



NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF EDUCATION

COURSE CODE: EDT 801

**COURSE TITLE: INFORMATION & COMMUNICATION TECHNOLOGY IN
EDUCATION**

Course Guide

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Introduction

This Course Guide is a brief description of what the course is about and the course materials that 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 at the completion of each unit.

What You Will Learn In This Course

This course is to bring you to the awareness of the importance of Information and Communication Technology (ICT) in education. The course will introduce you to the role of ICT in education, 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 instruction in developing world with emphasis on introduction to computer and its application to education, the Internet, the mobile learning, the law and computer information systems, basic knowledge of programming, etc.

Course Aims

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

- introducing you to Information and Communication Technology (ICT).
- helping you to appreciate how ICT touches our lives everyday in a personal way.
- outlining ICT application in education.
- clarifying some basic concepts of ICT application in education.
- outlining the problems, prospects and challenges of ICT in education.

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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 specific objectives 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, Education, Information and Communication Technology, Information and Communication Technologies, the internet, world-wide-web, etc.
- describe synchronous and asynchronous packaging of instruction.
- examine computer application in learning.
- give the overview of ICT Policy in education.
- describe the information system (management and systems development)
- outline basic programming
- identify factors influencing the use of ICT in teaching and learning.
- Identify and outline online tools.

- outline the problems, prospects and challenges of application of ICT in education in 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 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.

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You are advised to utilize the opportunity of tutorial sessions for comparing notes and sharing ideas with your colleague.

Course Materials

Major components of the course are

1. The Course Guide
2. Study Units
3. References
4. Assignments
5. Presentation Schedule

Study Units

There are twenty one units listed under four modules in this course. They are as follows:

Module 1 Information and Communication Technology (ICT)

- Unit 1 Basic Learning Skills
- Unit 2 Information and Communication Technology
- Unit 3 Information Technology and You
- Unit 4 Clarification of Terms/Concepts I
- Unit 5 Clarification of Terms/Concepts II

Module 2 Computer In Teaching and Learning

- Unit 1 Information and Communication Technology and Development In Computer
- Unit 2 Using Computer I
- Unit 3 Using Computer II
- Unit 4 Computer Technologies and Education
- Unit 5 Problems and Prospects of Computer In Education

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Module 3 Application of Information and Communication Technology (ICT) in Education

- Unit 1 The Internet and the World Wide Web
- Unit 2 ICT in the classroom
- Unit 3 ICT and Distance Education
- Unit 4 Evaluation of the Quality of ICT Programme In Education
- Unit 5 National Information Technology Policy

Module 4 Challenges In Information and Communications Technology

- Unit 1 Basic Programming I
- Unit 2 Basic Programming II
- Unit 3 ICT and Tertiary Education
- Unit 4 Networks and Communications

- Unit 5 Problems and Challenges of Application of ICT in Developing Countries.
- Unit 6 Your Future and ICT

Each unit consists of table of contents, introduction, statement of objectives, contents, 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 assignments 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.

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Assessment

Assessment method will be two-folds. These are assignments and written examination. The course materials are prepared to assist you to do 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 (TMAs)

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 (6) 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 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 you have adequate knowledge of the materials read and that you have equally made 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. Extension will not be granted after the due date.

Final Examination and Grading

The final examination for EDT 811 will be for three hours duration and will carry 70% of the total marks. The examination questions will reflect the type of self

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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 assignment written in each unit before the examination period.

Course Marking Scheme

Assessment	Category of Students	Scoring	Mark
Assignment 1-21 (best 3 out of all the assignment submitted)	Postgraduate	Each counts for 10 marks totaling 30%	30%
Final Examination		70% of overall score	70%
Total			100%

How To Get The Most From The 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 units provide appropriate exercises that will keep you abreast the pace of your progress in the course.
- 2) Each study unit is designed in 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.

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- 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 activities 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 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 with 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 4 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 carefully. These are designed to enable you

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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 till 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 problem 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).

Tutor and Tutorials

You will be able to provide answers to the following questions:

- What is Information and Communication Technology (ICT)?
- What roles does ICT play in education?
- What is basic programming?
- What role does computer play in the application of ICT in education?
- What are the factors that influence the use of ICT in education?
- What are the problems, prospects and challenges of application of ICT in education?

ASSIGNMENTS

1. Define the following terms:
Learning, Information, Technology, Education, Computer, Data, Communication, Information and Communication Technology (ICT).
2. Identify **six** benefits of ICT and discuss **four** of them.
3. What constitutes an information system? Explain each of the components that constitute an information system.
4. What role does ICT play in learning?
5. Define the following terms: videoconferencing, world-wide-web, the Internet, Synchronous and Asynchronous packaging.
6. List and describe the varieties of computers.
7. Name and explain the computer components and devices.
8. Describe the process of operating a computer.
9. Describe the roles of a computer as – a tool, a teacher, an assistant and a learner.
10. What are the problems, prospects and challenges of computer in education?
11. Describe the role of the Internet in education.
12. Describe the role of ICT in the classroom.
13. What role does ICT play in Distance Education?
14. What are the criteria for evaluating the quality of ICT programme in education?
15. What roles can ICT play in the future endeavour of people?
16. What are the steps in programming?
17. List the generations of programming languages.
17. What are the major issues addressed by the National Information Technology Policy?
18. What are the prospects and challenges of ICT in Tertiary Education?
19. Discuss the various types of networks that you read about in this course and enumerate their benefits.
20. What benefits can education, government and the business world derive from ICT?
21. As a teacher, how can you apply ICT in you area of specialization?

MODULE 1

Unit 1	Basic Learning Skills
Unit 2	Information and Communication Technology (ICT)
Unit 3	Information Technology and You
Unit 4	Clarification of Concept I
Unit 5	Clarification of Concept II

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UNIT 1 BASIC LEARNING SKILLS

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Concept of Learning
 - 3.2 Definition of Learning
 - 3.3 Levels/Stages of Learning
 - 3.3.1 Level 1 Learning – Memorization
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 - 3.3.3 Level 3 Learning - Applying, Analyzing, Synthesizing and Evaluating
 - 3.4 Factors that aid Learning
 - 3.4.1 Association
 - 3.4.2 Reinforcement
 - 3.4.3. Repetition
 - 3.5 Implication of Learning To Information Technology (ICT)
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

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1.0 INTRODUCTION

You are welcome to the first unit of learning in this course. You have read the Course Guide and you know what to expect in this course. This unit will acquaint you with the concept of learning which will be related to Information and Communication Technology (ICT). There is the need to go into the concept of learning since the main focus of ICT is to improve learning. This unit will discuss how learning occurs. We shall enumerate some factors that affect learning positively or negatively. This unit is not treating learning into detail but as it relates to ICT. Some of the items will be treated into detail under the use of computer.

2.0 OBJECTIVES

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

- define learning
- explain the concept of learning
- list some factors that aid learning
- explain the relationship between ICT and learning

3.0 MAIN BODY

3.1 Concept of Learning

A situation that occurs in a person through experience causes a relatively lasting change in the person as a result of that experience. The change in performance is what is referred to as learning. Conceptually, learning involves not only the acquisition of subject-matter but also that of interest, ideals and other non-cognitive matters. Some psychologists conceptualize learning as involving some basic biological, chemical and neurological changes in the learner. A school of thought sees learning as involving the moderation of perception and behavior while the behaviourists conceive learning as the association between certain stimuli and responses. Learning however begins with differentiation, as objects are

identified and classified into different categories. Differentiation is followed by integration. This is where pieces of perceived objects are put together as a whole in relation to the experience of learners. These activities lead to the drawing of inferences and creation of new conceptualizations from what was known before and what is learnt.

3.2 Definition of Learning

Gagné (1976) defined learning as “a change in human disposition or capability, which persists over a period of time, and which is not simply ascribable to processes of growth.

Heinich, et. al. (1985) described learning as “a general term of relatively lasting change in performance caused directly by experience; also the process or processes whereby such change is brought about. Learning is inferred for performance.

Driscoll (1994) defined learning as “a persisting change in human performance potential (brought) about as a result of the learner’s interaction with the environment”

Woolfolk (1998), on the other hand, declared that “learning occurs when experience causes a relatively permanent change in individual’s knowledge or behavior”.

These definitions are very vital when relating learning to the development in technology which brings about information and communication technology. Learning brings about a relatively permanent change in an individual when such individual is exposed to a ‘learning situation’. The sole concept of Information and Communication Technology is to improve learning thereby making it immediate, concrete, real and permanent. Thus it is necessary to be exposed to the concept of learning.

Self Assessment Exercise 1.1

- (a) Name two schools of learning.
- (b) Give two definitions of learning.

Answers to Self-Assessment Exercise 1.1

- (a) Your answer may have included the behaviourists and the associationists.
- (b) Your answer may have included that learning is a change in human disposition or capability, which persists over a period of time, and which is not simply ascribable to processes of growth; a persisting change in human performance potential (brought) about as a result of the learner's interaction with the environment; learning occurs when experience causes a relatively permanent change in individual's knowledge or behavior, etc.

3.3 Levels or Stages of Learning

The approach of Bloom (1956) and his colleagues in *Taxonomy of Educational Objectives* has become a reference point for all educators in classifying learning. The approach classifies learning into a hierarchy of six critical skills which are further subdivided into two lower-order skills and four higher-order skills respectively. The lower-order skills comprise 'memorization' and 'comprehension' while the higher-order skills comprise 'application', 'analysis', 'synthesis', and 'evaluation'. Let us have a look at the various skills and relate them to Information and Communication Technology (ICT).

3.3.1 Level 1 Learning – Memorization

"I can recognize and recall information". The behavioural perspective emphasizes the influence of external environment whereas the information processing perspective has an internal focus. Going by the assertion that 'learning is a change in knowledge stored in memory', it could be said that most behavior including learning, is governed by internal memory processes rather than external

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circumstances. Recognition and recall of information are internal processes. Memorization is the foundation of learning ability whereas storage information is the process used in computer technology. Information is stored as data in the memory of a computer and recalled when needed exactly as it was stored. This is a process by which ICT can help both learner and teachers in preserving their document for further use. A memory is therefore like a library.

The following could come under Level 1 Learning: Self-test questions, Multiple-choice questions, True/false questions which enable you to test how you will recall basic terms and concepts.

3.3.2 Level 2 Learning – Comprehension

“I can recall information in my own terms and then explain them to a friend.” This is where an individual can translate, interpret, paraphrase, summarize and predict any information. In other words, such individual should be able to describe, in his own word, the situation. This is what is emphasized in independent learning, Computer-Assisted Learning (CAL) or Computer-Mediated Learning (CML). An example is open-ended short-answer questions.

3.3.3 Level 3 Learning – Applying, Analyzing, Synthesizing and Evaluating.

“I can apply what I’ve learned, relate these ideas to other concepts, build on other knowledge, and use these thinking skills to form a judgment.” This is where a learner uses his ideas and information available to him. For example, the computer could be used as a teaching machine. Here, the computer performs the function of an instructor. Thus it presents instruction, provides instructional activities or situations, quizzes otherwise requires interaction from learners, evaluate learners responses, provide feedback, and determine appropriate follow-up activities. This is application of computer into teaching and learning situation because the computer plays the role of the instructor. Typical examples are Computer-based Instruction (CBI), Computer-Assisted Instruction (CAI), or

Computer-Assisted Learning (CAL). Examples of these are drill and practice, tutorial, simulation, instructional game, problem-solving, etc. These aid learning because they are interactive, they provide immediate feedback, they show the infinite patience of the computer in the sense that it is never tired of the learners repeating a process until the mastery level is reached. Above all, the learner is motivated.

In another situation, application could come in form of the computer being the learner and you are to 'teach' the computer to perform some task (for example, arrangement of names in alphabetical order, comparison of scores, etc.) as directed by you. In essence, the Level 3 learning is the stage where the learner or instructor can use ideas and information, relate them to situation around him or modern techniques, break these ideas or information down into components and combine the components to form results that are new. This is an example of systems approach to learning.

3.4 Factors that aid Learning

There are several factors that can aid learning. For the purpose of this course, we shall explain three of them. These are association, reinforcement and repetition.

3.4.1 Association

There is the belief among the associationists psychologists that when two ideas are commonly experienced together, the presentation of one tends to arouse the thought of the other. For example, the picture of domestic animals like a dog may likely arouse the thought of a cat. This kind of knowledge is employed with learning with computer which is the basic tool of ICT. Clicking the symbol of a printer on the system will quickly link your system to the printer once you are ready to print, the 'standby', 'switch-off' and 'restart' icons are associated with the function you are to perform on the computer to ease your activity. In learning at the elementary stage, words are associated with pictures for identification.

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Association is a vital aspect of learning and this is very relevant in Information and Communication Technology (ICT).

3.4.2 Reinforcement

There are two schools of thought concerning reinforcement as an ingredient to positive learning or positive outcome of learning. The first school of thought which was hinged on Thorndike's classic statement of the law of effect seemed to prove that learning is positively influenced when there is a satisfying state of affairs. Here, reinforcement is considered to occur when a motive is directly satisfied, for example, food and hunger. The drive for food is reduced when hunger is not felt. However, with human being, reinforcement may go beyond the drive for food. Other things may stimulate him to go extra mile.

The other school of thought spearheaded by Skinner conceived reinforcement as something that is contingent on some conditions. In the learning situation, the response desired from the individual is deliberately made to precede the occurrence of some response which has a high probability of being made. To Skinnerian school of thought, the satisfying after effect strengthens the association. Learning was influenced by after effects that brought about drive reduction and the activities to be learned must be organized to take place in such a way that the after effects are made contingent on occurrence.

These principles are applied in Information and Communication Technology (ICT) in instruction or education. The computer is made learner-friendly. The tasks required by learners are spelt out, once a learner is able to achieve the objective, he is encouraged to proceed to the next level. This makes learning immediate, real, concrete and permanent.

3.4.3 Repetition

Repetition is a fixing device. As an activity is repeated over and over it becomes permanent. Repetition of labels or fact does not necessarily lead to better retention. It is when retrieval is practiced that improvement occurs in the later recall of learned information. Some processes are repeated in order to recall them easily for further operation. Repetition is very useful in verbal information and programming. For example, in a programmed instruction or in designing a chart, instead of writing a step again, the instruction can just be ‘Repeat Item 2’, ‘Repeat Step 1’, etc. If learners watch a video programme or a recorded experiment, when it is repeated, they may understand it better. This view is supported by Katchen, 1996, Adeyanju, 1996, 1999 and 2005, Bada, 2004 and Egbowon, 2006.

Self -Assessment Exercise 1.2

- (a) List the factors that aid learning.
- (b) What are the levels of learning?

Answers to Self-Assessment 1.2

- (a) Factors affecting learning include
 - i. Repetition
 - ii. Reinforcement
 - iii. Association
- (b) Your answer should include
 - i. Level 1 – Lower Level (Memorization)
 - ii. Level 2 - Comprehension
 - iii. Level 3 – Applying, Analyzing, Synthesizing and Evaluating

3.5 Implication of Learning To Information and Communication Technology (ICT)

Learning is vital to Information and Communication Technology (ICT). ICT is expected to change the learning situation, the learner and the teacher. ICT marries the learner, teacher, technology, media and people for the purpose of learning improvement. Thus there is a changing role in the learner-centred environment. The learner is no longer viewed as someone passively waiting for the teacher to give directions and information rather, he is actively searching for needed information and learning experiences. She/he determines what is needed, and seeks ways to attain it.

On the part of the teacher, he is no longer viewed as the expert and source of all of the answers but he is now seen as participating, at times, as one who may not know it all but desires to learn. This is the relationship between learning and ICT which makes access to learning materials easy and possible.

4.0 CONCLUSION

The development in technology has made it possible to apply the learning principles in a way that allows learners to have access to learning, not depending totally on the teacher as the main source of knowledge. It has equally made it possible for teachers to guide their students in sourcing for relevant information.

It is important for you to know some basic facts about learning before you can apply the knowledge of Information and Communication Technology in education. In the next unit, we shall discuss the meaning of Information and Communication Technology (ICT).

5.0 SUMMARY

In this unit, you have learnt about

- the concept of learning
- the meaning of learning
- factors that aid learning
- relationship between learning and ICT

6.0 TUTOR-MARKED ASSIGNMENT

- i. Give **three** definitions of learning and explain **one** of them based on your understanding.
- ii. Is there any relationship between ICT and learning? Give **three** reasons to support your answer, if there are any.

