieve this efficiently, librarians require to have the skills of using the following:

- Video Conferencing Software
- Skype
- GoToMeeting
- Instant Messaging
- Google Docs
- File Sharing
- DropBox Pro
- Slack
- Google Hangouts

Data Management and Queries

To be able to manage data and information in libraries, librarians need to be able to develop and manage data using spreadsheets. Furthermore, they have to be able to analyze that data and recognize trends and

patterns. Fluency in programs like Microsoft Excel and others is critical in today's information environment. To this regards, librarians need to acquire skills in the following areas:

- MS Excel
- Filters
- SQL
- NoSQL
- MySQL
- Quantitative Analysis

Desktop Publishing

Desktop publishing involves the creation of materials that need to be printed and distributed. These might include fliers, brochures, newsletters, and more. Because you can create so much using desktop publishing software, information work requires you to have some basic skills in this field. While librarians with a creative, artistic eye might be particularly good at desktop publishing, anyone can get better with practice.

- MS Publisher
- MS PowerPoint
- MS Word
- Print Settings
- Adobe Creative Suite
- QuarkXPress

Smartphones and Tablets

Many libraries require that their users use smartphones and tablets; they might even issue particular phones to employees or state that workers must be accessible by email during certain hours. For these reasons, it is important for librarians to know and have skills on how to use the following:

- iPhone
- Samsung Smartphones
- Blackberry Devices
- iPad
- Samsung Tablets
- CAT S41
- Panasonic ToughPad

Word Processing

In this day and age, it is expected that librarians know how to use word processing technology. Librarians need to be able to produce written documents (including business letters, meeting minutes, and more) using a computer processor such as Microsoft Word.

- MS Word
- Libre Office Writer
- Transcription
- Typing
- Note Taking

More ICT Skills

- Calendar Management
- Organization
- Time Doctor
- Asana
- Invision
- Prevue
- Mailbird
- Cage
- Viewflux
- Slab
- Airtable
- Yammer
- Chanter
- Scribus
- Zeplin
- Acquire
- Concept Inbox
- I Done This 2.0
- Red Pen
- LaTex
- Iovox
- Realtime Board
- Mural
- GoVisually
- Data Analysis
- Big Data
- Computer Science
- Computer Programming

4.0 CONCLUSION

From the above it worthy to note that Information and Communication Technology application in libraries requires that those who are going to operate the electronic systems possess a certain level of knowledge and skill to be effective in the expectation of what ICT application has to offer. Majority of librarians are trained in the traditional methods of librarianship. In view of this, Morgan (1998) argued thus: in today's world, why would anybody trust a librarian whose profession is about information and knowledge, who had not mastered a computer? This argument explains why we librarians must acquire computer knowledge to be committed to providing ICT-based services. This in turn means that we will be failing those whom we serve if we do not acquire ICT skills (Olorunsola, 1997). Though information technology applications in library service are included in the curriculum in library schools but these are not taught effectively due to lack of equipped laboratory for practical classes in the library schools (Omoniwa, 2001). Information technology is the language of the 21st century. Thus, librarians need to continuously update their skills to be able to function maximally in an IT environment. Librarians have found themselves in a new environment, otherwise known as digital environment. The environment is characterised with uncertainties and increasing complexities of digital technology (Nwakama, 2003). Librarians need ICT skills for a number of reasons. The new working environment has become a competitive one and many players are now involved in information provision which include, Internet cafe, mobile communication medias, ICT staff, and many others in the information profession (Wittmer, 2001). Some of these players especially the internet café providers lack the necessary IT skills to obtain quality information (Stubbings and McNab, 2001).

Librarians will be called upon to act as both educators and intermediaries (Sharp, 2002). New services are emerging in the new working environment. Published works in this area revealed these trends; too much emphasis has been placed on the development of ICT infrastructure in developing countries, and not enough considerations have been given to human resource development (Lim, 1999; Jensen, 2002; Magara, 2002). This is responsible for the much talked about global digital divide. Aschroft and Watts (2005) observed that in Africa, one in a hundred people has access to a Personal Computer. They added that there is a significant skills gap among information professionals in Nigeria, which has resulted in serious underutilisation of electronic resources in many libraries in Nigeria. But it can be improved when librarians in developed economies gain knowledge of new technologies through continuing educational programmes, professional training, and revision in the library school curricular. Ramzan (2004) noted that the

application of ICT to library processes will help librarians develop appropriate ICT skills. University libraries, especially in Nigeria should focus their attention on applying ICT in their operations so as to keep pace with the developments in both education and ICT around the world (Adeyoyin, 2005).

Librarians are expected to possess these ICT knowledge and skills: operating system, packages and programming languages, web awareness, technical skills and knowledge of online services. Warmwin (1998) observed that because computers have assumed such a central role in our profession over the years, we need to know more about them. It is therefore imperative for librarians to have technical skills and subject knowledge so as to add value to library services for user. Morgan (1998) considered other skills such as elementary programming of one or two languages, project management, and change management charge. Islam and Islam (2007) also observed that librarians must develop the competencies to carry out effective searches on CD-ROMs, OPAC, on the web and other electronic databases. Pairy (2007) outlined the ICT skills of librarians as database management, web development, management of multiple media, metadata skills, knowledge of standards such as Z39.50 and Dublin Core. Levine (2007) listed some of the ICT skills to include but not limited to word processing skills, spread sheet skills, database skills, electronic presentation skills, web navigation skills, website design skills, e-mail, management skills, Windows Explorer skills, etc which will enable the library staff to manage the resources.

Nyamboga (2007) enumerated the ICT skills among librarians as operating systems, packages and programming languages, knowledge of library automation software, web awareness, knowledge of online facilities/services, technical services, and managerial skills. The use of training tools has been found to be effective in training library academic staff. Some of these training tools include in-house training manuals, software programmes, and self-instruction and vendor annuals. Other methods identified by Kirkpatrick (2007) include individual training by co-worker, individual training by other individual, individual training by supervisor, outside workshops, and in-house workshops of all these, he found that individual training by co-worker was the most commonly used method

5.0 SUMMARY

In this unit, you have:

I. Learned the ICT skills and competencies for Information Professionals .

6.0 REFERENCE/FURTHER READING

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MODULE 3 LIBRARY AUTOMATION AND INTERNET RESOURCES IN LIBRARIES

This module will take you through the internet resources available in the library, impact of ICT to the library and information services, the electronic storage systems. In addition, a lot of exercises will be provided for your practice to help you gain more knowledge on the units discussed under this module.

Unit 1 Data Communication
Unit 2 storage systems
Unit 3 Internet and Web Technology Resources
Unit 4 Impact of ICT to Library and Information Services

UNIT 1 DATA COMMUNICATION

CONTENTS

1.0 INTRODUCTION

This Unit will introduce to you the library automation and internet resources available in the libraries. The unit will also educate you with the understanding of the data communication meaning in libraries. This unit does not intend to make you an ICT expert rather to help you explore the potentials of data communication and give you a working knowledge of what ICT can do to facilitate the reader services in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- discuss the meaning data communication.
- mention the types of data communication
- state the network topologies
- discuss the communication media
- explain the communication networks
- define international communication.

3.0 MAIN CONTENT

3.1 Data Communication - Basic Concepts

The term "data communication" is used to describe the transmission of computerized records having structured format which are generally unintelligible in the transmitted form unlike messages and word processing communications which consist of unformatted text. Data Communication is the conveyance of information from a source to a destination. Data means the symbolic representation of information, generally in a digital (that is, discrete) form. (Analog information refers to information encoded according to a continuous physical parameter, such as the height or amplitude of a waveform, while digital information is encoded into a discrete set of some parameter, for example, a voltage level.) Usually, this digital information is composed of a sequence of binary digits (ones and zeros), called bits. The binary system is used because its simplicity is universally recognizable and because digital data have greater immunity to electronic noise than analog information and allow flexible processing of the information. Groups of eight bits create a data byte or character. These characters make up the alphabets (including alphabetic, numeric, and special symbols) which are used in data communications. The most common data sources and destinations are computers, computer peripherals, and other data devices [such as digital phones, cellular phones, personal digital assistants (PDAs), and digital imaging applications], and the data represent groups of characters to form text, hypertext (text organized according to topic rather than linear sequence), or multimedia information, including audio, graphics, animation, and video information.

Basic concepts, procedures and standards that are associated with high-speed data communication are given below:

Speed

The unit for measuring the speed of data transmission is known as baud. It refers to the number of signal elements transmitted each second. Common speeds available to terminal users accessing remote systems are 300 and 1200 bauds. Faster transmission speeds of 2400, 4800, 9600 and even 24,000 and 96,000 bauds are also available. The speed of transmission depends upon the band-width of the channel being used to transmit the data; the bandwidth is measured in Hertz or cycle per second. The number of bits transmitted per second may not be same as a baud for this very reason.

Serials vs. Parallel Data Transmission

Within a computer, it is usual to employ parallel data paths which transmit 8, 16, and 32 bits simultaneously. Parallel data buses are employed to achieve much higher transmission speeds where the cost of additional wires or tracks on circuit boards is not significant. While the parallel interfaces allocate dedicated functions to the wires, the serial lines have to carry data and accompanying information multiplexed in a bit-by-bit form according to a communication protocol. It is common to employ parallel data transfer buses between computers and printers (18 pins, 24 pins, etc.) and disk drives to achieve higher speed and accuracy. Serial transmission is preferable for all long-distance data transmission as the cost of an interface for a long parallel transmission cable becomes prohibitive.

Communication Channels

Data transmission occurs in one of three modes:

- Simplex
- Half Duplex (HDX)
- Full Duplex (FDX)

The choice for selection of transmission mode rests upon host computer system being accessed. Simplex transmission is suitable only for device such as printers which never transmit information. In full duplex mode, data can be transmitted in both directions along the telecommunication channels simultaneously. In full duplex mode a key pressed on the keyboard results in a series of bits

which is transmitted down the channels to the host computer and then 'echoed back' for display on the screen or console which, in turn, serves as a check on the character actually received by the computer. In half-duplex mode data can be transmitted along the channels in one direction at a time; consequently the terminal displays characters that were transmitted. Thus the appearance of characters on the screen has no

assurance that the host computer has received the transmitted data correctly.

Communication Modes

Information may be sent on a line in one of the two modes - asynchronous or synchronous. Asynchronous or start-stop transmission is simpler and is used usually when terminals access remote computer systems. In this case a start code is prefixed and a stop code is suffixed to each character being transmitted. Thus an ASCII character of 8 bits is transmitted as a string of 10 or 11 bits; so a speed of transmission of 300 baud is roughly equivalent to 30 characters per second (cps). In Synchronous transmission, data octets are transmitted in a continuous sequence without start and stop pulses. Each set of synchronous character in a continuous starting of bits which are delimited by using a number of synchronization characters at the beginning of the block and by counting at groups of 8 bits octets after the final synchronous character.

Communication connections

There are various ways by which terminals and computer systems can be connected to other computer systems. Dial-up access employs a telephone line for dialling up the host computer system directly. Although cost effective, this method cannot be used for fast and accurate transmission of data. A leased line may be used to transmit large amount of data at a very high speed. A data network, is a practical alternate for remote access. The charges for using such a network are usually dependent on the amount of data transmitted and not on the distance.

Switching Techniques

Computers connected to the transmission lines may establish a path by either circuit switching, packet switching or message switching. Circuit switching connects the two machines via a line and this line is used exclusively by the two machines as long as they communicate. In packet switching, blocks of messages to be transmitted between machines are formed into a packet with sources and destination addresses synchronizing, error detection and control bits and placed on the channel. Packets are routed using the address information. In message switching, all packets are sent to a central computer by all other machines. The central computer, stores and forwards the messages to the appropriate destination addresses. It is more economical to use packet switching for data communication.