7.0 REFERENCES/FURTHER READINGS

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UNIT 2 INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
- 3.3 What is Information and Communication Technology?
- 3.2 Developments in Information and Communication Technology
- 3.3 Some Benefits of Information and Communication Technology
 - 3.3.1 Fast, accurate and direct exchange of information
 - 3.3.2 Rapid information processing
 - 3.3.3 Early handling of large amount of information
 - 3.3.4 Increased availability of information
 - 3.3.5 Improved quality of Instruction
 - 3.3.6 Information and Communication Technology (ICT) is systematic
 - 3.3.7 Information and Communication Technology extends human experience
 - 3.3.8 Information and Communication Technology helps to overcome physical limitation
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

UNIT 2 Information and Communication Technology (ICT)**1.0 INTRODUCTION**

In the last unit, the concept of learning was presented to you as very vital to Information and Communication Technology. You were told that Information and Communication Technology (ICT) enhanced learning. It is, therefore, necessary to know some factors that aid learning and the relationship between learning and Information and Communication Technology (ICT).

In this unit, you will be introduced to Information and Communication Technology (ICT) and the role it plays in learning.

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 often preferred to Information Technology (IT)
- enumerate some benefits of Information and Communication Technology (ICT)

3.0 MAIN CONTENT

3.1 What is 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 internet and the potentials it provide 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,

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information and knowledge (Ezekoka, 2008). The term 'ICT' is often preferred to 'IT'. The basis of ICT, however, is simply to help improve the way we deal with information in all areas of life.

Qualification and Curriculum Authority (QCA) (1999:184) while receiving a National Curriculum of England came up with the following statement which could be used to describe ICT.

In the context of the school curriculum, the term Information and Communications Technology (ICT) is used to refer to a range of tools and techniques relating to computer-based hardware, to communications including both directed and broadcast, to information sources such as CD-RUM and the internet, and to associated technologies such as robots, videoconferencing and digital TV.

This is an all embracing description. It marries both the old Information Technology to the new innovation made possible by 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 very fast speed with 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 tools that leads to the change of the teaching process from one closed and rigid, oriented on teacher, to an inciting and interactive educational process centred on learners. 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

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nations are grappling with the crumbs of technology. ICT enhances effective network and information processing.

3.2 Developments in Information and Communication Technology (ICT)

Technology evolved through different ages. The Stone Age was the beginning of 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 weapon of war like hoes, cutlass, arrows, spears, sword, etc. The Middle Age was the age when writing was developed and people used feather 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 Electronic Age. This age involves the use of computer 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 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 computer. There is an upsurge in ‘multitasking’ activity: people are now highly skilled and they can perform several tasks at one, 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

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mobile devices. These trends pose a challenge on 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.

Self-Assessment Exercise 2.1

1. Discuss the result of the merging of computer technology and communications technology?
2. What was the first technology discovered by man?

Answers to Self-Assessment Exercise 2.1

1. Information and Communication Technology (ICT) is the result of information and communication drifting away from the orthodox verbal and print media towards the more recent electronic media, 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

2. Fire.

3.3 Some Benefits of Information and Communication Technology (ICT)

Computer remains the focal point of Information and Communication Technology (ICT) because it refers to the range of tools and techniques that are computer-based. Hence the benefits of ICT centre round the benefits derived from the use of computer. The following benefits could be derived from the utilization and integration of ICT into teaching and learning.

3.3.1 Fast, accurate and direct exchange of Information

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

3.3.2 Rapid Information Processing

Computer can sort or search through huge amount of information. 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 huge one can be transmitted within a specified time.

3.3.3 Easy handling of large amount of information

Tertiary Institutions are now taking the advantage of the benefits that ICT offers. Most institutions have computerized their systems for use at examinations, student registration, payment of fees and other similar administrative operations are no longer handled manually. ICT has made networking possible and has reduced the bottleneck of accessing information regarding admission and other related functions. Examining bodies like West African Examinations Council (WAEC) and National Examinations

Council (NECO) no longer need to be on the necks of School Principals to send in their entries since this is done on-line. In the same vein, individual students can access their results with the use of scratch cards. Government can equally monitor tax-payers through electronic registration.

Lecturers can link up with their students at various locations at the same time. This is done through teleconferencing or videoconferencing. This is very vital improvement that ICT offers in Distance Learning.

3.3.4 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 a greater access to a variety of information sources. Learners, teachers and people from other works of life can surf the internet for information relating to their field of study and other related matters as a result of development in science and technology.

3.3.5 Improved Quality of Instruction

The use of ICT in education has paved the way for a more student-centred learning setting. ICT improves the quality of instruction by increasing the desire of the learner to explore, discover, and create unique solutions to learning problems. The teacher 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 a coach for students as they learn to gather and evaluate information for themselves.

In essence, the use of ICT changes the roles of both teachers and students in the teaching and learning processes. Instructions could be presented through the multimedia equipment thus raising the standard or the quality of presentation. Through the use of ICT, quick and concise presentation is enhanced.

3.3.6 ICT is systematic

ICT applies the principles of systems approach to teaching and learning. This conserves the teachers' time and broadens teachers-students' access to information. Teachers do not need to stay all night in the libraries and bookshops to plan lessons as they used to source for adequate and current books but, rather, they can browse the internet and get current texts.

3.3.7 ICT extends human experience

Human experience could be extended when dealing with materials that are not in the immediate environment of the learner or, on the other hand, when dealing with materials that could be injurious to the life of the students, for example, a wild animal like a lion cannot be brought into the class live rather a film or video can present it live in the class or a zoo could be networked to the classroom 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 human experience.

3.3.8 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 grounds among the youths. Exposure to these materials is changing the situation among the youths 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. Learners in developed countries and some institutions in developing countries no longer have the barrier of distance to contact their teachers. Distance learning students do not need to leave their job before they can access their learning materials. They even stand a better chance than students who have to wait for the physical presence of their teachers/instructors before they could proceed. With the utilization of ICT, learners and their teachers can interact any time any day regardless of the location once they are connected to the net.

Self-Assessment Exercise 2.2

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

Answers to Self-Assessment 2.2

1. Multimedia
2. Your answer should include any of the following:
Improved quality of instruction, ICT is systematic, Increased availability of information, rapid information processing, etc.

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 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.

In the next unit, we shall discuss Information and Communication Technology and You. You will be able to relate ICT to your activities.

5.0 SUMMARY

In this unit, you have learnt

- the meaning of ICT

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- the development of ICT
- why ICT is preferred to IT
- some benefits of ICT

6.0 TUTOR-MARKED ASSIGNMENT

- (i) Give the definition of ICT.
- (ii) Mention the tools that facilitate the application of ICT.
- (iii) Mention and explain **five** benefits of ICT that can be harnessed for teaching and learning.

7.0 REFERENCES/FURTHER READINGS

Longman Dictionary of Contemporary English (New Edition)(2000)

QCA (1999: 184)

Williams, B. K. and Sawyer, S. C. (2005). *Using Information Technology: A Practical Introduction To Computer Communications*. Boston: McGraw Hill.

UNIT 3 Information and Communication Technology (ICT) and You

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
- 3.1 Information System
 - 3.1.1 People
 - 3.1.2 Procedures
 - 3.1.3 Software
 - 3.1.3.1 Systems Software
 - 3.1.3.1.1 Operating Systems
 - 3.1.3.2 Application Software
 - 3.1.4 Hardware
 - 3.1.5 Data
 - 3.1.5.1 Document Files
 - 3.1.5.2 Worksheet Files
 - 3.1.5.3 Database Files
 - 3.1.5.4 Presentation Files
- 3.2 Connectivity
- 3.3 Wireless Revolution
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

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1.0 INTRODUCTION

In the last unit, we briefly discussed the meaning of Information and Communication Technology (ICT), the development in ICT and some benefits of ICT. In this unit, we shall discuss Information Technology and You. You will learn about new forms of learning and ways of communication with people at different levels.

2.0 OBJECTIVES

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

- explain the five parts of an information system
- distinguish between systems software and application software
- distinguish between general purpose and special purpose application software

3.0 MAIN BODY

3.1 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 writers 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 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 role played by Information and Communication Technology in their professional lives.

3.1.1 People

People are the most essential part of Information System. They are the end users of information. It is easy to overlook people but they are obviously the most 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 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. or mental risks which include noise and electronic monitoring.
- **Environment:** The ranging question is: What can individuals and organizations do to minimize the impact of technology on our environment?

3.1.2 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 properly, it has to follow specified rules or guidelines.

3.1.3 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.

3.1.3.1 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.

3.1.3.1.1 Operating Systems

These are major software required by all computers. No computer can function without them because the computer cannot understand your own instructions. The operating system is a set of programmes designed to efficiently manage the resources 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). 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 have no need to recall or remember any command. Its graphical interface enables the user to have fun while communicating with the computer.

3.1.3.2 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 are 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.

3.1.4 Hardware

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

3.1.5 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. Physical view focuses on actual format and location of data. Logical view focuses on 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 file. We shall discuss each of them.

3.1.5.1 Document files

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

3.1.5.2 Worksheet files

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

3.1.5.3 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 which might contain all the workers' names, social security numbers and other relevant information.

3.1.5.4 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.

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Self-Assessment Exercise 3.1

1. Name the components of Information System.
2. What are the components of software

Answers to Self-Assessment Examination

1. The components of Information Systems are
 - a. people
 - b. procedures
 - c. software
 - d. hardware
 - e. data
2. The components of Software are
 - a. Systems Software
 - b. Application Software

3.2 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.

3.3 The Wireless Revolution

There is a dramatic change in connectivity and communications through the widespread use of mobile or wireless telephones. Students, teachers, parents,

business people and administrators carry out their routine talks and communicate with these devices. The wireless technology allows individual 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.

Self-Assessment Exercises 3.2.

1. In your own word, explain what connectivity is.
2. Name one advantage of the wireless revolution.

Answers to the Self-Assessment Exercise 3.2

1. Connectivity includes using computer to link people and resource.
2. The wireless technology allows.

4.0 CONCLUSION

Information system is made up of five parts namely: people, procedures, software, hardware and data. People are the most important. They are end users. Procedure provides the guidelines while software are the invisible parts of the computer system. They provide the instructions that control the computer. They are in two categories: systems software and applications software. The hardware are the physical equipment and they are controlled by the software. They are the control room of information. Data are raw facts and when processed they become information. Information system is viable through connectivity and this connectivity is being enhanced by the wireless revolution.

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In the next unit, we shall look at the clarification of terms/concepts.

5.0 SUMMARY

In this unit, you have learnt about

- Information system
- Components of Information system
- Connectivity
- Wireless revolution

6.0 TUTOR-MARKED ASSIGNMENT

- i. What is an Information System?
- ii. List the parts of an Information System.
- iii. Explain the relevance of each of them.

7.0 REFERENCES/FURTHER READING

Eyitayo, A. O., Eyitayo, O. T. and Akeju, O. M. (2008): *Computer Studies for Beginners 1*. Ibadan: Bounty Press Ltd.

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UNIT 4 Clarification of Term/Concepts I

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 General Terms/Concepts used in Information Technology
 - 3.1.1 Information
 - 3.1.2 Communication
 - 3.1.3 Technology
 - 3.1.4 Education
 - 3.1.5 Learning
 - 3.1.6 Information Technology
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

UNIT 4 Clarification of Term/Concepts I

1.0 INTRODUCTION

You are welcome to the first unit of this course – Information and Communication Technology (ICT) in Education. By now, you should have read the Course Guide. You should have equally known what to expect in this course. This First Unit will intimate you with the terms/concepts used in Information and Communication Technology (ICT) in order to simplify or clarify how a range of people, including teachers, learners, parents, administrators, social workers, etc. can effectively use

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(ICT) in their day-to-day activities. This course does not intend to make you an ICT expert but rather to 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

- list some general terms/concepts relating to ICT
- clarify the following terms/concepts – Information, Communication, Technology, Education, Learning, Information and Communication Technology
- define five of the terms/concepts of ICT discussed in this unit.

3.0 THE MAIN BODY

3.1 Clarification of Terms/Concept I

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 the need to clarify some of the terms/concepts used in Information and Communication Technology (ICT) in order to assess the its impact on human development, learning and education.

3.1.1 Terms/Concepts of Information and Communication Technology (ICT)

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

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3.1.2 Information

When you are curious about something, you make enquiries and you get some results. These results, when store 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 computer, 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.

3.1.3 Communication

Communication could be seen as a complex phenomenon without which no human activity is complete. It is basic to every day existence because though 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 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).

Self-Assessment Exercise 4.1

1. State the features of communication.
2. Describe information.

Answers to Self-Assessment Exercise 4.2

1. Communication is either verbal or non-verbal. It could be between man and man, man and animal, man and machine, animal and animal.
2. Information is data that have been processed into information.

3.1.4 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.

3.1.5 Education

Education is generally linked with the school. What comes to mind when the word is mentioned are teachers, students and a school. What takes place in a school is a minute fraction of what a person experiences in life. Education involves activities that bring several people together. These people include the teacher, the pupil, the parent, the government and the entire people of the country. Education involves the teaching-learning process and this begins at home. This is then stepped up in the school system. Thus a child goes through the informal and formal education.

Education is derived from the Latin word *educere* which means ‘to lead out’. Those who held this view believed that every learner has innate ideas that need to be squeezed out, pulled out and expanded. Another group taking that same Latin word *educere* believed that education means ‘to form’ and ‘to train’. Thus education can be described as a drawn-out process through which an individual acquires knowledge, aptitude, skill and experience.

Dewey (1916) saw education as a continuous process of growth while Peters described education as a process of socializing, enculturation and transmission of what is worthwhile to those who are committed to it, either children or adult.

In the Information Age, education could be seen as a process of developing one’s ability through training and acquisition of skills that can enhance learning.

3.1.6 Learning

For one to move from the level of a novice to that of an expert there is the need to learn. The time, effort and purpose involved in learning vary from one task to the other as a result of the depth or importance of what is learnt. The bottom line is that learning has occurred.

Learning is a broad concept and it occurs across varieties of objects. Here are some definitions of learning: Driscoll (1994) described learning as “persisting
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change in human performance potential (brought) about as a result of learner's interaction with the environment." Woolfolk (1998) stressed that "learning occurs when experience causes a relatively permanent change in an individual's knowledge or behavior."

The central point of these definitions is 'change'. To learn is to change or having the innate ability to change from one level of ability to a permanent one. Learning is measured by the amount of change that occurs within an individual level of knowledge, performance or behavior (Newby, Stepich, Lehman. and Russel, 2000). Changes that qualify as learning are changes that are brought about by experience and not ones caused by maturation like growing taller (Woolfolk, 1998).

Learning is an essential concept in Information and Communication Technology (ICT) because ICT is designed to make learning faster, immediate, and less strenuous. It is designed to bring about a permanent change in the learner.

Williams and Sawyer (2005) categorized learning into two lower orders and four higher orders based on Blooms Taxonomy of Educational Objectives. The lower orders include

(a) Memorization: *"I can recognize and recall information."*

(b) Comprehension: *"I can recall information in my own terms and explain it to a friend."*

The higher orders include

c) Applying, Analyzing, Synthesizing, Evaluating

"I can apply what I've learned, relate these ideas to the concepts, build on other knowledge and use all these thinking skills to form a judgment."

The computers work from simple to complex combining various media to assist in information processing and data analysis which are the foundation of Information and Communication Technology (ICT).

Self-Assessment Exercise 4.2

1. How do people view education in the Information age?
2. List the higher orders of learning in their correct order.

Answers to Self-Assessment Exercise 4.2

1. In the Information Age, education is seen as a process of developing one's ability through training and acquisition of skills that can enhance learning.
2. The higher orders of learning include applying, analyzing, synthesizing and evaluating.

4.0 CONCLUSION

There are some terms/concepts relating to Information and Communication Technology (ICT). Their clarification will enable you to have a deep understanding of what ICT stands for.

5.0 SUMMARY

In this unit, we have

- (i) learnt some general terms/concepts in ICT
- (ii) explained and clarified these terms/concepts as they relate to ICT.

In the next unit, you will be exposed some further to clarifications of terms/concepts. These terms/concepts are the ones related to computer and telecommunications - the 'driving force' of Information and Communication Technology (ICT).

6.0 TUTOR-MARKED ASSIGNMENT

1. List six terms/concepts in ICT.
2. Explain and clarify each of these terms/concepts as they relate to ICT

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UNIT 5 Clarification of Terms/Concepts II

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Terms/Concepts used in Information Technology
 - 3.1.1 Video conferencing
 - 3.1.2 Audio conferencing
 - 3.1.3 The Internet
 - 3.1.4 World-wide-web
 - 3.1.5 Local Area Network
 - 3.1.6 The Radio
 - 3.1.7 Television
 - 3.1.8 Teleconferencing
 - 3.1.9 Telecommunications
 - 3.1.10 Mobile Learning Devices
 - 3.1.11 Synchronous packaging of Instruction
 - 3.1.12 Asynchronous packaging of instruction
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

In the last unit, you learnt about the clarification of some terms/concepts relating to ICT. Those terms/concepts are general concepts that relate to other fields of study. In this unit, you will learn some other terms/concepts that are related to computers but are also related to electronics or telecommunication materials. Before you continue, let us again take a look at the objectives for this unit.