Communication Protocols

Data transmission protocols are sets of commonly agreed rules that are followed to interconnect and communicate between computers in a network. A protocol defines the communication procedures and encoding used to interconnect the systems. A number of such protocols are now available and are in vogue. A universally used standard method of interconnecting user terminals to computers is RS 232-C (proposed by Electronic Industries Association, USA). The RS 232-C interface consists of 25 connections, voltage levels, signal transmission rates, timing information and control information. In 1976, CCITT (The International Telegraphy and Telephonic Consultative Committee) also introduced the X.25 standard for the interface between terminal and host computer in a packet switched data network. CCITT introduced another standard X.75 in 1978, for the interlinking of packet-switched data network.

International Standard Organization (ISO) has suggested a layered approach where each layer addresses itself to one aspect of the communication problem. This approach allows each layer to be independently developed. CCITT X.25 standard defines the first three layers of ISO. This standard has been integrated in the network architecture of many vendors. A few important standards and specifications available for various aspects of data transmissions are given below (McGoven, 1989):

- Physical Transmission Links: RS-232-C, RS-422, RS-423 & X.21
- Data Link Control (DLC): Async, Bisync, SDLC , ISO HDLC
- Communication Path Control: X.25 Packet Switching Procedures
- System and User Control: IBM SNA, DEC DNA, ISO OSI Standards

Network Topologies

Network topologies address issues like number of network nodes, concentration of terminals and devices to various locations and how effectively they could be interconnected. Different patterns of interconnections amongst computers in a network are known as network topologies. Computers in different locations may be interconnected in a Mesh Network having multiple message paths between nodes; Star Network having dedicated channels between each station and the control hub. All communication between stations must pass through the hub; Bus Network having a linear topology and station attached by tabs; Tree Network which are bus networks consisting of a series of branches converging indirectly to a control point and offering only one

transmission path between any two stations; and Ring Network in which each node is connected to its two adjacent nodes and messages are circulated around the closed ring. A loop network is a ring network in which one master station control transmission. Each of these topologies has their advantages and disadvantages. The local requirements and computer configurations involved may be considered while choosing a specific topology (Stallings, 1984).

3.2. Communication Media

Communication media are the physical channels through which information is transmitted between computers in a network. Media may be classified as bounded (i.e., wires, cables and optical fibres) or unbounded (i.e., ether or airwaves through which radio, Transmitted data can move along simplex, half-duplex or full- duplex lines depending on the needs and protocols involved.

Bound Media

Twisted - pair of wires are inexpensive media used in voice grade telephone lines. They are used for low speed transmission of signals of the order of 1200 bps. Coaxial cables can be used for high-speed data transmission over distance of several kms. Coaxial cables have wide bandwidth of the order of 400 MHz. They may be used in LAN at transmission rates of about 1 Mega bps. Fibre Optics cables are glass fibres that provide high quality transmission of signals at very high speeds of nearly 1000 Megabits per second (Mbps) for distances up to 25 miles.

Unbound Media

Radio wave in the very high frequency band (VHF) at about 300 MHz is used for communication between computers in inaccessible locations or for short-range communications. Micro-waves are used for wide bandwidth line-of-sight communication. Rates of transmission up to 20 Giga bps are possible with this media. Communication satellite acts as microwave relay station is the sky. Transponders on the satellite are used to receive, amplify and retransmit signals sent from an earth station. The main advantage of satellite is its wide coverage of a large area and thus it may be used from inaccessible location. A transponder has a very large capacity and can handle about 400 channels, each channel having 64 kbps speed.

3.3 Communication Components

Modems

A MODEM is a MOdulation-DEModulation device that converts the discrete stream of digital "on-off" electric pulses used by computers into the analog wave patterns used for transmission of the human voice. Demodulator (recovers) the digital data from the transmitted signal. A special type of MODEM called an acoustic coupler is often used in libraries and information units with portable machines, but internal and external direct-connect MODEMs are generally used at permanent stations.

Multiplexers

A multiplexer is a device used for transmission of several messages over a single channel using predetermined frequencies within the full bandwidth. The multiplexer operates on the principle that individual channel may require only a small account of actual transmission time; thus the multiplexer acts almost as a timeshare computer allocating use of the single communication lines on a priority basis. A multiplexer is capable of accepting as many as 45 separate channels for transmitting data on a single communication line.

Concentrators (Data Switch)

A concentrator is a switch that allocates a particular input to a particular output. While a multiplexer combines the inputs on a high-speed line; the concentrator allocates a particular input to the line for the duration of its information transfer. The allocation of the output line to a specific input depends on when the request is made, the speed of the input line, and the class or importance of the request.

Front-end Processors

Front-end processors are installed to handle communication related functions for a mainframe computer so that the later can be fully used for processing applications, be it an inquiry to a database, a printing job or updating a master file, etc... The aim of the front-end processor is to provide an inter-face between the mainframe computer and the network so that the data is passed to and from the mainframe efficiently. The front-end processor is responsible for supervision of the input/output controllers or channels attached to the network, for providing buffering and partial processing of in-coming and outgoing data, for the assembling and dissembling of messages and for error handling.

3.4 Types of Communication Networks

Communication networks can broadly be grouped into the following categories based on the geographical locations of its computer terminals:

Remote Job Entry Stations

Remote Job Entry Stations are very useful for large organizations to transfer data and program generated in their in- house smaller computer to a larger computer which provides better computing facilities. An RJE provides faster input/output, while the bigger remote computer may be used for massive data processing and for storing large files, all slower operations like printing and scanning may be done at the RJE station.

Local Area Network

Local Area Network (LAN) is used to interconnect many computers within a given local area, more often premises of a single organization building. A very high speed of data transmission can be attained within a limited geographic area. The network allows its user to share library programs, databases, languages and special facilities such as an expensive supercomputer. LANs are typically used in a star, bus or ring configuration and they can be classified into high, medium and low speed categories. Some low speed LANs designed for use with personal computers use special cables, while other low-speed networks use telephone wires and digital PBX controllers. Optical fibre cables are used to achieve high-speed transmission of data in a LAN. Regardless of the type of LAN used at a local site, it must be coordinated with the communications elements that link geographically dispersed processing centres.

Wide Area Network

Wide Area Network (WAN) is used to interconnect a number of widely dispersed computers in various cities of a country or different countries. WANs use communication media maintained by telegraph or telephone companies. These networks usually have land telephone lines, underground coaxial cables, microwave communication and satellite communications. The main objective of such interconnection is to allow users of the network to access specialized library programs, databases etc. available at any of the computers in the network. Two big networks of this type are ARPANET and TYMNET in USA.

Metropolitan Area Network (MAN)

Metropolitan Area Network (MAN) refers to the inter- connection within geographical limits of a city or town. Usually referred as "last

mile" problem, the MANs shares problems associated with poor telephone network infrastructure of local telephone authority While the satellite based WANs provide excellent communication between remote points irrespective of distance, reliability of intra-city communication in case of MANs are doubtful.

Distributed Data Processing Network

Distributed Data Processing Network consists of many geographically dispersed independent computer systems connected by a telecommunications network. It places the needed data, along with the computing/communications resources necessary to process these data at the end-user's location. DDP networks may be intended for the use of a single organization or many organizations. The possible DDP networks configurations include the star, and the ring arrangements. The Distributed Information Centres (DIC's) of the Biotechnology Information System (BTIS) consisting of 9 DIC's scattered in 7 cities of India is an example of Distributed Data Processing Network.

Gateways

Gateways consist of software and hardware that are required to interconnect networks amongst them. Gateways contend with any differences in packet sizes, protocols and addressing methods between the two networks it connect. Two similar LANs are connected by a type of gateway called a bridge. In such cases since the protocols used are same, there is no need to modify the contents or the format of the data packets as they pass from one network to the other. A bridge combines two similar LANs to make one larger network while retaining the individuality of each network in terms of performance reliability and security. Gateways are also used to connect LANs to WANs and WANs, in turn, can be linked through gateways to create national and international data communication networks.

The Videsh Sanchar Nigam (India) has commissioned the International Gateway Packet Switching System (GPSS) to serve as a reliable and economical public data transmission service. The system supports data traffic at speeds ranging from 300 bps to 9.6 kbps. A subscriber to GPSS can make a STD or local PSTN dial- up call to PADS (Packet Assemblers/Dissemblers) installed at the VSNL premises at Bangalore, Bombay, Hyderabad, New Delhi and Pune. The PAD, in turn, is linked to International data networks of many countries around the globe. Users can also take leased lines from customers’ premises to GPSS. The communications networks can be grouped into the following three categories based on the technology and communication media used by them:

- **Public Switched Telephone Network**

The Public Switched Telephone Networks (PSTN) are managed by common carriers usually telephone companies/departments the world over. The PSTN generally provide two basic services, the normal dial-up connections to the subscribers and permanent leased connection between two subscriber's points. Dial-up lines are often referred to as switched lines because the connection between two telephones requires a series of intermediate switches to be activated. The permanent leased connections provide single traceable line between two subscriber points. The leased lines are generally less prone to noise than dial-up lines.

The PSTN or common carriers can, however, be used for data transmission via MODEM. Simple dial-up connections can be used for low-speed asynchronous and synchronous data transmission up to 2400 bps. Leased lines can operate up to 2400 bps on asynchronous connections, and 9600 bps on synchronous lines.

- **Public Data Network**

Analogous to the public telephone network, many domestic common carriers provide data communications services via a specialized network called a Public Data Network (PDN). A public data network may provide circuit switching services and/or packet switching (PSDN) and, in future, may be expected to provide many other enhanced services. Examples of Public Data Networks include GTE Telenet, Tymnet, Graphnet, and Faxpac in US; Datapac in Canada, PSS (Packet Switching Service) in UK, Transpac in France, DDX and Venus in Japan, etc. Public Data Networks in the USA such as GTE Telenet and Tymnet are, in turn, interconnected to public data networks in more than 25 countries.

- **Integrated Services Digital Networks (ISDN)**

Advances in digital switching and transmission techniques have made possible Integrated Digital Networks and Integrated Digital Services Network (ISDN). An ISDN is a network that provides end-to-end digital connectivity to support a wide range of services, including voice and non-voice services. Users are provided access by a limited set of standard multi-purpose user- network inter-faces. It provides circuit switched 64 kbit/s digital connections. The network also incorporates packet switching capabilities and may also include, subsequently, circuit switched paths at bit rates higher and lower than 64 KBs.

3.5 International Data Communication Networks

National and International Telecommunications services, depending upon their scope and function, can be classified into common carriers, specialized common carriers or value-added carriers (VAN) categories. Common carriers provide large public telephone and telegraph networks and a broad range of services. Specialized common carriers often use broadband facilities such as microwave/satellite systems to offer public networks that provide a limited number of services. Value-added carriers generally use the telephone lines and transmission facilities of other carriers. Data is received, temporarily stored and organized into packets of characters, and then routed over high- speed leased channels to their destinations. There are also large organizations that are avoiding some of the facilities of local telephone companies and long-distance systems by establishing their own private bypass networks. Most of the international data communication networks used for online searching through remote terminals are value-added carriers. Various national and international networks are further linked to each other through gateways. Since this article focuses on computer communication networks, networks falling into the latter two categories are discussed here.