2.0 OBJECTIVES

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

- list some computer or telecommunication related terms/concepts of ICT.
- explain or clarify the terms/concepts
- define five of the terms/concepts of ICT
- explain their relevance in ICT

3.0 MAIN BODY

3.1 Clarification of Terms/Concepts II

In the last unit, you learnt some terms/concepts relating to ICT. These are ones related to computers and telecommunications.

3.1.1 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.

3.1.2 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 his students no matter where they are located as long as they are connected.

3.1.3 The Internet

This is the heart of 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 which connects hundreds of thousands of smaller networks. The network is made up of wires, cables and satellites. Internet networks links educational, commercial, non-governmental agencies, military as well as individuals.

3.1.4. World-wide-web (w.w.w.)

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.

3.1.5 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 variety of media format in a given presentation or self-studied programme.

Self-Assessment Exercise 5.1

1. Differentiate between videoconferencing and audio conferencing?
2. Describe World Wide Web?
3. What is multimedia?

Self-Assessment Exercise 5.2

1. In videoconferencing, people can see and hear each other but audio conferencing involves no face-to-face interaction.
2. World Wide Web is the multimedia aspect of the internet. It is an interconnected system of the internet.
3. Multimedia means presenting information in more than one medium.

3.1.6 Local Area Network (LAN)

This is a network which 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 system, phones, etc.

3.1.7 Radio

A 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.

3.1.8 Television

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.

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3.1.9 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.

3.1.10 Mobile Learning Devices

‘Mobile’ is formed from the word ‘mobility’ meaning the tendency to move between places, ability to travel from one place to another. Mobile learning devices can be described as learning devices that are not hindered by space and time. Learning devices that 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.

3.1.11 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.

3.1.12 Synchronous Transmission

This mode sends data in blocks instead of the start and stop 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 quantities 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.

Self-Assessment Exercise 5.2

1. Name the two transmission mode.
2. What is LAN?

Answer to Self-Assessment Exercise 5.2

1. Asynchronous and synchronous.
2. Local Area Network.

4.0 CONCLUSION

There are many terms/concepts relating to Information and Communication Technology (ICT). Some are general and some are associated with computer and telecommunications. Their clarification enables one to have a better insight into what ICT entails.

In the next unit, we shall discuss Information and Communication Technology and Development In Computer.

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5.0 SUMMARY

In this unit, you have

- learnt more terms/concepts in ICT
- learnt the meaning or clarification of these terms/concepts.

6.0 TUTOR-MARKED ASSIGNMENT

- i. List **six** terms/concepts of ICT?
- ii. Explain or clarify **five** of them.

7.0 REFERENCES/FURTHER READING

O’Leary, T. J. and O’Leary, L. I. (2005). Computing Essentials 2005 Complete Edition. Boston: McGraw Hill Technology Education.

Williams, B. K. and Sawyer, S. C. (2005). Using Information Technology: A Practical Introduction To Computers and Communications (6th Ed.). Boston: McGraw Hill Technology Education.

MODULE 2

- Unit 1 Information and Communication Technology and Development In Computer
- Unit 2 Using Computer I
- Unit 3 Using Computer II
- Unit 4 Computer Technologies and Education
- Unit 5 Problems and Prospects of Computer In Education

Unit 1 Information and Communication Technology and Development in Computer

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Trends in Information and Communication Technology
 - 3.1.1 Historical Development of Information Technology
 - 3.1.2 Components of Information Technology
 - 3.2 Varieties of Computer
 - 3.2.1 Supercomputers
 - 3.2.2 Mainframe computers
 - 3.2.3 Workstations
 - 3.2.4 Microcomputers
 - 3.2.5 Microcontrollers
 - 3.3 Basic Concepts of Operating a Computer
 - 3.3.1 Computer processes data into information
 - 3.3.2 Difference between hardware and software
 - 3.3.3 Basic principles of operations
 - 3.3.3.1 Input operation
 - 3.3.3.2 Output operation
 - 3.3.3.3 Storage operation

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- 3.3.3.4 Output operation
- 3.3.3.5 Communication operation

- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-marked Assignment
- 7.0 References/Further Reading

UNIT 1 INFORMATION AND COMMUNICATION TECHNOLOGY AND DEVELOPMENT IN COMPUTER

1.0 INTRODUCTION

In the last module, you learnt about the principles and how Information and Communication Technology (ICT) enhances learning. Some basic terms/concepts were clarified. You learnt about the benefits of Information and Communication Technology which include easy handling of large amount of information, improved quality of instruction and overcoming physical limitations, to mention a few.

In this unit, we shall look at the trends of development in Information and Communication Technology (ICT) and the tools that enhance its development.

2.0 OBJECTIVES

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

- identify the development in Information and Communication development.
- Identify the development in computer.
- list the various types of computer.
- list the uses of each type of computer.

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- state the importance of computer in Information and Communication Technology.

3.0 MAIN BODY

3.1 Trends in Information and Communication Technology.

The general purpose of information is to present accurately and clearly an event which 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 word, 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. 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.

- In hotel Business, the clerk needs computer to deal with reservation problems, guests who have online problems need someone to attend to them.
- Law enforcement officers need the 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 presentation, computers are used for 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.

3.1.1 Historical Developments of Information Technology

Developments in 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 transaction on clay tablets.
- **3000 BCE**
Abacus was invented in Babylon
- **1621 CE**
Slide rule was invented by Edmund Gunter.
- **1642**
First mechanical adding machine was invented by Blaise Pascal.
- **1666**
First mechanical calculator that can add and subtract was invented by Samuel Morland.

- **1801**
A linked sequences of punched cards controls the weaving patterns in Jacquard's loom.
- **1820**
The first man-produced calculator, the Thomas Arithometer.
- **1829**
William Austen patents the first workable typewriter in America.
- **1833**
Babbage's difference engine (automatic calculator)
- **1843**
World's first computer programmer, Ada Lovelace, published her notes.
- **1844**
Samuel Morse sent a telegraph message from Washington to Baltimore.
- **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**
Alexander Graham Bell patents the telephone.
- **1890**
Electricity used for the first time in a data-processing project (punched cards).
- **1895**
First radio signal transmitted.
- **1907**
First regular radio broadcasts from New York.
- **1920-1921**
The word "robot," derived from 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**
First demonstration of television in USA.
- **1930**
General theory of computers (MIT).
- **1944**
First electro-mechanical computer (Mark I)
- **1945**
John von Newman introduces the concept of a stored programme.
- **1946**
First programmable electronic computer in United States (ENIAC)
- **1952**
UNIVAC computer correctly predicts election of Eisenhower as US President.
- **1964**
IBM introduces 360 lines of computers.
- **1967**
Hand-held calculator.
- **1969**
ARPANet established by U. S. Advanced Agency, led to Internet.
- **1970**
Micro-processor chips come into use; floppy disk introduced for storing data.
- **1971**
First pocket calculator.
- **1975**
First micro-cumputer (MIT's Altair 8800)
- **1976**
Apple I computer (first personal computer sold in assembled form).
- **1978**
5¹/₄" floppy disk; Atari home videogame.

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- **1981**

- IBM introduces personal computer.
- **1982**
Portable computers.
- **1984**
Apple Macintosh; first personal laser printer.
- **1993**
Multimedia desktop computers.
- **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 developments in Information and Communication Technology from localized technology to global technology.

3.1.2 Components of Information 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 and increase productivity.

Communications technology or telecommunication technology consists of electromagnetic devices and systems for communicating over long distances. Typical examples are telephone, radio, broadcast television, cable TV 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).

3.2 Varieties of Computer

A computer is a programmable, multiuse machine that accepts data – raw facts and figures- and processes, or manipulates it information we can use. It is an all purpose machine. From the alarm clock to the TV remote control, your handheld calculator, 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 variety of shapes and sizes that can be classified according to their processing power.

3.2.1 Super computers

These are high-capacity machines with thousands of processors that can perform more than several trillion calculations per second. They are the most expensive but 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.

3.2.1 Mainframe Computers

They are the only type of computer available until late 1960s. They vary in sizes from small, to medium, to large, depending on their use. Small mainframes are often called *midsized 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 instructions 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.

3.2.3 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 midsized mainframes in capacity. They are used to design airplane fuselages, drug prescription and movies special effects. The graphic capabilities endeared them to movie makers.

3.2.4 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 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.

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

Tower PCs are microcomputers whose case sits as a “tower,” often on the floor beside a desk, thus freeing up desk surface space.

Notebook computers (*laptop computers*) are lightweight computers with built in monitor, keyboard, hard-disk drive battery and AC adapter that can be plugged into an electric outlet, 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-sensitive while some are capable of being connected to desktop computers for sending and receiving information.

3.2.5 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, air bag sensors for water and air, and vibration sensors.

Self-Assessment Exercises 6.1

1. From the data provided you on the historical development of Information Technology, list the development from 1801 to 1843.
2. What are four of the various types of microcomputers.

Answers to Self-Assessment Exercises 6.1

1. Linked sequence of punched cards controls the weaving pattern in Jacquard's loom.
First mass-produced calculator.
William Austin patents the first workable typewriter in America.
Automatic calculator
World's first computer programmer, Ada Lovelace, published her notes.
2. Desktop PCs, Tower PCs, Notebook (laptop), Digital Assistants (PDAs).

3.3 Basic Concepts of Operating a 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 learnt that computer aids learning.

There are three basic key concepts about how computer works.

3.3.1 Computer processes data into information

Data are raw facts and figures processed into information, e.g., the number of candidates offered admission. *Information* is data that have 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.

3.3.2 Difference between Hardware and Software

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

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

3.3.3 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 a recent addition of (5) Communication.

3.3.3.1 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. Results of students typed on the computer are data.

3.3.3.2 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.

- (b) Hardware and Software.
 - (c) All computers follow four basic operations regardless of types and sizes.
2. Input, Processing, Storage, Output and Communication.

4.0 CONCLUSION

In this unit, we traced the development in 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.

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

5.0 SUMMARY

In this unit, you have learnt about

- Trends in Information and Communication Technology
- Historical development of Information Technology
- Components of Information Technology
- Varieties of computers and
- Concepts of operating a computer

6.0 TUTOR-MARKED ASSIGNMENT

- i. Why is ICT preferred to IT?
- ii. List the events of historical development in computer between 1924 and 1974.

- iii. List the various types of computer and give an example of the use of each type.

7.0 REFERENCES/FURTHER READINGS

O’Leary, T. J. and O’Leary, L. I. (2005). Computing Essentials 2005 Complete Edition. Boston: McGraw Hill Technology Education.

Williams, B. K. and Sawyer, S. C. (2005). Using Information Technology: A Practical Introduction To Computers and Communications (6th Ed.). Boston: McGraw Hill Technology Education.

UNIT 2 USING COMPUTER I

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 What is a computer?
 - 3.2 Computer components
 - 3.2.1 External Components
 - 3.2.2 Internal Components
 - 3.2.3 Classification of Computer components
 - 3.2.3.1 The Motherboard
 - 3.2.3.1 The System Case
 - 3.2.4 Computer Devices
 - 3.2.4.1 Ports and Peripheral Device
 - 3.2.4.2 Input Devices
 - 3.2.4.2.1 Keyboard
 - 3.2.4.2.2 Mouse
 - 3.2.3.2.3 Scanners
 - 3.2.4.3 Output Devices
 - 3.2.4.3.1 Printer
 - 3.2.4.3.2 Speakers
 - 3.2.4.3.3 The Monitor
 - 3.2.4.4 Storage Devices
 - 3.2.4.4.1 Microprocessor
 - 3.2.4.4.1 Floppy Disk and Zip drives
 - 3.2.4.4.3 Hard-disk drive
 - 3.2.4.4.4 CD/DVD drive
(Measurement)
 - 3.2.4.4.6 Types of Storage

- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignments
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the last unit, we examined Information and Communication Technology and the Development In Computer.

In this unit, we shall discuss the use of computers. We shall look at computer as a tool and the various components of a computer.

2.0 OBJECTIVES

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

- identify a computer system.
- list various components of a computer.
- describe the various components of a computer.

3.0 MAIN BODY

3.1. What is a computer?

A computer is a programmable, multiuse machine that accepts data - raw facts and figures – and processes, or manipulates it into information we can use, such as summaries, totals, or reports. Its purpose is to speed up problem solving and increase productivity (Williams and Sawyer, 2005).

A computer is any machine or device which, under the control of a stored programme, can accept data in a prescribed form, process the data and supply the results as information in a specified form (Eyitayo, Eyitayo and Akeju, 2008).

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Computer refers to a machine that processes information according to set of instruction (Newby, Stepich, Lehman and Russel. 2000).

Generally, people picture or think of a computer as a desktop device that has a keyboard, a disk drive unit and a monitor. This is a computer system, that is, a collection of components which includes the computer and all its *peripherals*.

The *peripherals* are devices used with the computer that realize or extends its capabilities. The computer is the device responsible for processing information. The other components and peripherals are usually responsible for putting information into the computer (input devices) or getting information out (output devices).

3.2 Computer Components

Computers are made up of many components which can be broadly classified as internal and external components.

3.2.1 External Components

These are components located outside the computer's case. They are referred to as peripheral devices. They are externally connected to the computer using ports. (A port is a type of plug, usually located at the back of the computer).

3.2.2 Internal Components

These are components located inside the computer case.

Because the computer uses components, it is possible to customize PCs so that the user can add internal or external components for specific task. For example the user may decide to play sound or perform higher task like converting video to CD and, therefore, decide to choose more powerful components. Equally, the user can specify how powerful he wants his PC to be. This accounts for why there are

different components in computers depending on the taste or specification of the user.

3.2.3 Classification of Computer Components

Computer components can be classified into the following categories: microprocessors, storage devices, input devices, output devices, and network devices. Other components include the motherboard and the systems case.

The microprocessors process instructions and perform calculations. Storage devices (memory and disks) hold data while Input Devices (mouse and keyboard) allow the user to enter data. The output devices (monitor, speakers, and printers) display data. Network devices (network card, modem) allow computers to transfer to and from other computers. We shall discuss this into detail later.

3.2.3.1 The Motherboard

A motherboard, otherwise known as System Board, is a large printed circuit board with connectors. For all the other components to exchange data and it equally houses the power supply.

3.2.3.2 The System Case

The motherboard and other internal components are housed within a protective case, made of metal and plastic. This is referred to as “box.” The design affects how many expansion cards and components can be added to the computer. Some of these cases are designed to open easily in order to make it easy for maintenance.

Self-Assessment Exercises 7.1

1. Name the computer components?
2. Describe two computer components?

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Answers to Self Assessment Exercises 7.1

1. External and Internal Components.
2. The Motherboard and The System Case.

3.2.4 Computer Devices

3.2.4.1 Ports and Peripheral Devices

A port is a socket designed for all the connection of extra devices used outside the system case. Such devices are known as peripherals. Typical examples are the mouse, keyboard, monitor, and printer. Although these devices are located outside the case, they are essential or vital to the operation of a computer. Some parts are attached directly to the motherboard while others may be attached to an expansion card plugged to the motherboard. Ports are generally positioned at the back of the system case. In many modern designs some ports (USB – Universal Serial Bus, and firewire connectors) are located at the front of the system case for easy access.

On laptop computer, ports are usually located at the back and sides of the case. They are used to connect the newest USB memory devices often referred to as slots. Ports and connecting cables are always one of two genders, that is, male and female. The males have pins which the females have holes. The ports require different types of connectors.

3.2.4.2 Input Devices

Input refers to data entered into a computer for processing, for example, from a keyboard or from a file stored on a disk. Input includes programmed instruction that the CPU receives after commands are issued by the user. Input devices include the following among others: keyboard, mouse, scanner, digital camera, webcam, video capture card, joystick, microphone, etc. All these send message into the system unit.

3.2.4.2.1 Keyboard

This is the most common input device. It is used both for text-based data input and for selecting commands. It is a device that converts letters, numbers, and other characters into electric signals that can be read by computer's processor. A keyboard looks like a typewriter keyboard but some special keys are added. It may also look like the keys of a bank ATM or a keypad of a pocket computer.

The keyboards usually have the following:

- keys for letters of the alphabet.
- keys for punctuation symbols.
- numbered keys or numeric keypad (or both).

3.2.4.2.2 Mouse

A mouse is a pointing device. Pointing devices control the position of the cursor or pointer on the screen and allow the user to select the options displayed on the screen. A user selects a command from the computer by moving a pointer and clicking on the icon.

A mouse is used by moving it across a mouse mat or other flat surface. This movement of the ball sends a signal to the computer. However, there is now optical or wireless mouse that does not have a ball at the bottom. This is a late development.

There are other variants of mouse namely trackball, pointing stick and touchpad. The *trackball* is a moveable ball, mounted on top of stationary device that can be rotated using your fingers or palm.

A *pointing stick* looks like a pencil eraser protruding from the keyboard between the G, H, and B keys. The screen pointer moves as you move the pointing stick with your finger.

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A *touchpad* is a small, flat surface over which you slide your finger, using the same movements as you would with a mouse. The cursor follows the movement of your finger. You “click” by tapping your finger on the pad’s surface or by pressing buttons positioned near the pad. Touchpad is most often found on notebook (laptop).

3.2.4.2.3 Scanners

Scanners use light-sensing (optical) equipment to translate images of text, drawings, photos, and the like into digital form. The images are processed by a computer, displayed on a monitor, stored on a storage device, or transmitted to another computer. Scanners are similar in operation to photocopying machines except that they create electronic files of scanned items instead of paper copies.

3.2.4.3 Output Devices

The output devices display data. Examples are monitor, speakers, and printers. Output is whatever is put out of the computer system; the result of processing. People use output to make a decision. Without output devices, computer will not be able to view or use the results of processing.

3.2.4.3.1 Printer

This is an output device that produces text and graphics on paper. Printers provide one of the major forms of computer output.

3.2.4.3.2 Speaker

These devices play sounds transmitted as electrical signal from the sound card. They are connected to a single wired plugged into the back of the computer.

3.2.4.3.3 The Monitor

This is the display device that takes the electrical signals from the video card and forms an image using points of coloured light on the screen.

3.2.4.4 Storage Devices

These are devices that hold data that are not currently being used. They are of two types: Primary Storage which is the computer circuitry and Secondary Storage which is usually some kind of disk (such as floppy disk, hard disk, or CD) or tape.

The development of microprocessor has drastically reduced the problem encountered in storage system. Television set which weighed as much as 45 pounds is now manufactured in a lightweight, for example, a handheld Casio 2.3 colour TV weighs 7 ounces. The development in technology has brought about *miniaturization* and *mobility* in electronic devices. That is, storage materials can now be in smaller sizes and thus enhance mobility. This Information Age has experienced shrinking components. This is brought about by the development of microchips. For example, the lightbulb-size 1940 vacuum tube was replaced by a transistor one-hundredth its size. Today's transistors are much smaller, being microscope in size (Williams & Sawyer, 2005).

There are different kinds of microchips, e.g., microprocessor, memory, logic, communications, graphics, and mathematic coprocessor chip. The most important is microprocessor.

3.2.4.4.1 Microprocessor

This is also called “microscopic processor” or “processor on chip”. This is the miniaturized circuitry of a computer processor – CPU, the part that processes, or manipulates, data into information. When they are modified for use in machines other than computers, microprocessors are called microcontrollers or embedded computers.

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3.2.4.4.2 Floppy-disk and Zip drives

A floppy-disk drive is a storage device that stores data on removable 3.5 inch diameter diskettes. The drive is installed in the CPU, this enables you to insert your diskette and store the needed information. Diskette is not so common today.

A zip disk drive is a storage device that stores data on removable floppy-disk cartridges with 70-170 times the capacity of the standard floppy.

3.2.4.4.3 Hard-disk drive

This is a storage device within the computer case that stores billions of characters of data on a non-removable disk platter.

3.2.4.4.4 CD/DVD drive

A CD (Compact-disk) or its most recent variant, a DVD (digital video-disk) drive, is a storage device that uses laser technology to read data from optical disks. Today, new software is generally supplied on CD rather than floppy disks. It is easier to install a new programme from one CD rather than repeatedly inserting and removing, say, 10 or 12 floppy disks.

Universal Serial Bus (USB) flash drive is a popular external magnetic storage option. It is portable and can be removed and transferred elsewhere. It can store hundred times

3.2.4.4.5 Storage Components (Measurement)

The units of measure (that is, capacity of storage) are bits, bytes, megabytes and gigabytes.

A **bit** is a binary or logical 1 or 0 which is the lowest measurement of information.

A **byte** is a chunk of bits (combination of bits) used to represent and information (e.g., a character) and there are usually eight bits in a byte, e.g., 01000001 is used

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to represent the letter A in a binary code. Bytes are represented with capital B and bits with lower-case b, but not always.

Hardware and software are often described as being a certain number of bits. This is to determine the capacity of such hardware or software. For example, if a CPU is a 32-bits processor, it means that it can process 32 bits of data in each clock cycle. Hardware and software are popularly measured thus:

- **Kilobyte (KB)**
1 kilobyte (KB) = 1024 bytes
The size of a data file is often measured in kilobyte. Why is it 1024 and not 1000? Remember, there are 8 bits in a byte. It is a multiple of 8.
- **Megabyte (MB)**
1 megabyte (MB) = 1,048,576 (1024 kilobytes)
A megabyte (MB) is often used to measure the amount of main memory of the size of a collection of files within a folder. It is about as much data as 500 pages of double-line spaced text.
- **Gigabyte (GB)**
1 gigabyte (GB) = 1024 MB
Memory capacity of most storage devices such as hard drives, is measured in gigabyte (GB).
- **Terabyte (TB)**
1 terabyte (TB) = 1024 GB
Hard drive on corporate files servers are approaching terabyte capacities.

3.2.4.4.6 Types of storage

There are three (3) types of storage used by computer for storing data.

1. Read-only Memory (ROM)

- Stores the data necessary to start the computer and identify its components.

- Non-volatile or persistent memory that holds permanent information such as BIOS software that enables the components in the computer to communicate with one another.
- Data stored are not deleted even when the system is switched off.
- It cannot usually be deleted or overwritten in the course of normal computer operations.

2. Random Access Memory (RAM)

- Stores data while it is being processed. It is expected to run software while the computer is powered.
- Volatile or non-persistent memory. It is temporary memory store.
- Data held in RAM is only stored when the computer is switched on, e.g., a document created (such as report) is stored in the computer's RAM until it is saved in the disk.
- RAM holds data required by the CPU, which cannot store large amount of data on its own.
- It enables CPU to get data quickly.

3. Storage Disks or Drives

- Invented in the 1950s, used to store and transfer data files.
- Used to preserve data when the computer is turned off and to move and back up data.
- Software applications need to install files on the main disk drive in the computer in order to run.
- The hard disk is the most important long term storage component in a computer.
- Many computers have removable disk drives to install software and backup.

Self-Assessment Exercise 7.2

1. List the input devices.
2. List the output devices

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3. List the storage devices.
4. What are the measurements of storage components?
5. Mention the types of storage.

Answers to Self-Assessment Exercise 7.2

1. Keyboard, Mouse and Scanners
2. Printer, Speakers and the Monitor
3. Microprocessor, Floppy and Zip drives, Hard-disk drive, CD/DVD drives.
4. Bit (b), Byte (B), Kilobyte (KB), Megabyte (MB), Gigabyte (GB) and Terabyte (TB).
5. Read-only Memory (ROM), Random Access Memory (RAM) and Storage Disks or Drives.

4.0 CONCLUSION

Computer has been identified as a multiuse machine that accepts data and processes, or manipulates, it into information that we can use. Its purpose is to speed up problem solving and increase productivity.

In the next unit, we shall discuss about how to operate a computer and how computer works to solve our problems.

5.0 SUMMARY

In this unit, you have read about

- i. the computer system.
- ii. the components of a computer system.

6.0 TUTOR-MARKED ASSIGNMENTS

- a. Define a computer.
- b. List and explain the computer devices.
- c. State the units of measurement of computer storage system.

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7.0 REFERENCES/FURTHER READINGS

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UNIT 3 USING COMPUTER II

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UNIT 3 USING COMPUTER II

1.0 INTRODUCTION

In the last unit, you were introduced to computer which is a major tool in Information and Communication Technology (ICT). You were equally exposed to the various components of a computer.

In this unit, you will be introduced to the operation of a computer and how it could assist you in doing your work. You are not going into the basics of operating a computer but something that will be helpful to you to handle your documents, present papers or reports or access information.

This unit is very essential for you to learn because it is assumed that not everyone that is going through this cause is computer literate. As such, there is the need to

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go through some basic principles which will enable you to have a minimum literacy level in computer.

You are expected to have a computer and put into practice what you have been taught in this unit.

2.0 OBJECTIVES

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

- describe the operating system of a computer.
- start up a computer.
- create documents.
- format text, and
- save documents.

3.0 MAIN BODY

3.1 Using Computer

In Module 1, Unit 3, you learnt about Information System. You were told that it consists five parts – people, procedures, software, hardware and data. You learnt that the physical equipment in an information system constitutes the hardware and that the software is the invisible part of a computer system which enables the computer to perform useful tasks. The software is divided into operation systems and applications. Let us consider what operating systems do.

3.2 Operating a computer

By this time, it is assumed that your computer has all the necessary software that will aid you in operating it. You should ascertain that you have the following:

- CPU – Central Processing Unit (Systems Unit)
- A keyboard
- A monitor

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- A mouse
- Connecting cables
- A printer (optional)
- Speakers (optional)

As a quick reminder, the CPU is the Central Processing Unit where all the computing activities take place. The keyboard is an input device that converts letters, numbers, and other characters into electrical signals readable by the processor. The mouse is a nonkeyboard input device (pointing device) that is used to manipulate object viewed on the computer display screen. Connecting cables are the special cables used to connect or network the computer systems. They are of two types – male and female. The male end has pins while the female end has holes. A printer is an output device that produces text and graphics on paper. Though optional, a printer is essential. Speakers are devices that play sound transmitted as electrical signals from the sound card.

You should also be familiar with the following terms: windows, icon, menu, cursor, mouse pointer, click, left-click, right-click, double-click, drag, dialogue box, radio button and default selection, and desktop.

3.3 Clarification of terms

3.3.1 Windows

A window is a user-friendly operating system with graphical interface. The ‘graphical interface’ means you do not have to remember the commands to use the computer. Instead, you can click on commands or tools on menu or icons on the screen.

3.3.2 Icon

A small picture that usually represents a programme or command or a tool in the windows operating system.

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3.3.3 Menu

A list of commands or tools that appear on the screen.

3.3.4 Cursor

This is the small blinking vertical line that is seen on the screen. It shows where you are working on the screen.

3.3.5 Mouse Pointer

This is the small arrow on the window screen.

3.3.6 Click

To press and release a mouse.

3.3.7 Left-click

To click with the left mouse button. Usually, the term 'click' means 'left-click'.

3.3.8 Right-click

To click with the right mouse button.

3.3.9 Double-click

To quickly press a mouse button twice.

3.3.10 Drag

To hold down a mouse button, move the mouse (without releasing the mouse button) and then release the mouse button.

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3.3.11 Dialogue box

A rectangular box that appears on the screen and asks you for a reply by clicking buttons like OK or Cancel.

3.3.12 Radio Button

A small white circle next to an option in a dialogue box. If it contains a black dot, it indicates the option has been selected.

3.3.13 Default selection

Options selected by window

3.4 Stages of Operating a Computer

3.4.1 Start up a computer

The first thing is to 'log on' the system, that is, switch on the power source. Then allow the computer to 'boot'. The 'booting' is the process of loading and operating the system into a computer main memory. Allow the computer to be stable, that is, when the mouse pointer is the only image on the screen (not a double image).

There are two ways of opening a Microsoft word.

- The screen of your monitor is called the desktop. Here you can create some shortcut. You can place some icons on the desktop. You can double-click any of these icons to open the needed page.
- If the shortcuts are not available on the desktop, click on start, then click on Programmes and select Microsoft word.

After the word is displayed, the toolbars becomes visible on the screen. The function of the toolbars is to provide easy access and functionality to the user.

Click View, select **Toolbars** select Standard, Formatting and Drawing, you can select others if you wish. They are to help format you document. When you open Microsoft Word (MS word), the Window will be displayed. Take note of the following:

Title Bar – This displays the title and name of current document.

Document Area or Workspace – This is the area to type and edit text. This area shows a flashing vertical line which indicates **insertion point** where the text will appear.

Menu bar - This displays all menus with each menu consisting of a set of logically grouped commands. For example, Edit menu groups together all commands used for editing a text. Each of these menu bar items has a drop-down **sub-menu**. These lists have options which are displayed when you click on the menu bar items.

Task Pane – This provides shortcuts for performing commonly used commands, such as creating new documents or searching for specific texts.

Scroll bars – (horizontal and vertical) enables you to move through a document that cannot fit completely in the workspace.

Status bar – (Usually positioned at the bottom of the page) displays information about the current document, e.g. the current page, the total number of pages in the document, the line number on which the cursor is positioned and the column number.

3.4.2 Document Window

This contains various toolbars and the commonly used ones are Standard toolbar, Formatting toolbar, Drawing toolbar, etc. Let us discuss each of them.

3.4.2.1 Standard toolbar

This contains buttons for the frequently used actions such as opening files, saving files and copying and pasting texts.

3.4.2.2 Formatting Toolbar

This provides various tools that will help format the text in the document areas, e.g., changing the font size or the style text.

3.4.2.3 Drawing Toolbar

This consists of various drawing tool – to draw arrows, different shapes, geometric figures, etc. You can also modify the graphics by adding colour and 3D effects or by moving graphics behind or in front of the texts. You can equally insert preformatted styles, text boxes, and pictures.

3.4.3 Creating a Document

This means entering text using the keyboard or the dictation function associated with the speed-recognition software. Word processing software has three features which affect this process – the cursor scrolling, and word wrap. The cursor and scrollbars have already been explained. *Word Wrap* deals with automatic continuation of text to the next line when you reach the right margin. You don't have to hit a 'carriage-return' key or 'enter' key as it is done in typewriting.

Click Start → Programme → Microsoft word (Word Window is displayed)

Click File → New (New dialogue box is displayed)

Click on the General tab

Select the Blank document option

Select the Document under the Create New

Click ok.

3.4.4 Opening a Document

To open a document

Select the file → Open (Open dialogue box displayed)

Select file of document to be open and double click or right click and select open.

If the document is not on the list, you can navigate to the document path to the desired folder or location. Click Open button to open the document.

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3.4.4.1 Saving a Document

As you create documents in Word, it is important you save it. This is important because saving your work in a file ensures that any text, graphics, or other elements in your work are written in a permanent disk. An unsaved document is stored in the computer temporary memory and what you do save might not be recovered if the computer is shut down. There are three basic ways to save a document. These are

- saving a document using the Save As command.
- saving a document using the Save command.
- saving the same Auto Recover option.

3.4.4.2 Using Save As Command

This is used to save a file for the *first time*. It can also be used to save a document with a *new name* or to save the document to a different location.

- Click File→ ‘Save As’ (Save As dialogue box appears)
- Specify name and/or location where to save using ‘Save in’ drop-down list.
- In case you need to create a new folder to save the file, click the Create *New Folder* button in the dialogue box.
- In case you are using Window 2007, click Save as typed drop-down list and click Window 95-2003, which is the compatible mode, before saving the document.

3.4.5 Closing a Document

After working on a document, you need to close it. If it is a document you will require later, you need to save it before closing it. The computer will bring a dialogue box that will ask you whether you would like to save the document. You are to click Yes/No.

- Select the File→ Close Command, OR
- Holding down the *Ctrl* key and pressing F4, OR

- Clicking the close button (x) displayed in the upper-right corner of the window.

If you make some changes to a document and then try to close without saving, Word will prompt you to save the document.

- To close all active documents, hold down the *Shift* buttons and select the File→ Close All command.

3.5 Deleting Text

Word enables you to delete characters, words, lines, paragraphs or a block text from a document.

- To delete a character, press either Backspace or Delete key. Delete key deletes a character located on the right of the cursor position while Backspace deletes a character located on the left of the cursor position.
- To delete word, line or paragraph, select and highlight the required word, line or paragraph. Press either the Backspace or Delete key.

Self-Assessment Test 8.1

- What are the essential components that a computer should have?
- Describe the following: Title Bar, Menu Bar, Task Pane, Scroll Bars and Status Bar.

Answers to Self-Assessment Test 8.1

Your answers should include

- CPU – Central Processing Unit (Systems Unit), a keyboard, a monitor, a mouse, connecting cables, a printer (optional) and speakers (optional).
- Title Bar* – displays the title and name of current document.