Most of the data networks rely on packet switching techniques first developed on ARPANET, a data communication network of the US Advanced Project Agency of the Department of Defence. Its purpose was to explore network design and to establish connections between computers at centres where ARPA sponsored research was being carried out. The Tymnet and the Telenet were amongst the first few data networks that started operating in North America in 1971 and 1975 respectively. Both the networks are value-added networks (VANs) because their owners lease transmission lines from AT&T (American Telephone and Telegraph Company) and add their own switching and communications facilities. Table 1 lists public switched data networks that are currently operational in different countries by dates of introduction (Wessler, 1983):

4.0 CONCLUSION

In this unit, you read the library automation and internet resources available in the libraries. The unit also educated you with the understanding of the data communication meaning in libraries

5.0 SUMMARY

In this unit, you have:

i. Learned data communication- the basic concepts; communication media; types of communication networks

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UNIT 2 ELECTRONIC STORAGE SYSTEMS

CONTENTS

1.0 INTRODUCTION

This unit will educate you with the understanding of the different types of electronic storage systems in libraries. This unit does not intend to make you an ICT expert but to help you explore the potentials of electronic storage systems and give you a working knowledge of what ICT can do to facilitate the storage of information resources in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- explainmeaning electronic storage systems and devices.
- discuss thetypes of electronic storage systems
- State the importance of electronic storage devices to libraries.

3.0 MAIN CONTENT

3.1 Electronic Storage Systems

Electronic storage is a set of administrative and Information Technology (IT) processes which allows documents to be stored on digital media, ensuring their legal validity and enforceability towards third parties. This service can be provided for documents that were originally created in digital format or for paper documents that have been previously dematerialized; for the latter, upon completion of the storage process, the paper medium can be sent for pulping. Any media, permanently attached or transportable, capable of storing electronic information.

Examples:

- hard drive
- CD-ROM
- DVD-ROM
- flash media
- "thumb" drive
- memory stick
- iPOD
- digital camera
- removable hard drive
- back-up tape
- PDA (Palm, Windows Mobile, etc)
- Cell phone

3.2 Main Features of Electronic Storage Systems

Generally, a Document Management and Storage System provide your documents a complete filing system, including storage space and security, making them easier to search for. Some document management and storage systems also have a scanning capability, which utilizes Optical Character Recognition (OCR) to create electronic, searchable forms of a physical document. While it may take a little bit of time to digitize all of the old paper documents, it is worth it as you will save more than enough time by not having to manually dig through cabinets anymore. Some other key features that are included in most document management and storage systems are as follows:

File Organization

Electronic document management and storage systems let you organize your documents into digital files and folders and reconstruct your old physical filing system into a digital arrangement. It shows how is it possible for software to help you seamlessly make a switch from a physical storage system to an electronic one. It allows you to create a file hierarchy replicating the physical filing system.

Text Search

One of the major benefits of going paperless and buying a document management system is being able to look for a file just by typing in the name of the file. With a search option that is text-based, the solution will go through the text of every file present in your system to quickly locate the document you are looking for.

Multiple Users

The sole purpose of document management and storage systems is not just file storage. In fact, a good solution will allow you to work together on documents and files across your organization. Various users will be given the permission to access, edit, and share files.

Remote Access

Most software options will create a back-up of your documents and files in the cloud so that you are able to access them no matter where you are, even if you are outside the office premises. Some document management and storage systems also have a mobile app which expands the accessibility of your files beyond computers to tablets and smartphones.

Built-In Compliance

While a lot of open-source choices are available for DMS software, a major reason you should go for a paid solution for your business is that they are designed with government compliance kept in mind.

3.3 Types of Storage Media

Storage media is the hardware in which information is physically stored. This differs from the storage device which is usually the docking bay for the storage medium. One example of a storage device would be your CD/DVD drive in which you place your disks when inserting them into your computer or your USB flash drive reader. Storage media would be the actual CD/DVD disk itself or the memory within your computer known as RAM (Random Access Memory). Storage media can be internal or external meaning that it can be either hard-wired to the computer (ex. hard drive) or it can be a separate physical storage facility that’s meant to be more mobile, (ex USB Flash Drive). Internal storage media is usually faster since it is hard-wired to the desktop or laptop and does not requires any extra space outside of the computer. On the other hand, external media is very mobile, can be transferred from one computer to another rather quickly, and is easily secured in a safe place separate from your main working station. On top of this the Non-Volatility of these storage medias have made them very valuable. Normally when a computer is shut down, any unsaved information is wiped clean from the RAM. Or if the information isn't being used, while the computer is still on, the RAM may delete it to make room for processes being recalled more frequently. Storage media on the other hand, saves data despite the computer being powered down and can only be deleted by the user. From this, storage media such as flash drives and data CD's are more commonly used for the user's wants and needs.

Magnetic Hard Drive

Storage Technology usually comes in three forms; magnetic, optic, and solid state. Some common magnetic storage systems are hard drives, floppy disks, and cassette tapes. Though cassette tapes don't work with computers, they use the same technology. This type of technology stores binary code using polar alignments on the magnetic medium and can change those alignments as needed when information is altered, deleted, or rewritten. The magnet does this by converting the binary code from 1's and 0's to positive and negative charges, respectively, which are recorded on an iron oxide film inside the media. Optics use laser beams which rely on marking the media. In this case, lasers burn in lines of data which represent the binary code it is converting. "Rewritable" media has also become a popular choice for those who want to reuse the same disk. Rewritable media relies on changing the reflectivity of the media instead of scarring it. When the binary number 1 is recognized, the laser alters the reflection of the discs surface in certain spots. Data is then separated by the pits in between reflectivity which represent the binary number 0 so that 1's alter the reflection and 0's leave the reflection of the media as is. This creates a "bouncing-wave" like appearance on the surface of the disk called an Amplified Spontaneous Emission or ASE for short. Solid State Drives, or SSD's as they are called, do not contain any moving parts such as lasers or magnetic heads. They operate electronically by storing the binary code as electrons which are either trapped or not trapped inside the flash memory cells within the unit. These types of media tend to be faster than the other two since they rely on electrical polarity within a cell instead of electronic motors to be read or rewritten. This also makes them more resistant to shock, allows them to run more quietly, and reduces the latency of the media. Typical storage media of this kind are "jump" drives or "thumb" drives, but some computers use this technology in their hardware as well.

Hard disks have many circular pieces called platters inside them. These platters have two sides are made up of tracks, sectors, and clusters. A cluster is a group of sectors, and a sector divides tracks into pie shaped sections. Each cluster, sector, and track is numbered in order to help the computer quickly locate where specific stored data is. For example, data can be saved to side 2, sector 1, track 5. A track can be compared to the grooves on a music record, because there are physical indents where the data is actually stored. Data is read and written by a read/write head, also commonly referred to as a “head.” Each platter has a head. When data is to be stored on a hard disk, the heads will align with the same track on every platter, and write the data across each one. There are a few measurements you can take to see how well a hard disk preforms.

The most important measurement is calculating seek time. Seek time will tell you how long it takes for a head to move from one track to another. The quicker the seek time the better because that would mean data can be reached faster.

Random vs SequentialAccess

When thinking of storage systems, one could presume that all of your data in one folder is located next to each other within the hard drive. This is false when talking about random access. With random access your information can be pulled from any location on the disk. Meaning, your one folder could have its data scattered about the physical hard drive. The benefit of this type of storage is that you could access data in any order. Think of it as your CD player, your favourite song ends and you want to hear it again just hit back and you instantly hear it again. It's fast and nearly instantaneous, unlike sequential. You could think of sequential access like a cassette within a cassette player. When a song finishes and you want to listen to it again, you must rewind the cassette, or if you want to skip a song you must fast forward the tape, this is used with magnetic tape drives which, are used for backup purposes. Even though in random access media devices may seem like data could be misplaced or somehow lost in the sea of data. When created, every file is given a unique name by the computer system, otherwise called addressable media, in order to keep tabs on all the data.

CDROM-Random Access

Random access and sequential access of data are two separate ways a computer can access data. Random access is the ability to access data in any given location within the hard drive, quickly and efficiently. Most computers use random access today because it saves the user time, as well as avoids confusion. Sequential access requires data being accessed in a sequence. Examples of sequential access would be: data on a disk file, or magnetic tape data storage. This can be useful to some users, if they are purposely attempting to process a sequence of data elements in order. However, this can also be time consuming for users who are trying to find a certain file on a disk or tape, which requires skimming through all of the data in a sequence. An example of a comparison between random access and sequential access would be the A-Z method. Sequential access would inquire the user to go through letters A-Z to achieve the goal of meeting point" Z"; whereas with random access, the user is able to jump directly to point "Z".

USB Stick, Storage Medium

The storage medium is a part of the storage system where the actual data is stored, such as on a DVD or a memory card. This medium can then be put into a storage device like a DVD player or phone to read this data. You usually find these two parts to be separate pieces, making the storage medium removable. Some storage devices can be found inside of the system unit, while others are plugged into an external port. There are letters on the storage device that go along with this that helps the unit to identify them.

These letters or words describe where these are and what they are used for. For example, when you plug in a USB into the USB port on the computer, while viewing this USB in “My Computer” you will see a letter next to it verifying what it is used for in the system unit. Storage devices contain primary and secondary memory. Primary memory is volatile memory, which means that when the device is shut off, the information is lost. Secondary is the exact opposite, being non-volatile in that the memory remains even if the computer is turned off. The problem with these devices is you must be cautious with how they are treated, especially if they have important information. Misplacing or mistreating can result in a loss of important data that could be impossible to get back depending on the circumstances.

The Cloud

Cloud storage, also referred to as "The Cloud", is simply the use of a remote storage device that is accessed by means of the internet. Cloud storage has seen a massive increase in popularity over the last few years, and the industry for it has grown substantially to the point where there are now hundreds of companies that offer a variety of cloud storage services. More specifically, some cloud services focus only on digital pictures or email messages, while other systems store all kinds of digital data. Some services, like Google Drive, allow users to save their files in one of many massive data centers Google operates where, for instance, multiple users can collaborate on projects by having access to the same file.

As the cloud’s popularity is growing, more and more businesses are transferring over to its storage capabilities. Many businesses are using the application as a backup program for their software and documents. By scheduling a set time for the computer to automatically transfer documents over, businesses can be sure that their information lies safely in the hands of the Internet without having to spend the tedious amount of time and cost of backing it up manually. Though the different applications of the cloud do sometimes have a monthly fee to pay, it is a small price to pay for the time and convenience it lends you. By utilizing

these applications, anybody is able to access their documents anywhere worldwide. An individual is no longer tied down to just one electronic device in one set area, but can instead revise a version of a document on their laptop and then pull it up at work for a presentation the next day. This is just one example of the hundreds of ways that the application can be used conveniently to meet your day-to-day needs. The cloud is connecting electronic devices all across the globe and making every day processes just a little bit easier.

Flash Memory

Flash memory is a type of storage device that uses electronic memory. Flash memory comes in a variety of ways and is known as a solid state storage device, meaning "there are not moving parts – everything is electronic instead of mechanical." Flash memory is used in many different devices, such as, computers, digital cameras, and mobile phones. Flash memory is a type of EEPROM chip. EEPROM stands for Electronically Erasable Programmable Read Only Memory. Inside of a flash memory chip is a grid of columns and rows with a cell. There are two transistors at each intersection and a thin oxide layer separates them. One transistor is known as a floating gate and the other one is known as the control gate. An electrical charge comes through the columns to the floating gate, which is called tunnelling. The electrical charge causes the floating gate transistor to act like an electron gun. When the electrons get trapped on the other side of the thin oxide layer, closer to the control gate transistor, they act like a barrier between the two transistors. A cell sensor monitors the level of the charge. If the flow is above the 50% threshold, it has a value of 1 and if it is less, the value changes to 0. This is how information/data is being read on the flash memory device. Nowadays, flash memory has become the "dominant memory type wherever a system requires a significant amount of non-volatile, solid state storage."

Embedded Memory

Embedded memory is becoming an increasingly popular type of flash memory due to its small, convenient size. In today's society these types of memory can be found in phones, cameras, gaming devices, and even handheld devices like a GPS. In July 2013, Samsung announced that they developed the world's fastest embedded memory. These new products will be available in the 16, 32, and 64 GB sizes and feature an interface speed of 400 MB/s. This will increase user's abilities to multitask and perform tasks such as file transferring, browsing, and gaming. It also decreases the amount of time it takes to boot and load applications. This is a key factor in mobile devices where the physical

space for additional storage or memory is limited. Memory cards are being used less and less when manufacturing mobile devices and smartphones. One limitation of the chip is the amount of memory it could store. The larger the chip, the more expensive the device is going to cost. Something else to consider is the problem that arises if the device breaks. Any valuable information that was stored on it is virtually irretrievable. That is one advantage of having a removable memory as discussed below.

USB flash drive

USB drives are the perfect devices for transporting data and files. They are easy to use and their portability makes them incredibly convenient. In addition to storing files, they can also be used to run portable apps. Certain applications can be turned into portable versions of themselves. You can have access to various software applications to use on any computer. Free programs exist to convert applications to portable ones to, in essence, create a portable PC on a thumb drive. USB drives range in storage capacity from 2 GB to 4 TB. With 4 TB of storage in such a portable size, the limits to their use are virtually endless.

USB drives can be password protected, or some can even be secured using biometric features, like a finger print. There are some concerns related to USB drive security. They can contain large amounts of information, and given their portability, they can be used for transporting files secretly. Anyone with access can simply plug a USB drive into a computer, copy files onto it, and remove them from the premises. USB drives carry an additional security risk in that they can contain malware that can be automatically launched using AutoPlay (which can be disabled) as soon as they are plugged in.

Remote Storage

Remote storage is there to expand the disk space without hard disks and isn’t connected to the computer directly but accessed through internet. That way you can access your files wherever you are, whenever you want, on your laptop or Smartphone or even a different computer. This is the basic concept of cloud storage. When you need to access a file, you open the file as usual but if thedata isn’t on your local volume, Remote Storage retrieves the information from a media library. When data is removed from a file, the logical size of the file remains but the physical size is reduce.

Being much faster and reliable than storage devices like CDs, DVDs, hard disks, and flash drives, an online remote storage provides protection against system errors like viruses, and enables one to recover lost data from any potential system crashes. Being critical to not only

businesses, but home computer users as well, an online storage provides low-cost and easily accessible security for data management and storage. To assure maximum security, many online companies automatically backup systems on a daily, weekly, or monthly basis, to an “electronic vault.” Also, unlike CDs or DVDs, using remote storage diminishes its vulnerability to damage and data loss. Living in today’s high-tech society, the online remote storage system is definitely a very essential, yet affordable tool to assure that the countless amounts of data being saved on devices is still remediable after a computer failure.

Floppy Disk

The floppy disk drive was invented at IBM by Alan Shugart in 1967. The first floppy drives used an 8-inch disk that was later called a "diskette" as it got smaller, which evolved into the 5.25-inch disk that was used on the first IBM Personal Computer in August 1981. The 5.25-inch disks were dubbed "floppy" because the diskette packaging was a very flexible plastic envelope, unlike the rigid case used to hold today's 3.5-inch diskettes.

The floppy disk is an archaic physical external storage device that is now obsolete. There might be some banks that still use this storage medium, but any business or person who is considered computer literate does not use this system to store information. The down sides to floppy disks are that they are not compatible with any device that is contemporary, their security is non-existent, and the storage capacity is low - usually with a maximum of 1.44MB. The last version of a floppy disk was released in 1987 by IBM.

Holographic Data Storage

Holographic storage utilizes photo-sensitive media and innovative laser beam technology as a means of computer storage. This new storage method has the ability to store 1,000 DVD's into this 4 square inch storage device. This is unlike previous methods of data recording, such as magnetic and optical hard drives, which involve a rotating disk or simple 2D lasers. Instead, holographic storage begins with a single laser that is split into two separate parts -- the signal beam (carries data), and the reference beam (reconstructs hologram when prompted). A spatial light modulator is used to encode data for the signal beam, followed by a conversion of electronic data into binary code. It is then arranged into a specific pattern of dark and light pixels (representing zeros and ones), consisting of >1 million bits each. The signal and reference beams intersect, and a holographic image is created through a 3D refraction that is etched into the media. Advantages include a safe, fast, reliable, and portable system of storage. Disadvantages include expense, limited

capacity, and recording fails. UV rays can also erase the data, which makes this method unstable in the long-term. Since the concept is still in its infancy, however, problems are expected to diminish greatly over time.

Optical Discs

An optical disc is a flat, circular disc that stores data and is made out of a very strong plastic called polycarbonate substrate. This helps to protect the disc with many layers of coating. Data on these discs are read optically, which means that they store data using laser beams. Data can be stored on one or both sides of the disc. The track, which is a single spiral around the disc, spins from inside the center track (or groove) to the outermost track for the data to be read. Most people today have already switched from VHS movies to DVD movies, and now to Blu-ray DVDs. The advancement in technology has made viewing and burning capabilities for DVDs and CDs much more beneficial. These optical discs do not degrade, like VHS and magnetic media do. Optical discs are used in our everyday lives for storage, backing up, photos, movies, music, and much more.

Read only discs are moulded and stamped to show the data so that it can only be read (and not over written). This happens with most CDs for music and software, and DVDs for movies. A recordable or rewritable optical disc with a CD or DVD uses a laser to represent the data. An example of this would be burning a CD for music, or an iMovie project to a DVD. There is a complex process that takes place when writing the data on the optical disc. To mould or stamp the discs, bumps (called pits) are formed on the disc's surface. The places that are not changed on the optical discs are called lands. Switching from a pit to a land represents a 1 (like discussed in the system unit). CD discs use infrared lasers, DVDs use red lasers, and Blu-ray discs use blue-violet lasers. These different types of lasers are used to store different amounts of data at a more compact size.

Optical drives are the machines that read the discs of CDs, DVDs, and BD drives. Many households have switched to Blu-ray DVD players. However, users are upset because only BD discs can be played on BD drives which is considered a hassle to some. These drives are also used to burn data on the discs.

Optical disks were invented in 1958 by David Paul Gregg, he patented them. James T. Russell was then the first person to have made a recording audio digitally to an optical disk. Later Sony and Phillips research physicists made the CD's we know today that can store large amounts of data. For this first generation of CD's they could hold up to

75 minutes of audio with 650Mb of storage. The purpose of the first generation was only for audio and computer software. They were capable of making a CD video but the VHS cassette was more popular at the time and it cost too much to produce them. These CD's were read with an infrared laser. Later the second generation could store even more data and was used for video. They were read with a visible laser light which allowed the lands a pits to be smaller thus creating more space to for more data. They allowed 4.7 GB of storage on a standard single disc. The third generations are being developed to create even more storage available, like a Blu-ray disc. The Blu-ray disc use blue-violet lasers. There is even a fourth generation to be discovered that could hold up to one terabyte of storage.

CDs, DVDs, and BDs

Read-only optical discs include CD-ROM, DVD-ROM, and BD-ROM discs. These are CDs or DVDs that come with something already pre-recorded on them and they cannot be cleared. This is because the pits that are moulded into the surface of the disc are permanent. There are also read-only discs for video games and different software. Recordable optical discs are also sometimes referred to as write-once discs. This means that these can be written to but the discs cannot be reused or erased. These include: CD-R, DVD-R, DVD+R, and BD-R discs. The difference between the DVD-R and the DVD+R is the standard being used. There is also a DVD-R DL and a DVD+R DL, which indicate whether or not it is dual layer. Using DVD+R will allow you to instantly eject the DVD without having to wait for the finalized version. It also allows you to record some of the DVD on a personal computer and some of it on the TV. Another feature is that is it 100% compatible with all DVD players. Recordable CDs are often used for backing up files, making music CDs, or sending large files to other people. BD-R discs are used for even larger backups that need even more storage and they are used for high-definition multimedia files.

Rewritable optical discs include CD-RW, DVD-RW, DVD+RW, and BD-RE discs. These can be written on and then erased and rewritten on. To rewrite on these types of discs they use phase change technology. So basically the rewriteable disc is coated with a metal alloy compound. They then use heating and cooling to write on the disc without making it permanent. These are used for backing up files but they are more convenient than recordable optical discs because they can be used multiple times.

4.0 CONCLUSION

In this unit, you learned electronic storage systems; the main features of electronic systems and the types of storage media such as Cloud, floppy disk, CD etc.

5.0 SUMMARY

In this unit, you have:

i. Learned the electronic storage systems

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UNIT 3 INTERNET AND WEB TECHNOLOGY RESOURCES

CONTENTS

1.0 INTRODUCTION

In the last unit, you read about the different types of electronic storage systems in libraries.In this unit, you will move a step further by reading and learning about the Internet and the World Wide Web. You will read about how computer has turned the world into a global village.

2.0 OBJECTIVES

By the end of this unit, you will be able to:

- give the brief history of the Internet
- describe the operation of the Internet
- describe the operation of the World Wide Web
- describe the classroom use of the Internet
- mention some of the problems and pitfalls of the Internet.

3.0 MAIN CONTENT

3.1 The Internet

The Internet, also known as the "Net", "Information Superhighway", and "cyberspace", is the collection of computer networks that links millions of computers and tens of millions of people worldwide. Computer on the Internet are linked together by a maze of interconnections sort of like a spider's web (Newby, Stepich, Lehman and Russel, 2000).

According to Williams and Sawyer (2005), the Internet - "the mother of all networks" is the heart of the Information Age. They describe it thus: The Internet (the "net") is a worldwide computer network that connects hundreds of thousands of smaller
networks.These networks link educational, commercial, non-profit, and military entities, as well as individuals.

O'Leary and O'Leary (2005) described the Internet as follows:

The Internet is often referred to as the Information Superhighway. In a sense, it is like a highway that connects you to millions of people and organizations. Unlike typical highways that move people and things from one location to another, however, the Internet moves your ideas and information. Rather than moving through geographical space, you move through cyberspace - the space of electronic movement of ideas and information.

These authors have actually put it succinctly what we ought to know about the Internet. The Internet can be seen as a 'liberator', 'instructor' and 'assistant' to every individual and corporate body that are conscious of providing and receiving information and utilizing these to influence positively the society in which we live.

The World-Wide-Web (w.w.w)

This is the multimedia part of the Internet. Williams and Sawyer (2005) stressed that the Internet has been around for more than 30 years but what made it popular, apart from e-mail, was the development in the early 1990s of the World-Wide- Web. They describe it as follows:

World-Wide-Web, usually called simply the "web" - and interconnected system of Internet computers (called *servers)* that support specially formatted documents in multimedia form.

Multimedia from "multiple media" refers to technology that presents information in more than one medium, such as text, still images, moving images, and sound.O'Leary and O'Leary (2005) stressed that the Web provides an easy-to-use, exciting multimedia interface to connect to the Internet and to access the resources available in Cyberspace.

In essence, the World-Wide-Web could be described as the 'distributor' of Internet services. The web is composed of many separately administered computer networks links.

Features of Computer Telecommunications

Computer telecommunications and the Internet have a number of applications. The three most common features are electronic mail (e-mail), information retrieval, and information publishing.