Menu Bar –displays all menus with each menu consisting of a set of logically grouped commands. e.g., Edit menu groups all commands for editing a text. Each of these menu bar items has a drop-down *sub-menu*. These are list of options which are displayed when you click on the menu bar.

Task Pane – provides shortcuts for performing commonly used commands, such as creating a new document or searching for specific texts.

Scroll bars (horizontal and vertical) - enables you to move through a document that cannot fit completely in the work space.

Status bar displays information about the current document, e.g., the current page, the total number of pages in a document, etc.

3.6 Copying and Moving Text

You can move or copy text from one place in a document to another location, either in the same document or in another document. This saves hours or retyping and ensures consistency across documents, e. g., you can copy a heading on a page to each page of the document. Text can be pasted in a document using smart tag or clipboard. *Smart tags* are special buttons that appear when Word recognizes some special types of actions such as pasting. *Clipboard* is a temporary storage area that holds the copied or cut text until you paste the text items in a different location.

3.6.1 Copying Text

Select text to be copied, select Edit→ Copy command, OR
Right-click on the selected text and select the Copy option on the pop-up menu.
Select the Edit → Paste option from the menu bar to paste the text, OR Right-click on the required location and select the *Paste* option from the pop-up menu.

3.6.2 Moving Text

- Select the required text (first you **Cut**, then you **Paste**)
- Select the Edit → Cut command, OR
- Right-click on the selected text and select the Cut option from the pop-up menu.

To copy text to another document, open destination document

- Position the cursor at the location where the text is to be pasted.
- Select the Edit→ Paste command to paste the text, OR
- Right-click on the required location and select the Paste option from the page-up menu.

To move text within the same document, you can use drag-and-drop method, i.e.,

- Select the required text.
- Position the cursor anywhere on the selected text and press the mouse button.
- Hold down the mouse pointer to the desired location and release the mouse button.

3.7 Modifying or Formatting a Document

Document can be modified by using various formatting tools which can help customize and enhance the appearance of texts. Enhancing a document with character formatting draws attention to parts of the document and improves readability. Different sizes within a text could be applied or you can underline, italicize or bolden a text. You can identify the part of the part of the document that needs modification in appearance and then change the appearance of the text.

3.7.1 Formatting Text

Formatting Text allows you to draw attention to different parts of the document and equally improves readability. Formatting of text includes modifying font,

highlighting text, changing case, alignment of the text and identification of the text.

To modify text, quickly highlight what you want to format by dragging the mouse over while holding down the left mouse button. Change the text to your desire.

3.7.1.1 Modifying Font

A font is a formatting characteristic that defines the way in which a text appears in a document. You can change the fonts by using the Font Dialogue box or by selecting required buttons from the *Format* toolbar.

- Select the text to be changed
- Select Format → Font Command (Font dialogue box display)
- Select the required text format – font style, size, colour and effects.
- Click OK button to apply changes to selected text.

Font Type is the preformatted design for letters in the font. e.g. Ariel, Tahoma, Times New Roman, Calibri, Book Antiqua, Ariel Black, Ariel Narrow, etc.

Font Style determines whether the text is **bold**, *italic*, or regular form. *Font Size* determines the weight or the size of the text which is measured in points (pts).

Font Colour – The option is used to specify the colour of the text.

3.7.1.2 Highlighting Text

This means marking a text with a different colour.

- Select the text you want to highlight.
- Click the inverted arrow to the Highlight button to view the colour palette from the Standard toolbar.
- Select the required colour from the colour palette.

In case you want to remove highlight, follow the above process and instead of selecting colour, select none colour from the colour palette.

3.7.1.3 Changing Case

The case of a text determines the type of capitalization used in the document.

- Sentence Case – Capitalizes only the first letter in the selected text.
- Lower Case – converts all selected text to lower case letters.
- Upper Case – converts all selected texts to upper case letters.
- Title Case – capitalizes the first letter of each word of the selected text.
- Toggle Case – Changes upper case to lowercase and lowercase to uppercase for all the selected text.

3.8 Implication of Learning Computer Operation

Computer is the major tool for Information and Communication Technology (ICT). A basic knowledge of computer operation will put all individual on the right track of the trend of Information Age. ICT helps personal development. A basic knowledge of computer operation will make you less dependent on people.

Self-Assessment Exercises 8.2

1. Describe how to highlight a text and remove highlight from a text.
2. State the different cases of a text and their uses.

Answers to Self-Assessment Exercises 8.2

1. Highlight means marking a text with a different colour. To do this, click the invited arrow to the Highlight button to view the colour palette from the standard toolbar. Select the colour from the colour palette.
To remove highlight, click the colour palette and select none colour from the colour palette.
2. Sentence case – capitalization of the first letter in the selected text.
Lower case – converts selected text to lower case.
Upper case – converts all selected texts to upper case letter.
Title case – capitalizes the first letter of each word of the selected text

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Toggle case- changes uppercase to lowercase and lowercase to upper case for all selected texts.

4.0 CONCLUSION

Computer is a vital tool in Information and Communication Technology and knowledge of the basic operation of computer will enable you access information, create your own document and package your instruction with ease.

In the next unit, we shall examine Computer Technology and Education.

5.0 SUMMARY

In this unit, you have learnt about

- i. the operating system of a computer
- ii. starting up a computer
- iii. how to create a document
- iv. formatting texts
- v. saving documents.

6.0 TUTOR-MARKED ASSIGNMENT

1. Explain the functions of **six** of the following terms.
Window, icon, cursor, menu, mouse pointer, click, dialog box, and drag.
2. Describe how to create a document.
3. Describe how to format a document.
4. What are the implications of learning computer operation?

7.0 REFERENCES/FURTHER READING

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UNIT 4 COMPUTER TECHNOLOGIES AND EDUCATION

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Computer as a Tool
 - 3.2 Computer and Instruction
 - 3.3 Computer as Teacher, Assistant and Learner
 - 3.3.1 Computer as Teacher
 - 3.3.2 Computer as Assistant
 - 3.3.3 Computer as Learner
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the last unit, you read about Using Computer. You also read about the basic operation of a computer, stages of operating a computer, creating, opening and saving a document.

In this unit, we shall move on to Computer Technologies and Education. In Module 1, you read about Introduction to Information and Communication Technology. You also learnt about the benefits of Information Technology. You read about the Development of Computer in Unit 1 of Module 2. In this unit, you will read about the application of Computer Technologies In Education.

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2.0 OBJECTIVES

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

- describe computer as a tool
- computer as Teacher, Assistant and Learner
- Computer-Assisted Learning (CAL)
- Computer-Assisted Instruction (CAI)

3.0 MAIN BODY

3.1 Computer As a Tool

Over the years, teachers grappled with problems of planning and implementing instruction using tools available to them – typewriters, pencil and papers, etc. Students likewise were involved in the use of these traditional materials for learning.

The advent of computer changed the scenario and made teaching and learning more interactive. The introduction of computer into the learning system makes it possible for students to attempt to solve complex problems. At times, it becomes an assistant, helping the teacher to manage classroom and instructional development efforts. The versatility of a computer, coupled with its power to store, access, and manipulate huge amount of information, is why so much attention has been devoted to computers in education (Newby, T. Stepich, Lehman and Russel, 2000).

Computer can be viewed generally as a tool for enhancing the various technologies of instruction. In other word, all modern technologies in instructional technology, Information and Communication Technology (ICT) are all computer-based. So, computer can be seen as a tool that enhances education, learning and communication.

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When computer is integrated into instruction, as a tool, it allows students to learn at their own pace and produces significant result and time saving over conventional classroom. It has high speed personalized responses to learners' activities and this yield high reinforcement. When used as a teaching tool, both teachers and learners have immediate response to activities thus it yields high motivational effects.

Computer as a tool has high record-keeping ability because of its high storage capacity. It can store, process and retrieve information for both immediate and future use. Thus it makes individualized instruction feasible and also makes it possible to monitor students who are not in the academic mainstream.

The computer is a multi-tool for teaching and learning. It can help with many different teaching and learning tasks. An advantage of computer is its processing power. Rather than having separate tools for common task such as writing, drawing, filing and calculating only one tool perms the task.

Computer could be used as a tool for teaching and learning in various ways, thus it has made some giant strides in education. That is why it is emphasized in the teaching and learning situation.

3.2 COMPUTER AND INSTRUCTION

Instruction is defined as the selection of information, activities, methods, and media to help students meet predetermined learning goals (Newby, Stepich, Lehman and Russel, 2000).

Computer is defined as a programmable, multiuse machine that accepts data – raw facts and figures – and processes, or manipulates, it into information we can use (Williams & Sawyer, 2005).

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Instructional computing is the use of computer in the design, development, delivery and evaluation of instruction (Newby, Stepich, Lehman and Russel, 2000).

Information is defined as data that has been summarized or otherwise manipulated for use in decision-making (Williams & Sawyer, 2005).

Information and Communication Technology (ICT) is the combination of networks, hardware and software as well as means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge (Ezekoka, 2008).

Computer is the focal point of Information and Communication Technology because it refers to the range of tools and techniques that are computer-based. Information and Communication Technology is now seen as a natural part of good learning and teaching. The challenge is to use it effectively to maximize learning to enhance and enrich teaching (Donaldson, 2007).

The development in computer technology has made it not an equipment to be used in industry alone but it is also integrated into teaching and learning to make learning concrete, real, immediate and permanent. Granted that the purpose of instruction is to get learners take appropriate actions that will result in learning that could be tested, the feature of computer which is to speed up problem solving and increase productivity could be harnessed in education.

Computer has all the resources and services for learning integrated in a single box. This makes learner have the potential to exploit them all, through an interface that is mostly intuitive. Instructors too, should exploit these potential to provide a set of events that will affect learners in such a way that learning is facilitated.

The power of computer within education is ascribable to its versatility as a production and a presentation tool. It is different from other forms of media because of its multiuse purpose. It could be used to present a story and at the same

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time monitor the internet to look for information. Classroom teachers should harness these potentials and adapt it for learning.

According to Newby, Stepich, Lehman and Russel (2000), instructional computing for teachers and learners can be used to

- enhance the quality of instructional materials using the electronic capabilities of the computer.
- reduce the time required to design, produce, and reproduce instructional materials.
- increase the overall effectiveness of instructional materials through enhanced presentations.
- combine graphics, video, audio, and textual form of media into single, integrated instructional presentations.
- store and quickly access huge amounts of information and data.
- communicate with others at both near and distant locations.
- function as a learner, in which the student programmes the computer to complete a task or to solve a problem.
- function as an instructional expert, in which the computer makes decisions about levels of student learning, suggests media and learning experiences to students, and then selects and presents those media and experiences.

It could be rightly stated that computer enhances the quality of instruction, increases effectiveness of instruction, allows combination of various media for presentation, bridges the gap between the learners and learning situation, encourages storage and quick access to information and assist learners in problem solving.

Self-Assessment Exercises 9.1

- i. State **two** advantages of computer as a tool.
- ii. List **five** of the uses of instructional computing.

Answers to Self-Assessment Exercise 9.1

Your answers should include

- i. Computer as a tool can be used for teaching and learning in various ways.

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Computer is a multi-tool for teaching and learning, Useful in teaching many subjects.

Computer as a tool has high record-keeping ability because of its high storage capacity.

- ii. Instructional computing can be used to
 - enhance the quality of instruction.
 - reduce time required to complete a task.
 - combine media for presentation.
 - store and quickly access huge amount of information.
 - communicate with others at both near and distant locations.
 - function as instructional expert.

3.3 Computer as Teacher, Assistant and Learner

The computer can perform three basic activities in education. It can act as the teacher, the assistant and the learner. This was exemplified in Robert Taylor (1980) reported by Newby, Stepich, Lehman and Russel (2000), Taylor categorized computer as 'tutor', 'tool' and 'tutee'. This model divides the educational application of computers into three broad categories – computer as a teacher, where the computer presents instruction to the learner. In the second category, computer aids the teacher or the learner in performing routine tasks such as writing, calculating or presenting information and the final category presents computer as the student. The learner teaches the computer to perform some tasks. This model is a simple way of looking at different computer uses in education.

3.3.1 Computer as Teacher

The oldest use of computer in education dated back to the early 1960s (Newby, Stepich, Lehman and Russel (2000). Here, computer was used as a tool that presents instruction directly to students. Such use is termed Computer-Assisted Instruction (CAI), Computer-Based Instruction (CBI), or Computer-Assisted Learning (CAL). In this mode, the computer acts as the teacher. It presents

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instruction, provides instructional activities or situations, quizzes or otherwise requires interaction from learners, evaluates learners' responses, provides feedback and determines appropriate follow-up activities.

The advantage of this is the interactivity of computer. Whereas printed worksheet may leave space for learner's response or instructional video may pose questions without ascertaining the viewer's response, the computer can require a response and equally demand learner's active involvement. When a teacher utilizes computer as a teaching machine, it can be highly interactive, individualized, engaging, and infinitely patient.

In this Information Age computer has a great role to play as a teacher and teachers can harness the benefits of these roles as enumerated by Newby, Stepich, Lehman and Russel (2000).

- CAI should be used in a supporting or adjunct role. Educational software broadens classroom activities but cannot replace the classroom teachers. CAI should be seen as tools at the disposal of the teacher that he can use for helping the students learn.
- Certain types of CAI are appropriate for certain learning goals. Just as there are various strategies for teaching and learning, teachers should equally vary the application of CAI to meet the desired goals.
- CAI can help students and free time for the teacher. As the students benefit from the software, the teachers also have the opportunity to address individual learners' needs.

3.3.1.1 Categories of Computer Assisted Instruction (CAI)

There are various categories of using computer as teachers and the advantages are enormous. Typical examples are

Drill and Practice

In drill and practice, computer has the following advantages.

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- Interactivity – the computer can present many problems and require learners' responses.
- Immediate feedback – The computer informs the learner immediately if the answer is wrong and tells the learner why.
- Infinite patience – It can go all days without getting tired or irritable.
- Variable level of difficulty – The computer can adjust the level of difficulty. This could be set by the teacher or by the learner or the programme may adjust automatically based on the student's performance.
- Motivation – Through the use of challenge and gaming elements or because it is on the computer, a drill and practice programme may be more motivating to students than similar paper-and-pencil exercises.

These characteristics make the computer an excellent tool for drill and practice.

Tutorial

The computer assumes the role of the teacher in tutorial application. A tutorial contains an organized body of knowledge. Computer-based tutorials offer a number of advantages such as

- Embedded questions – Tutorial questions on computer has the advantage of being interactive. Students take active roles by answering embedded questions and there is provision for immediate feedback.
- Branching – Computer tutorials can automatically branch, that is, adjust content presentation according to the learner's needs.
- Dynamic Presentation – The computer can present information dynamically. Important text can be highlighted on the screen to capture learners' attention, or by depicting processes using animation graphics. A multimedia computer system may employ audio and video.
- Record keeping – Computer tutorials can automatically maintain student's records, which can be used to inform them of their progress. It can also be used by teachers to ascertain whether students are progressing satisfactorily.

A well designed tutorial is highly interactive and can be an effective form of instruction that respond to the needs or wants of individual learners. They are

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often used to address verbal and conceptual learning. They are available for a range of subject matter and at all grades. Computer productivity packages, e.g., Microsoft word, come with associated tutorials that provide instruction on how to use the package. Tutorials are used in schools to supplement regular instruction rather than to replace it. Where computer hardware is limited, computer tutorials may be used with selected students for remediation, enrichment, or make-up work.

Simulation

This is a representation or model of a real (or sometimes imaginary) system, situation or phenomenon. In most cases, it simplifies or makes learning easier. It makes excellent use of computer's capabilities.

- Control of multiple variables – Computer can manage multiple variables simultaneously as a result, they can realistically depict complex phenomena such as growth and change of a city or the physical indices in motion. These can be manipulated to observe the effects on the system being modeled.
- Dynamic Presentation – Simulation enjoys computer's ability to dynamically present information. Simulated instrumentation can change like the real thing, and processes such as plant growth can be physically depicted.
- Time Control - Computer can contract or expand time to allow the study of phenomena that are too slow (e.g. population growth) or too fast, (e.g., chemical reactions) for normal classroom observation. The computer can also depict historical situations (e.g., slave trade).
- Effects of chance – Elements of chance and randomness are found in some simulations which make them look realistic, allowing students to interact with them differently in different occasions.

Simulations vary in degrees. Simulations in education are simplified and also vary in required use. Computer simulation can be effectively used with both individual and small groups of students.

Instructional Game

This adds an element of fun to Computer Assisted Instruction (CAI). Games are modified version of other types of CAI such as drill and practice or simulation but are distinguished by the following characteristics.

- Motivation – it has motivational elements which include competition, co-operation, challenge, fantasy, recognition and reward.
- Game structure – It has rule of play and end goal.
- Sensory appeal – Computer games attributes of sound, graphic animation and other sensory enhancement.

Computer games vary in time requirement. Some are few minutes while some take hours or days. Care must be taken to integrate these into the curriculum.

Problem Solving

Some CAI applications are designed to foster students' problem-solving skills. Computer problem-solving applications have the advantages of focusing on

- specific type – specific problem-solving programme.
- quantity – a large number of problems in a short period requiring interaction and providing feedback.
- variety – The computer is capable of presenting variety of problems. This helps students to generalize their problem-solving skills.

Problem-solving applications help to promote students' higher thinking skills, such as logic, pattern recognition, and strategies. It provides concrete representation of abstraction.

3.3.2 Computer as Assistant

The common tools are word processors, graphic and desktop publishing, presentation software, database and spreadsheets. We shall discuss each of them for you to understand.

Word Processors

Students can use word processor to

- write papers, stories, poems and other in-class work. Major emphasis is on writing. It helps students to practice creating a draft, editing the work and predicting a new draft.
- write letters – teachers can encourage their students to write letters to their friends and this reinforces their writing skills.
- do writing related activities – take notes, record experiments, or record project's progress.
- do language exercise – type spelling words, science vocabulary word and practice language skills.
- Type handwritten notes as a way of study: typing handwritten notes one word-processor can reinforce learning or study for examination.

Graphic and Desktop Publishing Tools

Computer graphic tools provide students with capability to work on images of all types, e.g., photographs, clip art, charts, graphs and desktop publishing software give them control over the layout of text and graphics on printed pages to produce professional looking printed materials. The following can be learnt using the tools.

- Create drawing – cutting and drawing programme can produce original work.
- Illustration of work – using printing and drawing or clip art to illustrate written stories, reports or hyper media projects.

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Presentation Software

Designed for display of computer text and images usually for presentation to a group. While they are seen as tools for the teachers to enhance lectures, students can use them as well. Students can use them to do the following:

- Make in-class presentation or reports – Presentation packages make it easy for students to create professional-looking reports with complete multimedia elements.
- Store and display electronic portfolios – Student can use them to assemble portfolio of work including text, graphics, and even digital audio and video.
- Transfer of work to other media. Many presentation packages provide single mechanism for converting electronic slides to print, photographs or web page.

Presentation software has multimedia capability and thus share usage characteristics with graphics software as well as hypermedia authoring.

Database

Computer database software provides the capability of creating, editing and manipulating organized collection of information. Student can use database management software to do the following:

- Create information in databases – Use database software to fill information, e.g., locate book in the School electronic Library.
- Develop problem-solving and higher-order thinking skill – Using database, student can develop problem-solving and higher order skills. For example, students might want to look at budget allocation for education and the rate
- of growth in the country's education. They could ask the question: Is there any relationship between budgeting and growth in education?
- Develop original data bases – Student can learn about research, information, and a particular content area by developing their database. For example, impact of ICT in a tertiary institution.

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Teachers should help students learn the structure of and organization of the database, and guide them through the process of using it.

Spreadsheets – These include enhancement of database elements and the capability to graphically depict data. Student can use these tools to do the following:

- Track financial information – spreadsheet first became a popular tool for helping businessmen track finances. Students can use them tracking financial information.
- Keep records – Though primarily calculating tools, they can be used to keep simple records and maintain information lists.
- Create charts and graphs – Students can use it to keep records of investment.
- Perform complex calculations – can quickly produce results involving complex calculations.
- Perform “what-if” simulation or hypotheses-testing activities. The rapid recalculation of spreadsheet can enhance students’ investigating how changes in one factor impact other factors – “What will happen if I change.....” Students in demography and statistics class could explore the rate of marriage and education of a girl-child in a community.

Spreadsheet allows students to concentrate on real-world problems without becoming bogged down in the calculation. An incorrect formula or bad data can lead to erroneous results. This is relevant to the expression in computer world: “garbage in, garbage out.”

3.3.3 Computer as Learner

When using computer as learner, the following should be noted:

- Students must learn both the content and how to present it.
- Students should be actively involved.
- There is more than one way to achieve success.

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Student can 'teach' the computer using programming language or hypermedia authoring tools. Logo is a popular programming language for education and Hyper Studio, a hypermedia authoring package is widely used in schools.

Logo: a computer language developed by Seymour Papert and his associates at MIT, the Massachusetts Institute of Technology. Unlike most computer language, Logo was created with education in mind. Logo can be used in the classroom for a variety of educational activities including learning objectives in the classroom:

- Introductory computer programming – Its simplicity makes it possible for a student to start doing something immediately after instruction. It can permit problem-solving and exploration for a long time.
- Problem-solving – Using logo, student can become acquainted with the computer and controlling it through a programmed language. This involves problem solving.
- Geometry – Turtle graphics introduces student to many geometric concepts at a much early age, and in much different way than has been in the past. An elementary student may not understand the concept of degrees in the Logo command RIGHT 90, but might later intuitively acquire the sense of degrees and other geometric concepts.
- Arts – Turtle graphics in Logo can provide a natural linkage to art and demonstrate the geometric underpinnings of many designs.
- Microworlds – Logo can be used to explore small, well-defined environment, called *microworlds*, in a variety of subject areas from mathematics to language to physical sciences. This affords learners the opportunity to enrich their knowledge of one small well-developed environment.
- Lego Logo – This takes Logo back to its roots. Students use Logo building blocks and small electric machines to construct simple machines that can be controlled via Logo. This makes their programming efforts real.

Hypermedia Authoring – refers to systems of information representation in which the information – text, graphics, animation, audio and/or video – is stored

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digitally in interlinked locations called *nodes*. The success of creating hypermedia is called authoring.

Hypermedia Authoring in the class – Opportunities in the classroom activities include:

- Hypermedia Projects – This allows students, either individually or in groups, to create reports that summarize a major effort such as a science experiment or interdisciplinary project. Rather than simply writing about it, students can include written work, pictures, sound clips, video, and links to describe what they did and/or to present background information.
- Multimedia presentation – Students (and teachers) can use hypermedia authoring tools to create multimedia presentations or slide shows.

Self-Assessment Exercises 9.2

- i. State the three basic functions that a computer performs.
- ii. List two examples each for the functions performed by a computer.

Answers to Self-Assessment Exercises 9.2

- i. Computer performs the functions of Teacher, Assistant and Learner.
- ii. Computer As Teacher
 - Supporting Educational role (CAI)
 - Drill and Practice
 - Tutorials
 - SimulationComputer As Assistant
 - Word Processors
 - Graphic and Desktop Publishing Tools
 - Presentation SoftwareComputer as Learner
 - Log
 - Hypermedia

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4.0 CONCLUSION

In this unit, we examined computer technologies and education. We assume that computer is a tool which makes it possible to be used for teaching and learning. The computer's usefulness in instruction was also examined and the advantages in instructional computing were listed. Finally, computer was examined as teacher, assistant and learner and the various roles in classroom situations were highlighted.

In the next unit, we shall examine the problems and prospects of computer in education.

5.0 SUMMARY

In this unit, you have learnt about

- Computer as a tool.
- Computer as Teacher, Assistant and Learner.
- Computer-Assisted Learning
- Computer-Assisted Instruction

6.0 TUTOR-MARKED ASSIGNMENT

1. State why the computer is a multi-use tool.
2. List **six** uses of instructional computing.
3. Give **four** examples each for computer as a teacher, assistant and learner.

7.0 REFERENCES/FURTHER READINGS

- Digital Bridge Institute, Abuja (2007). *Introduction To Computers* (Manual for ICT Training For Tertiary Institution Lecturers – June 2007, University of Ilorin, Nigeria).
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UNIT 5 PROBLEMS, PROSPECTS AND CHALLENGES OF COMPUTER IN EDUCATION

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Computer and Information and Communication Technology
 - 3.1.1 Prospects of Computer In Education
 - 3.1.2 Problems Associated with Computer in Education
 - 3.1.2.1 Resistance To Change
 - 3.1.2.2 Inadequate Training
 - 3.1.2.3 Cost, maintenance and adequate replacement
 - 3.1.2.4 Government Policy
 - 3.1.2.5 Electricity Supply
 - 3.1.2.6 Theft of hardware
 - 3.1.2.7 Theft of software
 - 3.1.2.8 Theft of time and resources
 - 3.1.2.9 Theft of information
 - 3.1.3 Challenges of Computer in Education
 - 3.1.3.1 Learn to deal with Information Overload
 - 3.1.3.2 Have a strategy for what you memorize and what you don't
 - 3.1.3.3 Learn how to make your personal 'multitasking' efficient
 - 3.1.3.4 Be aware that 'smart mobs' could also be dumb mobs
 - 3.1.4 Worms and Viruses
 - 3.2.5 Health Matters
 - 3.1.6 Ergonomics
- 4.0 Conclusion
- 5.0 Summary

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- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

In the last unit, you read about Computer Technologies and Education. You read about computer and instruction and what teachers and learners stand to gain in instructional computing. You also read about computer as teacher, assistant and learner.

In this unit, we shall examine the problems, prospects and challenges of computer in education.

2.0 OBJECTIVES

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

- i. state some prospects of computer in education
- ii. list some problems of computer in education
- iii. describe some challenges of computer.

3.0 MAIN BODY

3.1 Computer and Information and Communication Technology

Computer has been identified as the focal point of Information and Communication Technology because it is the tool that controls all the activities of Information Technology. It is the technology that has different uses in the field of education. It is the instrument that propels the globalization of information and communication. What are the prospects of computer in education? What are the problems in applying computer in education and what are the challenges of applying computer in education? All these posers cannot be fully highlighted on

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the pages of paper but the few to be mentioned will assist you in identifying others that will be of benefit to your study.

3.1.1 Prospects of Computer in Education

A computer is defined as a programmable, multiuse machine that accepts data – raw facts and figures – and processes, or manipulates, it into information we can use.

Some basic facts are established here: it is programmable, it has a multipurpose use, it can process data into information that can be utilized. These functions depict a computer as a teacher, an assistant and a learner. In other words, computer can teach for educational purposes. It can assist in learning and it can be commanded to carry out functions. Thus it is a versatile tool in education.

Computer and communications are the wellsprings of the Information Age. There are recent innovations in computer that are associated with computer technology. Some of these are highlighted by Williams and Sawyer (2005) as stated:

- Desktop computers – “teleputers” - on which you can watch television as well as check e-mail, write documents, and do calculation. This is a ‘mini’ school on its own. This could be integrated into education. A student with computer system can exchange information on learning materials with his fellow students and teacher. In the same way a teacher can interact with his student through this medium.
- Cellphones with digital cameras can allow you to check the news, download video clips, and participate in multiplayer online games. The development has gone beyond boxy computers that sit on the desktop or on the laps. Computer has become a commonplace or mobile equipment and record vital information for classroom use.
- Smart, computerized houses that enable the users to change window tints, turn on music, control thermostat, monitor security, and from their cars

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miles away open the front door over the internet and watch via webcam to see who enters.

This device is already being used in education. A teacher can use this to connect another class far away with his students who watch live what goes on in a similar class in another location. This is one of the globalization features of computer.

- Internet refrigerator would make ice, keep track of provisions, and allow you to maintain an address book and calendar, watch television and surf the web.

Computers have accelerated access to general information but personal – electronic correspondence, documents, appointments, photos, songs, money matters, and other important matters are possible. Central to this concept is the internet – the ‘net’ – the collection of data residing on computers around the world and accessible by high speed connection.

Just as television is a versatile tool in the hands of educators when used as instructional television, computer has also become a tool in the hands of educators and instructional designers. Computer has also made it possible to combine other technologies – radio, television, telephones and other electronic equipment to enrich education. It also makes the combination of these materials (multimedia) possible in educational presentation.

Development in computer has brought about three directions namely: miniaturization, speed and affordability.

- *Miniaturization* deals with reduction in size. Everything becomes smaller. For example, ENIAC’s old-fashioned radio-style vacuum tube gave way after 1947 to the smaller, faster more reliable transistor. The next step was the development of integrated circuit.

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The miniaturized processor, or microprocessor, in a personal desktop computer can perform volumes of calculations that fill a room.

- *Speed*: The miniaturization and new materials used in making processors, make it possible for computer makers to put more hardware components into their machines to increase the speed and thus provide faster processing speed and more data storage capacity.
- *Affordability* Cost of processors today are far less than what they were over a decade ago.

Computers and communications started to fuse together in the 1990s. This signaled the beginning of a new era in the Information Age. The result brought about convergence, portability and personalization.

- *Convergence* refers to the combination of several industries through various devices that exchange data in the format used by computers. The industries include: computers, communications, consumer electronics, entertainment and mass media. Convergence has led to electronic products multiple functions such as TVs with internet access, cell phones that are also digital cameras, and refrigerators that allow sending e-mails.
- *Portability or mobility* in the 1980s meant trading-off computing power and convenience in return for smaller size and weight. In present times, there is no need to give up anything. Experts have predicted that small, powerful, wireless electronic devices will transform lives more than the personal computers. Smart phones are already taking on other functions. There is therefore the risk of work if not checked because they tend to invade the leisure time.
- *Personalization* is the creation of information tailored to one's preference, e.g., programme that will automatically cull recent news and information from the internet on just those topics one has designated. Companies involved in e-commerce can send messages about products based on your pattern of purchase, usage and other criteria. In any institution that is

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interested in e-registration, students have access to their biodata only through the use of registered bursary number.

There are a lot of prospects that education could derive from the development in computer. Others include e-library, e-registration, e-learning, to mention a few.

3.1.2 Problems Associated with Computer In Education

There are a lot of problems associated with the integration of computers in education. These are highlighted 3.1.2.1 – 3.1.2. 9.

3.1.2.1 Resistance To Change

Human beings are averse to change. A lot do not want to see computer as a companion, a teacher or an assistant. Rather, they see computer as an enemy that could relieve them of their jobs. Just as teachers initially kicked against the introduction of instructional television, some teachers are kicking against the introduction of computer in education.

The clamour for computer literacy is expected to keep the teachers and all those involved in education abreast global development in Information and Communication Technology (ICT) but people, teachers, students, businessmen, etc. not ready to change because of wrong perception.

3.1.2.2 Inadequate Training

For computer to be relevant in education, there should be regular training for both teachers and students to keep abreast of developments in computer, telecommunications and communication technology so that there can be proper integration of new innovation and the curriculum.

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3.1.2.3 Cost, Maintenance and Adequate Replacement

Cost is one of the bane of computer integration in education. Computer hardware are expensive. Even though they have become portable in size, less heavy and a bit affordable, not everyone can afford it. A good desktop like the (Pentium M) is not less than ₦120,000.00 (One hundred and twenty thousand naira only) and a laptop of the same capacity is not less than ₦160,000.00 (One hundred and sixty thousand naira only.) Only a few could afford this, except if they want to buy the fairly used ones that are almost outdated. This will, however, amount to a waste of some money.

The software are not cheap either and the manufacturers keep on changing them which makes it difficult to replace damaged ones and the computer becomes a junk.

The high cost of hardware and software coupled with the problems of maintenance as a result of constant change of software and hardware, make computers less available in institutions of learning for both academic and administrative purposes.

3.1.2.4 Government Policy

Government enacted the National Policy on Information and Communication Technology (ICT) but there is no proper follow-up. No machinery is put in place for implementation. Thus the impact of computer as entrenched in the policy is not felt.

3.1.2.5 Electricity Supply

Computer operation depends largely on electricity supply. In most developing countries, electricity supply slows down the pace of the progress expected to be made in computer application in education. Where they depend on generating set

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as an alternative to public electricity supply, the cost of maintenance is so high and this cannot result in optimal service.

3.1.2.6 Theft of hardware

This ranges from theft of accessories to removing laptops, or cellular phones, either in someone's home, car or office. These hardware may contain valuable materials like theses, project research, reports or collection of documents. It is, therefore, advisable that there is a backup of every work to prevent loss of valuable materials.

3.2.2.7 Theft of software and data – including music

Some people are fond of downloading information and using them for commercial purposes. Such affect original owner of materials and even discourage people from venturing into developing such materials. Such materials downloaded also lack originality.

3.1.2.8 Theft of time and services

Some employees – teachers, administrative staff, etc., steal their employers' computer time to play online games, home video or even dip into web pornography. A private school proprietor in a developing country bought some computers to teach the practical aspects of computer to the students. Three of the students disappeared from the class immediately the lesson started only to resurface with some home videos which they intended to play on the computer – a misplaced priority.