Electronic Mail (e-mail)

Simply referred to as 'e-mail', electronic mail is the most widespread of computer telecommunications. It is analogous to postal mail but much faster and more versatile. It allows private messages to be sent from individual to other individual or from individual to groups. An e-mail message travels from the sending computer to the receiving computer, usually in seconds to minutes, it is stored in the receiver's electronic mail box until he is ready to access it. Once the message has been received, it can be stored, printed, replied to or forwarded to someone else. If the message is no longer needed, it can be deleted.

To send e-mail to someone on the Internet, you must have access to mail services on a computer linked to the Internet. This should be a known person's *e-mail address.*Just as you have postal mail address, everyone on the Internet has e-mail address. e.g., kunlealabi@yahoo.com.

A typical e-mail message has three basic elements: the header, message and signature. The *header* has the following information:

- *Addresses:* Addresses of the persons sending, receiving, and optionally anyone else who receives copies. E-mail has twobasic parts: User's name and domain name, which includes the domain code. e.g., pmlang@lec.edu (pmlang- user's name; lec.edu - domain name, edu - domain code showing it is an educational institution). Other domains are: gov (government), mil (military), net (network) org (organization). Countries also have similar domain, e.g. fr (France), uk
  (United Kingdom), ng (Nigeria), etc. Let us see an illustration as shown below User Name

(User ID) Domain Name

James Brown@woodgrave.net.us

Domain Top-level domain Country (location) (domain type)

- *Subject:* a one-line description used to present the topic of the message. Subject lines are displayed when a personchecks his mail.
- *Attachments:* Many e-mailsallow attachment of files such as documents and worksheets. If a message has anattachment, the name of the file appears on the attachment line.

The letter or message comes next. It is usually short and straight to the point. The *signature line* provides additional information about the

sender, which includes the sender's name, address and telephone number.

Unsolicited e-mails are called *spam.* They are distractions and nuisance and can be dangerous. *Computer viruses* or destructive programmes are often attached to spam. You should not open them.

3.2 Information Retrieval

Information retrieval, especially for education, is one of the most important uses of the Internet. A source of information resources on the Internet is the World Wide Web (www or the web). It consists of millions of sites of information displayed in hypermedia format; it aids formatted text, graphics animations, audio and video. Through the Web one can visit any place, tour the Library of Congress, find information and topic imaginable. All these are accessible through a simple point-and-click mouse interface familiar to users of graphical operating system.

The software programme that issued for accessing the Web is known as a *browser.* The two most popular browser programmes today are Netscape Navigator or Microsoft Internet Explorer.

Browsers allow navigation of the Web, bookman favourite sites, control how the Web pages are displayed, and manage the behind-the-scenes interaction that take place in retrieving Web information.

Information on the Web is organized in units called *Web pages* which are similar to printed documents. A website consists of interrelated pages usually operated by a single entity (e.g. a company, organization, school or individual). The preliminary page for a particular site is called a *Home Page.* Most pages on the site contain links to other information. To access information, the user simply clicks on the *hot link,* which is usually presented by text, a picture or an icon.

Every site on the Internet has a unique address called URL (Uniform Resource Locator). You can switch to any page on the Web by entering its URLs in the browser location window.

To help you find information, a number of *search engines* are available. Search engines are sites on the Internet that maintain databases of Website that you can search to locate information on the Internet.

Search Service	**Site**
Alta Vista	www.altavista.com
Examples of search engines are	
Excite	www.excite.com

Google	www.google.com
Northern Light	www.northernligh. Com
Teoma	www.teoma.com
Yahoo	www.yahoo. Com

Source: O'Leary and O'Leary (2005): Computing Essentials p. 41.

The search engine provides two different approaches.

- *Keyword search:* Here, you enter the keyword or phrase reflecting the information you want. The search enginecompares your entry against its database and returns a list of hits, or sites that contain the key word.
- *Directory search:* Most search engines also provide a directory or list of categories of topics such as Finance, Sports,Health and News. In a directory search, known as an index search, you select a category or topic that fits the information that you want. Another list of subtopics related to the topic you selected appears. You select the subtopic and another subtopic list appears. You continue to narrow your search in this manner until a list of Web sites appears. This list corresponds to the hit list previously discussed.
- *Metasearch engines* are programmes that automatically submit your search requests to several engines simultaneously.The metasearch engine receives the results, eliminates duplicates, orders the hits, and then provides the edited list to you. Examples are:

Metasearch Service	**Site**
Dogpile	www.dogpile.com
Ixquick	www. ixquick. com
Mamma	www.mamma.com
MetaCrawler	www.metacrawler. com
Profusion	www.profusion.com
Search	www. search. com
Vivisimo	www.vivisimo.com

Source: O'Leary and O'Leary (2005): Computing Essentials p. 42.

Specialized Search Engines- focus on subject-specific Web sites. It saves time by narrowing your search. Examples are:

Topic	**Site**
Environment	www.eco.web.com
Fashion	www. infomat. com
History Law	www.historynet.

	com/guide
Medicine	www.medsite.com

Source: O'Leary and O'Leary (2005): Computing Essentials p. 43

3.3 Information Publishing

Web is now being seen as a place to display information for others to view and/or retrieve. Many libraries have created their Websites, which librarians, users, often use for display of resources as well as for dissemination of information about the library activities.

Web pages are written in Hypertext Markup Language (HTML). HTML documents can be created using any text editor, such as word processor. There are other available tools for developing Web pages, e.g. Adobe Page Mill, Netscape Composer, Microsoft FrontPage, etc.

3.4 History of the Internet

The Internet was launched in 1969 with ARPANET. It consists of the actual physical network made up of wires, cables and satellites. Being connected to the network is often described as being *online.*

The Web was introduced in 1992 at CERN. The Web (www or World-Wide- Web) provides a multimedia interface to Internet resources.

3.5 Common Uses of the Internet

- Communication - the most popular Internet activity.
- Shopping - *cybermalls* provide access to variety of stores.
- Searching - *Virtual Libraries* provide access to a variety of resources.
- Entertainment - music, movies, magazines and computer games.
- Education - e-learning or taking classes online.
- E-mailing other teachers in similar positions to exchange ideas and reduce teacher isolation.
- Assessing on-line databases of teaching methods, strategies and instructions.
- Gathering up-to-date content from the Internet to plan and carry out lessons.
- Setting up a home page to let parents and the community members know about activities, children's homework and assignment, upcoming field trips and so on.
- Using e-mail for pen-pals exchanges with users at other locations to learn more about other places and cultures or to practice a foreign language.
- Exchanging information resources with users at other locations.

- Sharing data from science experiments conducted at many locations.
- E-mailing teachers to ask questions, get help, submit work and so on.
- Conducting research using resources available on-line.
- Publishing class projects on the World-Wide-Web for access by other users, parents and members of the community.

SELF-ASSESSMENT EXERCISE

i. Give a definition of the Internet.
ii. Give a definition of the World-Wide-Web
iii. Name the features of Computer Telecommunications.
iv. Give two examples each of the uses of the Internet by the teachers and the students.

3.6 Problems and Pitfalls

Much as computer telecommunications open many new frontiers and exciting avenues for teachers and students, it is not yet 'uhuru'. There are technical details that have to be mastered. The major problem is that computer telecommunications requires many separate components to work in concert: the computer, modem or network adapter, communication software, telephone or network line, and remote computer. These do not co-operate with one another sometimes.

Many librarians are excited by the opportunities available through the Internet but there is the need for caution. Web resources available may accomplish little educationally. Librarians should, therefore, think of productive way of using the Internet. Time should be spent to locate useful resources in advance. This will make Interne-based activities meaningful.

Librarians should help users on how to evaluate information they find on the Internet. Close supervision is also necessary if Internet is available to users especially the young ones as they might digress from the educational purposes.

SELF-ASSESSMENT EXERCISE

i. State some pitfalls of the Internet.
ii. Suggest **two** solutions for these pitfalls.

4.0 CONCLUSION

You have read this unit on Internet and the World-Wide-Web. You have learned about the history of the Internet and the Web, the uses of

Internet by librarians and users, and the problems and pitfalls of the Internet.

5.0 SUMMARY

In this unit, you read about

i. the history of the Internet and World-Wide-Web.
ii. the operation of the Internet and the World-Wide-Web
iii. the features of the Internet
iv. the problems and pitfall of the Internet.

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UNIT 4 IMPACT OF ICT TO LIBRARY AND INFORMATION SERVICES

CONTENTS

1.0 INTRODUCTION

This Unit will educate you with the understanding of the impact of ICT to library and information services. This unit does not intend to make you an ICT expert rather to help you explore the impact of ICT and give you a working knowledge of what ICT can do to facilitate the provision of information resources and services in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to understand

- The impact of ICT on library collection.
- The impact of ICT on library staff
- The impact of ICT on library users

3.0 MAIN CONTENT

3.1 Impact of Ict To Library and Information Services

Rapid advances in ICT have brought revolutionary changes in the concepts, organization, functioning and management of libraries. The impact of these changes is affecting all the aspects of library operations, information resources and services, staff skills requirement and users expectations. Some of the notable impacts on libraries, staff, and users are:

1. **Impact of ICT on Library Collection:** Library collection goes beyond the print materials and includes the CDs/DVDs,audio & video cassettes, e-books e-journals and e-databases. The traditional paper as a medium of storage is getting replaced with electronic media. In India, many national and international origin library management software (i.e., Ventura, LibSys, E-

Granthalaya, Library Manager, SOUL etc. commercial software and Koha, NewGenLib etc. Open Source Software) are available for library automation. In India, UGC-INFONET, DELNET, and INDEST etc. consortiums are in action. Internet technology provides a wide scope for communication and information search across the globe.

2. **Impact on Library Staff:** Information and communication technology has changed the duties, responsibilities, andfunctions of the library professionals. The changing environment forces the librarian to become ICT skilled, dynamic, ready to accept the changes and challenges and outfit the requirements of library users, because, without change, management of library could not be survived.
3. **Impact on Library Users:** Library users can remote access the worldwide information through their desktops without anytime and distance limitations (24 x 7 x 365 days). Current users need to possess basic technical skills to access the information in electronic media. In the age of technology, users have multiple sources of information such as the Internet, commercial and non-commercial information service providers. As a result, the library is not the only source of information provider for users
4. **Impact of ICT on Society:** Development in ICT have brought about the merger of the computing, information,Communications, entertainment, and mass media industries thereby providing a means of exchanging information anytime, anywhere in the digital format used by computers. This technological convergence has brought about an enormous impact on the way we live, work, think and play. These changes are quite prevalent in our everyday lives such as the use of e-mail and cellular phones at home and in the workplace and also linked to all facets of society: business, education, military, recreation, transportation, communication, scientific exploration, knowledge management, etc.

5. **Impact of ICT to Change the Scenario of Libraries**: ICT has changed the nature of academic libraries. A variety of termssuch as hybrid, digital and virtual library are used to refer to the academic library. A digital library can be defined as a "Managed collection of information with associated services where the information is stored in digital format and accessible over a network". The virtual library has been defined as "Remote access to the content and services of libraries and other information resources, combining an on-site collection of current heavily used materials both print and in electronic form with an electronic network which provides access to and delivers from the external worldwide library and commercial information and knowledge sources. Hybrid libraries are libraries that provide access to both

electronic resources and paper-based resources". From the definitions, it is clear that most of today's academic libraries fall in the hybrid category. The internet has made information access and retrieval both simple and complex. Information retrieval systems are being designed to suit the need of end users and therefore try to simplify the process. Simultaneously however the user is overwhelmed with so much information resources and choices that the process becomes complex.