3.1.2.9 Theft of information

Vital information files could be infiltrated upon by information thieves. There have been cases of workers in examination bodies of some developing nations swapping names, numbers and marks of qualifying examinations. Some dubious

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administrators can implicate their colleagues by scanning their signatures on malicious documents. Files should be properly handled by putting password on them to deter unauthorized persons from gaining access to such files. Care must be taken that you do not forget your password.

Problems affecting computer application in education are innumerable. You can however delve into some of them.

Self-Assessment Exercise 10.1

1. List **five** of the prospects of computer in education.
2. State **five** problems associated with computer in education.

Answers to Self-Assessment Exercise 10.1

1. Desktop computers – “teleputers”
 - You can watch television on it, check e-mails, write documents and do calculation. Can be used by teachers and students for exchange of information.Cellphones with digital cameras
 - Allow you to check the news, download video clips and participate in multiplayer online games.
 - Help students on fieldtrips and for recording vital informationInternet refrigerator
 - Makes ice, keeps track of provisions and allows maintenance of address book and calendar, watch television and source the web
2. Problems associated with computers include
 - Resistance to change
 - Inadequate training
 - Cost, maintenance and adequate replacement
 - Government policy

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- Electricity supply
- Theft of software and hardware
- Theft of time and services
- Theft of information.

3.1.3 Challenges of Computer In Education

We are now in a new era in Information Age where the combination of computers and communications has brought about convergence, portability and personalization. It is pertinent to note some of the challenges involved in these developments. Williams and Sawyer (2005) identified four challenges that threaten to overwhelm people as a result of information explosion. These challenges include how to deal with information overload, strategy for what may be memorized, how to make your “multitasking” efficient and taking care of “smart mobs”.

3.1.3.1 Learn To Deal With Information Overload

They stressed that the volume of available information exceeded the time amount of time needed to absorb it. One has to sort out between what is really needed or what one thinks he really needed.

3.1.3.2 Have a Strategy for What You May Memorize and What You Do Not Need

People are stressed up about what they have to memorize and what they have to store. Some people store facts like phone numbers, internet addresses and birthdays on a cell phone, handheld computers, etc. They encouraged individual to have alternative saving devices as backup as some of these materials could be misplaced.

3.1.3.3 Learn how to make your personal “Multitasking” efficient

Multitasking refers to a computer’s ability to run several programmes at once. It is also a popular term for people performing several tasks at once, e.g. studying while eating, listening to music, talking on phones and handling e-mails. It has been discovered that people who do two demanding tasks simultaneously do neither task as well as they do each alone. The result of constantly shifting attention has been seen as a sacrifice in quality for any of the task with which one is engaged. This has some consequences for studying.

3.1.3.4 Be aware that “Smart Mobs” could also be dumb mobs

They claimed that smart mobile devices could produce groups of people which they called “smart mob” who could cooperate in ways never before possible because of carrying portable technology that possesses both computing and communications capabilities. They equally stressed that the possibility could exist for marketers, corporate bodies and government to transform those devices into weapons against the user. One has to be aware of how security and privacy could be abridged in ways that could transform you from a member of the smart club to that of a “dumb mob”.

Other challenges include

3.1.4 Worms and Viruses

Williams and Sawyer described worms and viruses as “forms of high-tech maliciousness”. They claimed that there are about 57,000 known worms and viruses and others not mentioned could affect your computers in future. According to them, researchers say they typically discover between 500 to 800 new ones every month.

A worm is a programme that copies itself repeatedly into a computer memory or into a disk. A virus is a 'deviant' programme, stored on a computer floppy drive, hard drive, or CD, that can cause unexpected and often undesirable effects, such as destroying or corrupting data.

These are challenges of using computer in education. A lot of good programmes are either corrupted or destroyed. It is advisable that, for protection, you should not open any programme you doubt the source to avoid damage to your programme and your computer. Obtain your antivirus material to protect your machine. Format and update your computer regularly.

3.1.5 Health Matters

The computer is supposed to make people efficient but rather, it has made some workers journalists, postal workers, data entry clerks worse because they suffer repetitive injuries; eyestrain and headache, back and neck pains. The Environmental Protection Agency's advice is to exercise prudence avoidance, that is, relatively taking easy precautions. Such precautions may include putting some distance between us and a cathode-ray tube (CRT) monitor.

3.1.6 Ergonomics

Before, workers had to fit themselves to the job environment but nowadays health and productivity issues have spurred the development of a relatively new field, called ergonomics, which is concerned with fitting the job to the workers.

The purpose ergonomics is to make working conditions and equipment safer and more efficient. It calls for designing hardware and software that are less stressful and more comfortable to use, that blends more smoothly with a person's body or actions. Examples are tilting display screens, detachable keyboards, etc.

Self-Assessment Exercise 10.2

1. Mention **four** challenges of computer in education.
2. What are worms and viruses?
3. How can workers health be protected from computer effects?

Answers to Self-Assessment Exercise 10.2

1. Learn to deal with information overload. Sort out or distinguish between what is needed and what is not.
Have a strategy for what you memorize and what you do not need. Have alternative saving device.
Learn to make your personal multitasking efficient. Do not sacrifice quality for any task.
2. A worm is a programme that copies itself repeatedly into a computer memory or into a disk.
A virus is a deviant programme, stored on a computer floppy drive, hard drive, or CD, that can cause unexpected and often undesirable effects, such as destroying or corrupting data.
3. Prudence avoidance – allow for distance between you and a CRT monitor.
Design hardware and software that are less stressful and more comfortable to use. Tilt display screens.

4.0 CONCLUSION

In this unit, you have read about the prospects, problems and challenges of computer in education. You read that computer can speed-up the work of an individual and how computer development brought about miniaturization, speed and affordability. You have also been told that the combination of computer and communications are responsible for convergence, portability or mobility and personalization. Among the problems associated with the computers are

resistance to change, inadequate training, cost maintenance and adequate replacement, to mention a few. Some of the challenges of computer in education includes dealing with information overload, worm and viruses, health matters and ergonomics.

In the next unit, we shall discuss the Internet and the World Wide Web.

5.0 SUMMARY

In this unit, you read about

- Problems of computer in education
- Prospects of computer in education.
- Challenges of computer in education.

6.0 TUTOR-MARKED ASSIGNMENT

- i. Identify **four** problems of computers in education.
- ii. List and explain **four** prospects of computer in education.
- iii. List and explain **two** challenges of computer in education.

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MODULE 3

- Unit 1 The Internet and The World Wide Web
- Unit 2 Information and Communication Technology (ICT) in Education
- Unit 3 Information and Communication Technology (ICT) and Distance Education
- Unit 4 Evaluating The Quality of Information and Communication Technology (ICT) Programme in Education
- Unit 5 National Information Technology Policy

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 The Internet
 - 3.1.1 The World Wide Web (www)
 - 3.1.2 Features of Computer Telecommunications
 - 3.1.2.1 Electronic Mail (e-mail)
 - 3.1.2.2 Information Retrieval
 - 3.1.2.3 Information Publishing
 - 3.2 History of the Internet
 - 3.3 Common Uses of the Internet
 - 3.3.1 Teacher's Uses of the Internet
 - 3.3.2 Students' Uses of the Internet
 - 3.4 Problems and Pitfalls
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the last module, you read about the development in computer technology, how to operate a computer, how to utilize computer in education, the problems, prospects and challenges of computer in education.

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 BODY

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, nonprofit, 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. p. 30

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.

3.1.1 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. p. 6

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.

3.1.2 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.

3.1.2.1 Electronic Mail (e-mail)

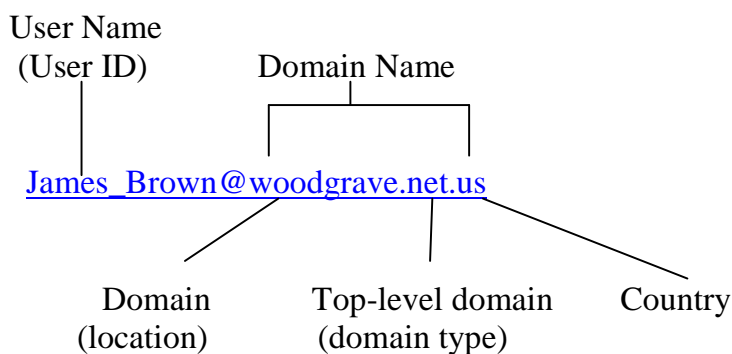
Simply referred to as ‘e-mail’, electronic mail is the most widespread of computer telecommunications. It is analogous to postal mail but much faster and more versatile. It allows private messages to be sent from individual to other individual or from individual to groups. An e-mail message travels from 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 two basic 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



- *Subject*: a one-line description used to present the topic of the message. Subject lines are displayed when a person checks his mail.
- *Attachments*: Many e-mail allows attachment of files such as documents and worksheets. If a message has an attachment, 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.

3.1.2.2 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 is used 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, bookmark 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. Examples of search engines are

Search Service	Site
Alta Vista	www.altavista.com
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 engine compares 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	www.historynet.
Law	www.lx.com/guide
Medicine	www.medsite.com

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

3.1.2.3 Information Publishing

Web is now being seen as a place to display information for others to view and/or retrieve. Many schools have created their Websites, which teachers, students, and a whole class often use for display of projects as well as for dissemination of information about the school.

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.

3.2 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.

3.3 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.

3.3.1 Teachers' Uses of the Internet

- 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 classroom home page to let parents and the community members know about class activities, children's homework and assignment, upcoming field trips and so on.

3.3.2 Students' Uses of the Internet

- Using e-mail for pen-pals exchanges with students at other locations to learn more about other places and cultures or to practice a foreign language.
- Exchanging written work with students 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 students, parents and members of the community.

Self-Assessment Exercise 11.1

1. Give a definition of the Internet.
2. Give a definition of the World-Wide-Web
3. Name the features of Computer Telecommunications.
3. Give two examples each of the uses of the Internet by the teachers and the students.

Answers to Self-Assessment Exercises 11.1

1. 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.
2. World-Wide-Web, usually called simply the “web” – and interconnected system of Internet computers (called *servers*) that support specially formatted documents in multimedia form.
3. The features of Computer Telecommunications include electronic mail (e-mail), information retrieval and information publishing.
4. Teachers’ uses of the Internet include
 - E-mailing other teachers in similar positions to exchange ideas and reduce teacher isolation.
 - Assessing on-line databases of teaching methods, strategies and instructions.

Students' uses of e-mail include

- Conducting research using resources available on-line.
- Publishing class projects on the World-Wide-Web for access by other students, parents and members of the community.

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

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

Self-Assessment 11.2

1. State some pitfalls of the Internet.
2. Suggest **two** solutions for these pitfalls.

Answers to Self-Assessment Exercise 11.2

1. Some of the components that work in concert with computer do not cooperate sometimes.
Sometimes, the materials available do not serve educational purposes accurately.
Students sometime digress from the main purpose of using the Internet.
2. Teachers should spend time to locate useful resources in advance.
They should supervise the students while sourcing for materials on the net.

4.0 CONCLUSION

You have read this unit on Internet and the World-Wide-Web. You have learnt about the history of the Internet and the Web, the uses of Internet by teachers and students, and the problems and pitfalls of the Internet.

In the next unit, you will learn about ICT in the classroom.

5.0 SUMMARY

In this unit, you read about

- the history of the Internet and World-Wide-Web.
- the operation of the Internet and the World-Wide-Web
- the features of the Internet
- the problems and pitfall of the Internet.

6.0 TUTOR-MARKED ASSIGNMENT

1. Give a brief history of the Internet and World-Wide-Web.
2. List the features of Computer Telecommunications and explain each of them.

3. List **three** uses each of the Internet by the teachers and the students and explain each of them.

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**UNIT 2 INFORMATION AND COMMUNICATION
TECHNOLOGY (ICT) IN THE CLASSROOM**

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Information and Communication Technology (ICT) and Learning.
 - 3.2 Visual Materials
 - 3.2.1 Books and Articles
 - 3.2.2 Charts, Posters and Flat Pictures
 - 3.3 Audio Materials
 - 3.4 Audiovisual Materials
 - 3.5 Other Forms of Information and Communication Technology (ICT) in the Classroom.
 - 3.5.1 Multimedia Presentation
 - 3.5.2 The Internet
 - 3.5.3 Adaptive Hardware
 - 3.5.4 Interactive White Board
 - 3.6 Benefits of Information and Communication Technology in the Classroom
 - 3.6.1 Autonomy
 - 3.6.2 Capability
 - 3.6.3 Creativity
 - 3.6.4 Quality
 - 3.6.5 Scope
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the last unit, you read about the Internet and the World-Wide-Web. You also read about the classroom use of the Internet by the teachers and the students. In this unit, you will read further about Information and Communication Technology (ICT) in the classroom.

2.0 OBJECTIVES

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

- describe the use of Information and Communication Technology (ICT) in the classroom.
- identify various ways of applying ICT in the classroom.
- list some benefits of ICT in the classroom.

3.0 MAIN BODY

3.1 Information and Communication Technology (ICT) and Learning

In the previous modules it was established that ICT has transformed the means by which we inform ourselves, remain up-to-date with world events and areas of personal interest to further our learning. Learning has gone beyond books and journals only. There is therefore reliance on images, video, animations and sounds for acquisition of information and learning. There is increased access to the Internet and this has increased or accelerated people's access to information.

We shall look at the various ways by which ICT could be integrated into the classroom use to enhance teaching and learning. This segment will marry the old technologies with the new ones and how the computer technology has influenced the old ones in classroom use.

3.2 Visual Materials

Teachers and students, prior to the development of ICT, made use of books, journals, prepared texts, handouts, charts, posters, transparencies, slides, flat pictures, etc. for teaching and learning. These materials are also used for display and presentation. With the advent of ICT, these materials are better packaged and utilized.

3.2.1 Books and Articles

Teachers no longer need to carry voluminous books about. Articles could be stored on compact Disk (CD) or flash drive and viewed in the class on the computer monitor. Articles could be downloaded from the Internet and used in the classroom. The Internet has made it easier to have access to written materials. Your projects or thesis or research report could be stored in your e-mail box and you can have access to it at any part of the world, provided you are connected to the net.

3.2.2 Charts, Posters and Flat Pictures

Charts, posters and flat pictures are useful tools in the hand of classroom teachers for illustrations in the classroom setting. Authors also illustrate their books with charts and flat pictures. Today, we have computer generated graphics that can be used to illustrate texts or used as graphics in the classroom setting. There are portable cellphones that even a young child can use. These can be used to take pictures of learnable materials for classroom discussion and could be connected to the Internet for online graphic materials.

Instead of charts, posters and slides being used for presentation, the PowerPoint presentation has made it easier and better for teachers and students to present reports, documents and projects in a better and easier form.

Today, we have Computer-Aided Design (CAD) software used for all three-dimensional designing. With the use of computer, movement is added to graphics.

This movement is called animation. This makes teaching with graphic materials interactive, concrete, immediate and real.

3.3 Audio Materials

Teachers use audio materials like radio broadcast, recorded music or messages audiocassette, audio discs, etc., for teaching and learning in the classroom situation. These are materials that appeal to the sense of hearing which teachers can use them to enrich teaching. They can be used during field trips to record materials outside the class and bring into the class for use. There are occasions where there is audio recording of resource person live in the class or at a different location for classroom use. Today, with the development in ICT, there is the phone-in programme where a classroom teacher with his class can reach a resource person live. There is no need inviting the person to the class or going to the person's location to record him or her.

3.4 Audiovisual Materials

Technology develops along human senses of sight and sound. Instructional materials relating to sight were earlier sets of materials that were found in the classroom. Such materials like posters, charts, drawings, flat pictures, printed materials, etc. were common in the class. The development of sound waves that brought about radio, added a new dimension to instructional materials. We have materials like radio, audiocassettes, audio discs, audiotapes and some of these were combined with slide projection to add sounds to presentations.

The development in technology has led to the production of materials that combine sight and sounds popularly referred to as audiovisual materials. Among these, we have the films and television. Education harnessed the qualities or characteristics of these materials for the production of instructional film and television. Films and television have the attributes of motion, arrested motion, to mention a few.

These attributes make them suitable for instruction. With the development in technology, film and videotapes now come in smaller sizes. Instead of the reel-to-reel films, programmes can be recorded in video compact disc (VCD) or digital video disc (DVD) and be used in the classroom.