- ICT made information creation in digital format possible.
- ICT made online access and file transfer possible.
- ICT made networking and sharing of information resources possible.

The shift from print to digital information has a high impact on libraries, information centers and other institutions directly involved in processing information. This shift is generally attributed to the merging of computing, telecommunications technologies, and other industries. Computers have permeated society because of their ability to perform high volume error-free repetitive tasks at speeds much faster than human beings, while recent and emerging developments in the area of computing; telecommunications, networking and resource sharing made access to information anytime, anywhere possible.

With the developments and application of ICT, the whole scenario of libraries has changed. There is a shift from traditional libraries to hybrid libraries. We see the emergence of libraries with different nomenclatures operating in the universe of knowledge. These libraries are automated libraries, electronic libraries, digital libraries or ubiquitous virtual libraries. In the web environment there has emerged the concept of Library 2.0. All these libraries are using different information technology applications for performing activities ranging from the acquisition of materials to the dissemination of information.

6. **Impact of ICT on Library Collection Management**: In this age of information explosion electronic resources has made collection management a very complex and challenging task. There is a budgetary constraint, numerous formats, everchanging user needs. Collection management implies involvement in tasks such as analysis of needs, negotiation of contracts and evaluation of resources:

Electronic Resources: ICT has fundamentally changed academic/college library collections. Forever gone is theera when academic library's physical collection determined its stature. In the modern networked technological era, the emphasis is shifted from ownership of physical resources to access electronic resources that are globally accessible.

E-Journals: The e-journal can be defined as a version of the traditional print or paper-based journal which isdisseminated electronically in some form or other directly to the user. Since its inception in 1665 the printed journal remained the primary vehicle for communication among academics and researchers but there had been major increases in the cost of journal subscription during the last decades. Between 1986 and 1996 the average increase per journal subscription had been 147%. The advent of the internet transformed publishing radically made it possible to publish cheaply. The Internet also made access universally available.

E-Books: E-Books are essentially published books and reference materials that were digitized and are distributedelectronically. From a library point of view, e-books are cost saving in terms of shelving, binding, circulation, overdue notices and management of fines. Other advantages are on-line availability, keyword searching capability, etc.

7. **Impact on Library Users:** library staff has a good understanding of the tremendous value of printed and electronicresources available to students at academic libraries. New generation library users have a preference for electronic resources rather than print resources. They want:

- All resources should be available in full text and printable
- The library service should be fast and easily accessible
- 24/7 hours availability of library services
- All library transaction should be online

Effects of these developments on the user community

- Increases the level of technology literacy
- Increases demand for better and faster access to information
- Aggravates discrepancies between the information rich and information poor.

Exposed to different applications of technology in their life, users nowadays are more adept at its use and are expecting to have access to it in their times of need. In libraries, users that are knowledgeable in using computers and the Internet for their research demand nothing less than a computer with Internet access. However, this may not be true and not applicable to those who have no access to such technologies due to financial difficulties. Thus, two different kinds of users have emerged that libraries must cater for: the “haves” and “have-nots”. Ideally, a balance must be maintained in providing services for both groups so that all users will have equal access to information. This can be effectively done through the use of powerful and appropriate technologies.

8. **Impact of ICT on LIS Professionals or Librarians:** The computer and IT has brought in a new impact on the

libraryservices and information usage. In libraries, ICT has assisted library and information science professionals to provide value-added services and give more remote access to available information resources. Information and communication technologies provide faster retrieval of stored information and reform our traditional library to a modern library. Recent ICT is impacting on various facets of libraries and the information profession. Advancements in ICT and the widespread use of ICT are resulting in digital information sources and digital media replacing and becoming the dominant form of information storage and retrieval. Information and communication technology also survives and makes true rules of Library Science "Every reader his/her book/information", "Save the time of the reader", "Library is a growing organism". Information and communication technology with its great information sources, fast transmission speed, and easy access guarantees the satisfaction of the user with multifaceted demand, overcome the distance barrier and reduced the time required and guarantee the right information to the right reader at the right time. It also rises and resolves the library's demand for collection development. It is really an outstanding tool for information centers or libraries. ICT has created complex challenges for Librarian or LIS professional they have to redesign their positions to meet evolving needs. Librarians or LIS Professionals have to manage the change by adopting the latest ICT, thereby improving performance. They need to improve the skills and knowledge of new information and communication technologies to provide quality library services.

3.2 Changing Role of the Librarian in the ICT World

At present dynamic turbulent world, the role of the librarian is accepting to new information & communication technologies, information resources, and users' demands. Librarian is responsible not only to provide traditional library information services but also to fast deliver online/offline information services according to the actual user's needs. The librarian needs to keep up with their users' demands to survive and service them. The librarian needs to become information knowledge navigators who distill data into usable information. Today, the Librarian has to play multiple evolving and expanding roles to face many new challenges in the dynamic ICT environment.

- Librarian as a leader
- Librarian as a two-way communicator
- Librarian as an identifier
- Librarian as an information collector
- Librarian as an information organizer
- Librarian role of information retrieval
- Librarian as a website designer

- Librarian as an information analyst
- Librarian as a researcher
- Librarian as a knowledge manager
- Librarian as an information scientist in electronic/digital libraries
- Librarian as an e-resource manager
- Librarian as an information disseminator.

4.0 CONCLUSION

In this unit, you read the changing role of the Librarian in the ICT world; the impact of ICT to library and information services.

5.0 SUMMARY

In this unit, you read aboutthe different roles a Librarian has to play in other to face the challenges in the dynamic ICT environment.

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MODULE 4 CHALLENGES AND PROSPECTS OF APPLICATION OF ICT IN LIBRARIES

This is the last module in this course, by now you must be well acquainted with the significance of information and communication technology to library services. It is very important that as a librarian, you know the ethical issues for applying ICT in libraries, the ethical challenges on information technology. As librarians you don not disclose what information a user came to research on to another user.

Unit 1 Ethical issues and Consideration for applying ICT in Libraries
Unit 2 Challenges of ICT application in Nigerian Libraries

UNIT 1 ETHICAL ISSUES AND CONSIDERATION FOR APPLYING ICT IN LIBRARIES

CONTENTS

1.0 INTRODUCTION

This Unit will educate you with the understanding of the ethical issues and consideration for applying ICT to Library and information services in libraries. This unit does not intend to make you an ICT expert rather to help you explore the ethical concerns about ICT and give you a working knowledge of what ICT can do to facilitate the provision of information resources and services in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you will be able to:

- The ethical issues about ICT application in libraries.
- The consideration for applying ICT on libraries.

3.0 MAIN CONTENT

3.1 Ethical Issues and Consideration for Applying ICT in Libraries

According to Cyert and March (1992) Ethics and morals are synonymous. Ethics is derived from Greek while morals are derived from Latin. They are identical terms referring to ideals of character and conduct. These ideals, in the form of codes of conduct become the criteria for distinguishing between right and wrong". Ethics is therefore the same thing as morality and they shape our conduct and behaviour right from childhood through adolescence and adulthood. In every aspect of life our conduct and behaviour is guided by what we were taught to be right or wrong. Heynes (1986) is of the opinion that ethics has to do with the actions of man. Consequently, itrequires adjustments in the actions and attitudes of the individual in whatever context in relation to his environment as well as in relation to himself. He notes that ethics are basic perceptions of the relative importance of our elements of existence. These perceptions always have to do with priorities, whereas norms are the function by which direct evaluation of human attitudes and actions is made possible.

Ethical Issues in Information Technology

Before now, business success was built on the ability to move goods and services with speed and accuracy. Today, information has become the fuel that propels business success. Information technology has been defined as the processing and distribution of data using computer hardware, software, telecommunications and digital electronics. As noted by Carbo (2006) ethical considerations for ICT related issues first appeared under the topic ''information ethics'' in the Annual Review of Information Science and Technology in 1992. This suggests that there is an ethical agenda associated with the use of ICT. Individuals and organisations therefore need to be ethically sensitive as they deploy ICT on their operations. The impact of ICT on human relationship has been tremendous. ICT has helped to enhance family relationship (e.g. mobile phones, palmtops, laptops, virtual conferencing and so on), as well help to separate family and friends from each other. ICT has enabled new friendship and relationships in virtual communities. How genuine are such relationship? What does it portend for individual satisfaction? In the workplace for instance, new kinds of jobs are being created such as data miners, web-counselors etc, but these opportunities are also endangered by problems of unemployment from computer replacing humans. A wide range of new laws, regulations, rules and practices are therefore needed if society is to manage these workplace and other changes and development brought about by ICT. Thus the society need to consider the following ethical and social challenges related to ICT use: Recognition for personal and corporate ethics associated with ICT.

In the rapidly changing technological environment in which we live; ethical issues are increasingly been raised, demanding attention and efforts towards resolution. Of particular interest for us and the information society are those related to information communication technologies (ICTs). The explosive growth of ICT and the use of its enabling technologies have had major impacts on society and thus raise serious ethical questions for individuals and organisations. These issues have been raised to a new and often perplexing level which has greatly affected the society in various ways. The pressing issues raised by ICT include the invasion of individual and corporate privacy, intellectual property rights, individual and societal rights, values preservation and accountability for the consequences arising from the use of ICT, etc.These issues have thrown up important challenges in the area of employment; working conditions and individuality. However, not much progress has been made in addressing these issues and challenges associated with ICT.

According to Fielden, (2004), Information Technology (IT) has a central role in commerce, industry, government, medicine, education, entertainment and society at large. Its economic and social benefits hardly need explanation. But like any other technologies, IT also has problematic implications and some negative impacts on our society. It poses and creates some problems related to ethics and contains in general three main types of ethical issues: personal privacy, access right, and harmful actions. In terms of personal privacy, IT enables data exchange of information on a large scale from anybody, on any locations or parts of the world, at any times. In this situation, there is increased potential for disclosing information and violating the privacy of any individuals and groups of people due to its widespread disseminations worldwide. It is our challenge and responsibility to maintain the privacy and integrity of data regarding individuals. This also includes taking precautions to ensure the accuracy of data, as well as protecting it from unauthorized access or accidental disclosure to inappropriate individuals.

The second aspect of ethical issues in computing systems is access right. Due to the current popularity of international commerce on the Internet, the topic of computer security and access right has moved quickly from being a low priority for corporations and government agencies to a high priority. This interest has been heightened by computer break-ins at places like Los Alamos National Laboratories and NASA in the US. Many attempts of such illegal access to United States government and military computers by computer hackers have been widely reported. Without implementation of proper computer security policies and strategies, network connections on the Internet cannot be made secure from illegal accesses (Grimesm Fleischman & Jaeger 2009).

Grimes, Fleischman & Jaeger (2009) notes that in computer ethics, harmful action means injury or negative consequences, such as undesirable loss of information, loss of property, property damage, or unwanted environmental impacts. This principle prohibits use of computing technology in ways that result in harm to any of users, the general public, employees, and employers. Harmful actions include intentional destruction or modification of files and programs leading to serious loss of resources or unnecessary expenditure of human resources such as the time and effort required to purge systems from "computer viruses. We shall also examine other specific ethical issues arising from IT below;

Plagiarism

Plagiarism is where the work of others is copied, but the author presents it as his or her own work. This is a highly unethical practice, but happens quite frequently, and with all the information that is now available on the Internet it is much easier to do and is happening more often.

Information and copyright

Education

Commerce and industry are certainly arenas in which the Internet has had a profound effect, but what of the foundational institutions of any society—namely, those related to education and the production of knowledge? Here the Internet has had a variety of effects, some of which are quite disturbing. There are more computers in the classroom than ever before, but there is scant evidence that they enhance the learning of basic skills in reading, writing, and arithmetic. And while access to vast amounts of digital information is convenient, it has also become apparent that most students now see libraries as antiquated institutions better used for their computer terminals than for their book collections. As teachers at all education levels can attest, students typically prefer to research their papers by reading online rather than wandering through a library's stacks. In a related effect the Internet has brought plagiarism into the computer era in two distinct senses. First, electronic texts have made it simple for students to “cut and paste” published sources (e.g., encyclopaedia articles) into their own papers. Second, although students could always get someone to write their papers for them, it is now much easier to find and purchase anonymous papers at Web sites and to even commission original term papers for a fixed fee. Ironically, what the Internet gives, it also takes away. Teachers now have access to databases of electronically submitted papers and can easily compare their own students' papers against a vast

archive of sources. Even a simple online search can sometimes find where one particularly well-turned phrase originally appeared.

Piracy

Piracy, the illegal copying of software, is a very serious problem, and it is estimated that approximately 50% of all programs on PCs are pirated copies. Programmers spend hours and hours designing programs, using elaborate code, and surely need to be protected. Although some might argue that some pirating at least should be permitted as it can help to lead to a more computer literate population. But, for corporations, in particular, this is a very serious issue, and can significantly damage profit margins (White 2002**).**

File sharing

Users and students have been at the leading edge of the growing awareness of the centrality of intellectual property in a digital age. When American college student Shawn Fanning invented Napster in 1999, he set in motion an on-going legal battle over digital rights. Napster was a file-sharing system that allowed users to share electronic copies of music online. The problem was obvious: recording companies were losing revenues as one legal copy of a song was shared among many people. Although the record companies succeeded in shutting down Napster, they found themselves having to contend with a new form of file sharing, P2P ("person-to-person"). In P2P there is no central administrator to shut down as there had been with Napster. Initially, the recording industry sued the makers of P2P software and a few of the most prolific users—often students located on university campuses with access to high-speed connections for serving music and, later, movie files—in an attempt to discourage the millions of people who regularly used the software. Still, even while some P2P software makers have been held liable for losses that the copyright owners have incurred, more-devious schemes for circumventing apprehension have been invented. The inability to prevent file sharing has led the recording and movie industries to devise sophisticated copy protection on their CDs and DVDs. In a particularly controversial incident, Sony Corporation introduced CDs into the market in 2005 with copy protection that involved a special viruslike code that hid on a user's computer. This code, however, also was open to being exploited by virus writers to gain control of users' machines.

Hacking

A hacker is an individual who is knowledgeable enough to gain access without authorization to computer systems to identify security flaws. Hackers break into, or 'hack' into a system. Hacking can be undertaken

for a variety of reasons, such as the wish to damage a system or the wish to understand how a system works, so that money can be made out of it. Alternatively, there might be a desire to alert people to the fact that a system is insecure and needs improving. Due to this some argue that there are 'hacker ethics'. Hacking can present a moral dilemma. This is because 'reformed hackers' sometimes offer their expertise to help organisations protect themselves against other hackers. Hackers cannot just wander into a system, as they could into an unlocked door. Instead, it requires a lot of skill. With this skill hackers can demonstrate that a system is insecure and needs improving. In this way, it could be argued that hackers play a valuable role. Many argue that hacking might lead to some improvements, but that it causes such a lot of disruption that it is not worth it in the long-run (McCarthy, Halawi ., Aronson, 2005)

Computer crime

By some estimates the personal records of about 73 million people in the U.S. were accidentally disclosed, lost, or stolen in 2006. In one high-profile case, a burglary at the home of an employee of the U.S. Department of Veterans Affairs resulted in the theft of a computer that contained personal data on more than 26 million current and former members of the U.S. military. The computer was later recovered, its data apparently untouched by the thieves, who had not realized what they had taken. There were fears that millions of other people might not be so lucky, however. In many cases the lost information included credit-card and Social Security numbers, which fuelled concerns that stolen information could lead to widespread consumer fraud. In an 18-month period during 2005–06, well over 200 different security breaches at companies and government agencies were reported. As a result, credit-card issuers tried to reduce their vulnerability by pressuring companies that handled credit-card transactions to comply with strict new credit-card security standards that were backed by Visa and MasterCard. As the year ended, it appeared that identity theft had not risen to the level suggested by the amount of personal information that had been compromised, but there was no way to know whether identity thieves were simply biding their time before they used the information to steal money through bank or credit-card accounts. Perpetrators of identity theft who had been caught recounted the ease with which they cashed in on stolen information. Thieves typically stole identity information when it was inadvertently disclosed or through "phishing" schemes, in which they used e-mail to persuade people to submit a credit-card number or other personal information to a fake Web page that pretended to represent a real business. Using a stolen credit-card number, the thieves then transferred money to themselves from a victim's account or purchased goods by using the victim's identity. The scope of the theft efforts was huge; in a single month more than 17,000 phishing attacks

were reported to volunteer groups trying to prevent identity theft. Many different computer crimes are committed, which clearly poses ethical questions for society. Various illegal acts are performed on computers, such as fraud and embezzlement. This includes, for example, using imaging and desktop publishing to create, copy or alter official documents and graphic images. There are also various ethical dilemmas, such as whether copying such files is as bad as stealing something.

Malicious Codes

Malicious code attacks include a number of types of computer programs that were created with the intention of causing data loss or damage. The three main types of malicious code attacks are Viruses, Trojan horses, and Worms.

A virus is malicious software that is attached to another program to execute a particular unwanted function on a workstation. An example is a program that is attached to command.com (the primary interpreter for Windows systems) and deletes certain files and infects any other versions of command.com that it can find.

A Trojan horse is different only in that the entire application was written to look like something else, when in fact it is an attack tool. An example of a Trojan horse is a software application that runs a simple game on a workstation. While the user is occupied with the game, the Trojan horse mails a copy of itself to every address in the user's address book. The other users receive the game and play it, thereby spreading the Trojan horse to the addresses in each address book. Viruses normally require a delivery mechanism, a vector, such as a zip file or some other executable file attached to an email, to carry the virus code from one system to another. The key element that distinguishes a computer worm from a computer virus is that human interaction is required to facilitate the spread of a virus.

Worms are self-contained programs that attack a system and try to exploit a specific vulnerability in the target. Upon successful exploitation of the vulnerability, the worm copies its program from the attacking host to the newly exploited system to begin the cycle again

A virus consists of a set of instructions that attaches itself to other computer programs, usually in the computer's operating system, and becomes part of them. In most cases, the corrupted programs continue to perform their intended functions but surreptitiously execute the virus's instructions as well. A virus is usually designed to execute when it is loaded into a computer's memory. Upon execution, the virus instructs its host program to copy the viral code into, or “infect,” any number of other programs and files stored in the computer. The infection can then transfer itself to files and code on other computers through magnetic

disks or other memory-storage devices, computer networks, or online systems. The replicating viruses often multiply until they destroy data or render other program codes meaningless. A virus may simply cause a harmless joke or cryptic message to appear on a computer user's video monitor each time he turns on his computer. A more damaging virus can wreak havoc on an extremely large computer system within a matter of minutes or hours, causing it to crash and thereby destroy valuable data.

Clearly writing and spreading virus programs are unethical acts; they have very serious consequences, and cause systems to crash and organisations to cease operating for certain periods. One of the most concerning consequences of such actions is when viruses interrupt the smooth functioning of an organisation which could in extreme cases even cause people to die. Logic bombs are also sometimes planted. There is obviously a lot of anti-virus software on the market now though that helps to deal with this ever-growing problem.

Ergonomics/health issues

There are many ergonomic/health issues related to I.T. Responsible/ethically-minded employers will, hopefully, give due consideration to this, as indeed should all employers. This includes issues such as the importance of taking adequate breaks from using the computer and ensuring that the screens comply with the regulations. Also, ensuring that the positioning of the chair and the computer is appropriate for the user and providing foot rests, when required. Some organisations will give special advice to their employees on these matters. Without such ethical/moral awareness and taking the necessary action, many workers will suffer health problems directly from I.T., such as back problems, eyestrain and eye infections and repetitive strain injury (RSI).

Job Displacement/Work Pressures Imposed On Computer Professionals

Computers are changing the face of the work scene. For some people, their jobs are becoming redundant or they have to play quite different roles, and others are suffering increasing levels of stress from work pressures. Others are, obviously, reaping the benefits of having more rewarding jobs, and there is certainly more emphasis on knowledge, information and I.T. skills than ever before. However, this all clearly poses various ethical issues. Should those that lose their jobs be compensated? How can the pressure be eased on those that are suffering stress? Is it acceptable for computer programmers to be made redundant ‘on the spot’ etc? There are many ethical issues that need to be addressed here.

Digital divide

The digital divide poses a serious problem today. A new breed of haves' and 'have nots' are being created, between those that have access and can use a computer and the Internet, and those that do not have such access. There are clearly serious ethical implications here. Those that do not have such access may well be discriminated against, feel 'socially excluded' and miss out on many life opportunities.

3.2 Ethical Challenges on Information Technology

As much as information technology is important to our lives, it is facing some serious ethical challenges, and it is up to the IT experts and users of information technology to be ready for these challenges. As more emerging information technologies pop up on the market, most of the IT experts and users do not know how to go about the challenges brought by these technologies. Information technology is facing one of its biggest challenges which are lack of privacy, security, copyright infringement and increased computer crimes. This has stimulated criminals to exploit users of IT basing on the lope holes left in these technologies. Since information technology speeds the access and flow of information, many businesses and organizations are at risk of losing this data because experienced criminals can easily tap that information for their personal use. Also unfaithful employees can use information technology to archive their personal goals which might be harmful to an organization. IT is not bad by its self, but the way humans use the tools provided by information technology has brought some serious challenges**.**

Below are some issues on ethical challenges of information technology

1. **Security:** With tools like the internet, hackers have found it very easy to hack into any computer or system as long asit is connected on internet. Hackers can easily use an IP (Internet Protocol) address to access a user's computer and collect data for selfish reasons. Also the wide spread of internet cookies which collect information whenever we use the internet , has exposed IT users to high risks of fraud and conflicting interests. Many big companies use these cookies to determine which products or service they can advertise to us. When it comes to online banking, the transfer of money can easily be interrupted by a hacker and all the money will be transferred to their desired accounts , which affects both the bank and the customers who is using online banking technology
2. **Copyright Infringement:** Information technology has made it easy for users to access any information or artifact at any given

time. With the increased development of music sharing networks and photo bookmarking sites, many original creators of these works are losing the credibility of their works, because users of IT can easily gain access and share that data with friends. Free music and file downloading sites are popping up on internet every day, lots of original work like music albums, books are being downloaded for free. In this case one legitimate user will purchase the book, software, web template or music album, and they will submit it to a free download site where others will simply just download that data for free. It is good news for the users because it saves them money, but it harms the original creator of these works. The government has closed some of these sites like **MEGAUPLOAD.COM** , but many are popping up using funny URLs.

3. **Increased pressure on IT experts.** Since information technology systems have to run all the time, pressure is mounted on IT experts to ensure the accuracy and availability of these systems. Many big organizations which need to operate 24 hours will require a standby IT team to cater for any issues which might arise during the course of operation. This pressure results into stress and work overload which sometimes results into Imperfection.
4. **Digital divide**: Information technology has many opportunities and it has shaped many industries in developed countries; however, developing countries have difficulties of enjoying the same benefits of Information technology. To get these benefits they have to train their labour and users should also adopt the new culture which is a bit costly in these developing countries. In some remote areas they do not even have power, so information technology tools like computers cannot be used. In other sectors like education, most of these developing countries have poor old education systems, so a student will not be aware of new information technologies.

4.0 CONCLUSION

The new world of information society with global networks and cyberspace will inevitably generate a wide variety of social, political, and ethical problems. Many problems related to human relationships and the community become apparent, when most human activities are carried on in cyberspace. Some basic ethical issues on the use of IT on global networks consist of personal privacy, data access rights, and harmful actions on the Internet. These basic issues have been solved partially using technological approaches, such as encryption technique, authentication, authorization SSL, digital IDs and computer firewalls. Besides these protection technologies, legal laws are also needed in cyberspace to address hundreds of countries, which are incorporated into

one global network. Guidelines and strategies should be implemented so that global information can be exploited in a socially and ethically sensitive way for our future benefit and applications. These and many more ethical issues urgently need the attention of governments, businesses, educational institutions, public and private individuals worldwide.

5.0 SUMMARY

In this unit, you read about:

i. The ethical issues about ICT application in libraries.
ii. The consideration for applying ICT on libraries.

6.0 REFERENCES/FURTHER READING

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UNIT 2 CHALLENGES OF ICT APPLICATION IN NIGERIAN LIBRARIES

CONTENTS

1.0 INTRODUCTION

This Unit will educate you with the understanding of the challenges of ICT application in Nigerian libraries. This unit does not intend to make you an ICT expert but rather to help you explore the ethical concerns about ICT and give you a working knowledge of what ICT can do to facilitate the provision of information resources and services in libraries. It is also meant to encourage you on how you would experiment ICT in library operations.

2.0 OBJECTIVES

By the end of this unit, you should be able to understand

- Overview of Information and Communication Technology.
- Benefits of Information and Communication Technology Libraries.

3.0 MAIN CONTENT

3.1 Challenges of ICT application in Nigerian Libraries

The challenge of ICT facilities application in libraries in African countries is enormous. Emmanuel and Alfred (2008) in their study on the challenges of managing information and communication technologies for education in Tanzania noted that while new technologies have added value to library services by presenting new modes of collecting, storing, retrieving and providing information, they have also brought new challenges and aggravated some of the challenges that had faced libraries before. The challenges relate to acquisition of ICTs, preservation of electronic information resources, maintenance and security issues, training of users, and general lack of

awareness and commitment among library stakeholders. Walmiki and Ramakrishnegowda (2009) studied ICT infrastructure in university libraries of Karnataka and found that most of the libraries lacked sufficient hardware, software facilities and do not have adequate internet nodes and bandwidth. The campus LANs were not fully extended to exploit the benefits of digital information environment. Sivakumaren, Geetha & Jeyaprakash (2011) in their study on ICT facilities in university libraries in India found that computers, printers, scanners and photocopiers were most of the facilities used and the application of ICTs has increased the library functions and user's expectations have increased due to development in technologies. Jordan (2003) was of the opinion that barriers to adequate ICT skills training in developing countries arose from both lack of ICT literacy and the fact that many local library schools failed to integrate ICTs into their curricular has greatly affected the performance of library staff. Other barriers or constraints as enumerated by Ashcroft and Watts (2005) include shortage of technology literate staff in libraries, the lack of skilled human resources to install and manage computer networks, and poor funding to develop ICT skills in existing staff. Goulding (2000) asserted that teaching departments have a responsibility to support the development of appropriate ICT skills to deliver modern information services, by incorporating new skills requirement into syllabi. One other solution is to encourage information professionals from developing countries to spend time learning in libraries in developed countries. This can be achieved through partnership programmes between libraries in developed and developing countries.

Adeleke and Olorunsola (2010) studied ICT and library operations and found that ICT facilities were the major constraints facing libraries in the use of tools. Shafi-Ullah and Roberts (2010) found that ICT infrastructure is necessary to provide a research culture in higher education institutions and recommended allocating funds for ICT infrastructure. Etebu (2010) studied ICT availability and found that the situation is not encouraging. Adeniji *et al* (2011) added that there are several problems militating against the respondents using the ICT facilities in their various campuses in Nigerian universities, such factors include power outage, the high cost of connectivity, lack of ICT skills, interconnectivity problem and obsolete equipment. Most of these challenges are to be overcome by both the library management and information providers before they can satisfy the information needs of their numerous users on daily basis. The above finding has established that respondents who make use of the ICT resources encounter various problems when sourcing their information. This finding correlates with Missen *et al* (2007) as cited by Okon (2007) who identified infrastructural impediments to internet connectivity and peculiar problems that are unique to the African context-power failure,

equipment failure, and regulatory restriction of communication technologies, expensive or unreliable technologies and low content. Imo and Igbo (2011) noted in their study that most Nigerian universities changed software averagely within five years of use. This length of time does not show evidence of adequate experimentation with the software. The reasons given ranged from inadequate technical support for the software (100%), lack of proper feasibility studies (85.71%), deficiencies discovered (71.43%) to high cost of maintenance (57.14%). Inadequate technical support and lack of proper feasibility studies are two technical areas which need to be properly taken care of if software use in Nigeria university libraries is to be meaningful. The importance of this lies in the fact that technology changes very fast.

Martel (2003) argued that because technology changes often, roles are grabbed on the fly noting that experts in one piece of software with its related slice of the information world might be obsolete with the release of a new piece of software with a new slice of the world. Inadequate knowledge of this among software users might lead to users subscribing to software with obsolete technology. This response is corroborated when the surveyed libraries rated lack of maintenance support for the software (3.57 mean score) and lack of proper planning and evaluation of software before acquisition (3.86 mean score) as the problems associated with software use in libraries. Zaid (2008), Afolabi and Abidoye, *et al* (2011) noted some of the challenges encountered in the library in ICT application to include:

Lack of adequate finance and cost of ICT facilities: The current downturn in the Nigerian economy has affected the educational sector and libraries are no exceptions. Lots of equipment and manpower are needed for successful automation of library services. Zaid (2008) noted that the university of Lagos library like other academic libraries in Nigeria is under-funded. The Library Development Fund is no more a reality as universities have to depend on the support which the Vice-Chancellors can give from the limited resources and despite the fact that ICT is applicable to library services, high cost of ICT equipment could not make it to be widely utilised by most libraries. Abidoye, *et al* (2010) stress that most library users and librarians could not afford the cost of common personal computer

Shortage of manpower and low level of ICT compliance: This was a major problem. Full library ICT application requires a large number of staff participants especially to manage data to really make it available to the users and many users and members of the library community require knowledge of ICT.

Power outage: For the past few years, the nation has been experiencing power outage. There had been problem with the generation and distribution of power by the Distribution companies(DISCO)

Occasional system failure/ poor maintenance of ICT equipment: The system occasionally breaks down and is out of use for few days before the consultants come to rectify the faults. The time lag usually affects the keying – in process as data entry has to be stopped. It would not have been necessary waiting for the consultants if staff had the competence, especially, on the software used. Most libraries lack conducive environments for keeping and effective functioning of ICT equipment. Besides, most of the ICT equipment are poorly managed by most libraries. In addition, the cost of maintaining ICT equipment is very high.

Staff attitude towards ICT utilisation/technophobia: Many staff shy away from electronic systems for the fear of damaging or deleting important information while keying-in. This slows down the automation processing. The University of Lagos Library management had addressed the problem by putting a PC on every librarian's table and embarked on training them on the use of it. The use of ICTs is easier for younger librarians. Several studies, according to Ezeani (2000) have showed that older librarians find it difficult to use some of these newer technologies.

Inadequate training and technical/skilled manpower: Staff are trained. However, the training is inadequate as staff need to always acquire more skills especially on the use of software currently used in the library. There should be continuous training and retraining. There is a death of technical manpower in the area of ICT in Nigeria. Faulty equipment is abandoned in some libraries because there is no knowledgeable staff to repair them.

Frequent change in technology which might lead to total overhauling of the existing system: Frequent changes in soft wareupgrading lead to total overhauling of the existing system as we have in some academic libraries in Nigeria.

Lack of ICT policies/ inability of the government to monitor effectively the policy on information technology: There is alack of systematic ICT policy in most libraries in developing countries and this impedes the deployment of ICTs. Various polices on ICTs in Nigeria like Nigerian University NET, school-net etc are not properly monitored. Also, there is lack of systematic ICT policy in most libraries in developing countries of which Nigeria is apart.

Imo and Igbo (2011) in their study of the challenges of software use in Nigerian university libraries found that more than 75% of the university

libraries surveyed have used more than one software in their automation project. These university libraries mostly migrated from The Information Navigator Library (TINLIB) management software to other software regimes. The survey also showed that these libraries have made use many types of software, namely TINLIB, GLAS, Alice for Window, Lib+ (X-Lib), Virtua, E-Lib. SLAM and CD-ISIS. This indicates that apart from TINLIB software which was introduced to these university libraries by the National Universities Commission (NUC), there is no attempt by these libraries to adopt a common software platform. The survey also showed that these universities changed software averagely within five years of use. This length of time does not show evidence of adequate experimentation with the software. The reasons given ranged from, inadequate technical support for the software (100%), lack of proper feasibility studies, (85.71%), deficiencies discovered (71.43%) to high cost of maintenance (57.14%).

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library computerisation programme which was initiated by NUC in 1995. He did not agree that the development of software in-house is a good enough strategy to sustain software use.

3.2 Prospects of ICT applications in Nigerian Libraries

The search for information now is assuming a dimension whereby an information user is increasingly becoming conscious of an individualized approach. In this regards, he wants a personalized access to information without assistance from library and librarians. This approach can easily be made available; the use of computer can facilitate an integrated information environment (Ubogu 2000). Saule (1990) asserts that computerization offers faster retrieval of a greater range of materials than the traditions method. The implication of this is, is that the user has the opportunity to search with the use of a more dynamic and varied search tools. Tedd (1984) gave the benefits of computerization of libraries which encompasses all libraries as follows:

- To provide a better service at a lesser or no great a cost and
- To give added benefit at lesser cost. Computerization of library system is of immense benefits both to the user and the library staff.
- The provision of the online access (by users and staff) to a library catalogue.
- The ability to access much more information through online search services than would have been to produce easily management information such as the average cost to new books, number of books on loan to specific group's e.t.c.
- Saving present cost and curtails the cost of future expansion.
- Accurate completion of tasks.
- Time saving in performance of tasks.
- Increase control of library activity that are repetitive in nature.
- Permit the acquisition and use of literature on CD-ROM thereby saving the even increasing cost of acquisition to important serial and other publication for higher education and research.
- Save shelving space for the libraries as a significant proportion of serial and reference collection can be on CD-ROM.
- Reduce the incidence of mutilation, defacing of library materials. The CD-ROM for example is search resistance and can more easily be secured from diligent users than printed materials in the open shelves.
- Improve the image and efficiency of the libraries and librarians both of which are important in securing the confidence and patronage of users.

4.0 CONCLUSION

The emergence of Information Communication Technology (ICT) and the application of computers technology to library operations have served to blend and expand information services, operations and dissemination of information. Libraries have no other option than to join the global information economy else they will be isolated, because the world is undergoing a global information revolution in which the library cannot afford not to be an actor. The importance of information lies in its value as a resource and in its strategic value in decision making and planning. The ability to harness information from all facets of the economy will add value to decision making and information dissemination to users.

5.0 SUMMARY

In this unit, you read about:

i. The Challenges of ICT application in Nigerian libraries.
ii. The Prospects of ICT application in Nigerian Libraries

6.0 REFERENCES/FURTHER READING

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