There are mobile phones or hand-held computers that can record video clips for instructional purposes. Before the ICT era, there is the closed-circuit television, that is the closed-circuit television, that is, the networking of television by institutions or organization for enhanced productivity. Instructional Television has moved a step further with the development in Information and Communication Technology (ICT). Instructional Television can incorporate *videoconferencing* or *teleconferencing* into the classroom system.

Videoconferencing 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 (Williams & Sawyer, 2005). With this, teachers can collaborate with colleagues in other locations and bring their classes live into the classroom.

3.5 Other Forms of ICT in the Classroom

There are some other features of ICT application in the classroom system. These include:

3.5.1 Multimedia Presentation

Multimedia comes from the word “multiple media” which refers to technology that presents information in more than one medium such as text, still images, moving images, and sounds. A teacher can make a multimedia presentation in the class, for example, he can combine PowerPoint presentation with audio music and video clip of an event. This is made possible through ICT.

3.5.2 The Internet

This is a worldwide computer network that connects hundreds of thousands of smaller networks. These networks link educational, commercial, nonprofit, and military entities as well as individuals. The Internet is described as “the mother of all networks” because it is at the heart of Information Age. Through Internet, one is able to have access to information anywhere in the world.

Teachers can stay connected in the classroom and bring information live online for use in the class.

3.5.3 Adaptive Hardware

ICT makes it possible to take care of physically challenged pupils in the class. For pupils with mild visual impairment, the fonts can be enlarged. This can be done through Optical Character Recognition (OCR) systems which convert print into electronic form for computer accessibility. For those with significant physical impairment, speech synthesizer can convert text on the computer screen into spoken language. A typical example is text-to-speech (TTS) system.

For the blind, Braille printers are available for personal computers. There are special software packages which allow physically impaired individual to access the often nonlinear and graphically oriented World Wide Web. ICT can take care of all categories of learners in the classroom.

3.5.4 Interactive White Board (IP Board)

It is an easy-to-use interactive board. It can engage both the audience and the learners. It uses an electric pen with which you can control the computer, write or draw on the board directly. It is useful for trainers, teachers, presenters, and for meeting participants expectations, for delivery of lectures, workshop activities. It equally facilitates exchange of information in a more interactive and efficient way.

It is easy to use, stable and durable. It is multilingual, 'eco-friendly' and has free software update. It can be used by both the teacher and the students in the classroom.

It works with computer (laptop) and projector and can turn the classroom teaching into an interactive experience, engaging learners, encouraging active participation and thus enhance learning interaction. It encourages interactive teaching. It can equally be used for boardroom interactive discussion or remote interaction in a Training Room.

The IP board has mouse function, writing and drawing function, supplementary tools and handwriting recognition. It can also replay, save and print. It also has a remote interaction function.

Self-Assessment Exercise 12.1

1. State the classification of instructional materials and name **two** examples of each.
2. Name **two** forms of ICT in the classroom.

Answers to Self-Assessment Exercise 12.2

1. Instructional materials can be classified into three broad categories. These are visual, audio and audiovisual.
Visual – charts, posters, printed materials, etc.
Audio – radio, cell phones, audiocassette, audio discs, etc.
Audiovisual – television, video, computer, DVD, VCD, etc.
2. Multimedia Presentation, The Internet, Adaptive Hardware, Interactive White Board.

3.6 Benefits of ICT in the Classroom

The National Association of Advisers For Computers In Education (naace) and British Educational Communications and Technology agency (BECTa)(2001) identified **five** features of effective practice of teaching and learning with ICT. These are autonomy, capability, creativity, quality and scope.

3.6.1 Autonomy

- Pupils make decisions or show initiative about which application or hardware use best suited to a task.
- Pupils develop their own ways of thinking about the task and develop their own strategies for overcoming problems. They seem confident, prepared to take risks and learn from their mistakes.
- Pupils use teacher intervention effectively to move them on to the next stage in their thinking.
- Pupils use peer intervention effectively to develop their thinking. They recognize the potential feedback from others to improve their work.
- Pupils participate actively in formative assessment of their work. They know and understand how their work will be assessed and use these criteria to improve their work.
- Pupils are inspired to learn with ICT. They transfer knowledge to other context, for example, when using ICT at home. They recognize and value how knowledge gained outside the classroom contributes to their school work.
- Pupils access independent, student-centred resources and use them to effect.

3.6.2 Capability

- Giving the opportunity, pupils will develop ICT skills and deploy same to the task in hand, with increasing confidence and competence.

- Pupils transfer and apply their skills using ICT effectively to support learning in other subjects.
- Pupils experiment purposefully, problem solving through extrapolating from previous experience.
- Pupils develop the ability to make critical judgments about the contribution of ICT to their work and understand the value of ICT.

3.6.3 Creativity

- Pupils are inspired to be creative with ICT.
- Pupils release their creative ability through a range of ICT tools.
- Pupils use ICT to explore styles of communication and expression.
- Pupils are innovative/creative in the use of ICT.
- Pupils explore the possibilities of multimedia tools, enabling them to create in the styles readily available to them in games, CDs and television.

3.6.4 Quality

- Pupils use ICT to present and communicate their ideas to a high standard, reducing as necessary to produce better quality outcomes.
- Pupils have clear ideas of how they use ICT to improve the quality of their work.
- Pupils readily engaged in thinking about the task in hand. They explain what they have done and why. They justify their use of ICT in terms of the quality of the outcomes.
- Pupils display evidence of pride and satisfaction. They value the outcomes of their endeavours. They develop a personal commitment to good quality work and aspire to the highest standards.
- Pupils are engaged in high quality thinking and analysis through decision-making, predicting, hypothesizing and testing.

3.6.5 Scope

- Pupils employ ICT to gain access to experiences, information or resources in ways that are not possible with other media. This extends opportunities and brings a new dimension to teaching and learning.
- Pupils' learning is enhanced by reaching beyond the classroom via e-mail, Internet use, etc., expanding their knowledge and understanding of the world.
- Pupils use ICT to think in new ways. Pupils use ICT to explore and question, hypothesize and predict. They find different ways to do things.
(naace and BECTa (2001) , pp. 2- 12)

Items mentioned under autonomy, capability, quality and scope can be taken as a brief summary of the benefits of ICT in the classroom because it is all embracing. If ICT is integrated into the classroom, students stand to gain. The teachers may also will be positively affected as they have more time to perform more of supervisory roles since the programme is more learner-centred and each learner has the opportunity to develop his skills.

Self-Assessment Exercise 12.2

1. List **five** of the benefits of ICT as stated by naace and BECTa.
2. Give **three** examples of each.

Answers to Self-Assessment Exercise 12.2

1. Autonomy, Capability, Creativity, Quality and Scope.
2. **Autonomy**
 - Pupils make decisions or show initiative about which application or hardware is best suited to a task.

- Pupils develop their own ways of thinking about the task and develop their own strategies for overcoming problems. They seem confident, prepared to take risks and learn from their mistakes.

Capability

- Pupils experiment purposefully, problem solving through extrapolating from previous experience.
- Pupils develop the ability to make critical judgments about the contribution of ICT to their work and understand the value of ICT.

Creativity

- Pupils release their creative ability through a range of ICT tools.
- Pupils use ICT to explore styles of communication and expression.
- Pupils are innovative/creative in the use of ICT.

Quality

- Pupils use ICT to present and communicate their ideas to a high standard, reducing as necessary to produce better quality outcomes.
- Pupils have clear ideas of how they use ICT to improve the quality of their work.
- Pupils readily engaged in thinking about the task in hand. They explain what they have done and why. They justify their use of ICT in terms of the quality of the outcomes.

Scope

- Pupils employ ICT to gain access to experiences, information or resources in ways that are not possible with other media. This extends opportunities and brings a new dimension to teaching and learning.
- Pupils' learning is enhanced by reaching beyond the classroom via e-mail, Internet use, etc., expanding their knowledge and understanding of the world.
- Pupils use ICT to think new ways. Pupils use ICT to explore and question, hypothesize and predict. They find different ways to do things.

4.0 CONCLUSION

From this unit you have learnt about ICT in the classroom. You understand better why the old technologies cannot be discarded, rather, ICT has come to improve on them. Some of the old types are modified while additional outlets are given to others for optimal performance. Books can be stored in CD or computer hard disk, charts, posters and flat pictures are incorporated into computer graphics while slide and overhead transparencies presentations evolved into PowerPoint presentation. Radio has phoning programmes added while television incorporates teleconferencing. Multimedia presentations allow various media to be combined for presentation. Other media like adaptive hardware take care of physically challenged pupils. The Internet makes the class to become a global village. Autonomy, capability, creativity and scope are some of the benefits derived from ICT in the classroom.

In the next unit, you will read about ICT and Distance Education.

5.0 SUMMARY

In this unit, you have read about

- Information and Communication Technology (ICT) in the classroom.
- Various ways of applying ICT in the classroom.
- Some benefits of ICT in the classroom.

6.0 TUTOR-MARKED ASSIGNMENT

- i. List **three** old materials that ICT improved upon for instructional delivery.
- ii. Define the following: Multimedia, Internet, Teleconferencing, Audiovisual Materials, Visual Materials and Audio Materials.
- iii. Identify the features of effective practice of teaching and learning with ICT and list **two** benefits of each of them.

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**UNIT 3 INFORMATION AND COMMUNICATION
TECHNOLOGY (ICT) AND DISTANCE EDUCATION****CONTENT**

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 What is Distance Education?
 - 3.2 Stages of Development In Distance Education
 - 3.2.1 Audio-Based Instruction
 - 3.2.2 Audio teleconferencing
 - 3.2.3 Video-Based Technology
 - 3.2.4 Computer-Based Technology
 - 3.3 Classroom Uses of Distance Education Technologies
 - 3.4 Roles of ICT in Distance Education
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the last unit, you read about ICT in the classroom. You also read about the various ways of using ICT in the classroom and the benefits derived from using ICT in the classroom was presented to you.

In this unit, you will read about ICT and Distance Education.

2.0 OBJECTIVES

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

- define Distance Education
- describe the features of Distance Education
- identify the roles of ICT in Distance Education
- apply ICT in Distance Education

3.0 MAIN BODY

3.1 What is Distance Education?

Distance Education is often used interchangeably with Distance Learning. This is the type of education given to people who are not able to fit into the main stream of learning on campuses or joining the regular students on normal academic programme as a result of their jobs or locations. There are a lot who want to improve their skills but are encumbered with a load of problems from their places of work. Time is not at their disposal and they cannot fit into the regular class.

Distance learning was previously based on correspondence or at times, phone conversation between the instructors and the learners. Learners were given printed materials which were generally sent by post. Sometimes, the materials would not reach them, at times, they are received late and going through the volume would be cumbersome. With the development in technology, Internet has turned the whole world to a global village. Through the World-Wide-Web, learners can access information anywhere, any place.

Your course in the National Open University of Nigeria (NOUN) is an example of Distance Learning. You are not in the regular class. You do not have access to your lecturer but only your course materials and your course facilitators.

Knowledge has multiplied and it is no longer fashionable to restrict learning to the conventional classroom. The development in Information and Communication Technology (ICT) has come to the rescue of hitherto neglected set of learners who were yearning to learn but have no access to education either to upgrade themselves or learn new skills entirely.

Newby, Stepich, Lehman and Russel (2000) described *distance education* as an organized instructional programme in which teacher and learners are physically separated. They stressed further that distance education addresses the time of educational access.

Williams and Sawyer (2005) described *Distance Learning* as the name given to online educational programme and that younger college students like it because they don't have to spend time commuting, the schedule is flexible, and they often have greater selection of course offering.

3.2 Stages of Development In Distance Education (Learning)

Newby, Stepich, Lehman and Russel (2000) identified the correspondence stage, the audio-based technologies and computer-based technologies.

3.2.1 Audio-Based Technologies

This involved the use of radio. Radio has the capacity of reaching a relatively broad geographical region at relatively low cost compared to a delivery technology like television. It can provide a standardize message to a large audience and it could be well utilize in the areas of music, discussion, drama presentation and language learning. It adheres to a fixed schedule and it is not flexible. It is a one way medium. It sends message to learners but it does not receive message from the learner, except it is an interactive radio presentation.

3.2.2 Audio Teleconferencing

This is a distance education technology that overcomes the on-way limitation of the radio. This is an extension of a basic telephone that permits instruction and interaction between individuals or groups at two or more locations. By using a speakerphone or more sophisticated equipment. Members of the audience can both hear and be heard. It allows true, live, two-way interaction between two or more people physically separated.

Audio teleconferencing is a popular way of conducting meetings or simple instructional sessions where the time and cost of travel cannot be justified. A Literature teacher might use it for the students to interact with one another. In the same vein, a Foreign-language teacher might use it to permit students to interact with a native speaker of the language. It is an audio-only medium. There is not visual element.

3.2.3 Video-Based Technology

Video overcomes lack of visual elements in audio-based Distance Learning. Video may deliver over distances using a variety of means, including broadcast television, satellite and microwave transmission, and closed-circuit and cable systems. The distinction among them is the degree of interactivity. Options include one-way video and audio, one-way video and two-way audio and two-way video and audio.

Like radio, video involves one-way transmission of information with limited opportunity for interaction. The mode of delivery is typical of broadcast television. The ability to reach the mass audience with the video and audio is an advantage. The chief limitation is time dependence (programmes and broadcast at a particular time).

A solution for interactivity problem is to provide a two-way audio accompaniment. Audio “talkback” is added by telephone connection.

The latest development in video-based learning is two-way interactive video. Both sending and receiving sites are equipped with cameras, microphones and video monitors. Some means of transmission – satellites, microwaves, cable, fiber optic or digital-grade telephone lines – link the two (or sometimes) more sight together. It is the closest approximation of face-face instructions.

3.2.4 Computer-Based Technologies

It is the newest tool for Distance Learning. They are used to supplement print-base correspondence study, computer diskettes or CD-RUM with instructional software that can be mailed to learners for correspondence study on home computers.

Holmes and Gardener (2007) stressed that this stage focuses more on the electronic interaction and communication between the learners and the tutor, with both asynchronous and synchronous communication supporting the learning.

Audiographic is the use of audio-teleconferencing along with transmission of still picture and graphics. These include slow scan video, fax, and electronic graphic tablets.

Computer can be used to enhance both one-way and two-way *video conferencing*. It can also be used for desktop video conferencing. These include: White Pine's *CUSeeMe* and Microsoft's *Net-meeting*.

Computer-mediated Communication (CMC) refers to any use of computer as a device for mediating between teacher and learners, and among learners, often over distances. Common applications include e-mail, computer conferencing and the Web. E-mail permits personal communication between and learners and among individual learners. E-mail is providing a kind of "electronic office housing" whereby students can keep in contact with teachers.

The Web with its array of resources is quickly becoming a key component of many distance education experiences. It can deliver content, provide links to information at other locations and serve as a focal point for a distance education experiences. Web courses and programmes at all levels are on the increase.

Computer-mediated communication, whether via the web or a dedicated computer system, can remove barriers of both distance and time. Student can take their courses anywhere that there is a network or telephone connection and, for asynchronous approaches, at any time that is convenient for them.

Availability of Internet in homes, schools and places of work around the world now makes it possible to reach everywhere with less cost. However, it requires computer access and familiarity for effective use. Not all contents can be effectively taught via the net.

Self-Assessment Exercise 13.1

- i. Define Distance Education
- ii. List the stages of development in Distance Education.

Answers to Self-Assessment Exercise 13.1

- i. Distance Education is synonymous to Distance Learning. This is the type of education given to people who are not able to fit into the main stream of learning on campuses or joining the regular students on normal academic programme as a result of their jobs or locations.
- ii. Stages of Development In Distance Education include
 - Audio-based Instruction
 - Audio teleconferencing
 - Video-Based Technology
 - Computer-Based Technology

3.3 Classroom Uses of Distance Education Technologies

Distance educational technologies can be applied for most educational goals that one could have in the conventional classroom. Some common applications include the following:

- Reaching individuals isolated by distance or geographical barriers.
- Reaching non-traditional population of learners (e.g. adult learners, homebound individuals).
- Providing instruction in specialized subject areas, such as advanced physics or foreign languages, for which a local teacher might not be available.
- Bringing experts or other special individuals into the classroom from a distance (e.g., having the author of a children's book interact with a class of students who have just finished reading the book.)
- Linking two classrooms together so that students can interact with one another to learn, solve problems, and communicate.

3.4 Roles of ICT in Distance Education

ICT plays significant roles in Distance Education.

- (i) It helps in getting course materials to the learners.
- (ii) It saves the learners from carrying loads of books about since they can access materials from the net.
- (iii) It makes it inexpensive for learners to get their assignment back to the teachers without travelling a long distance.
- (iv) It reduces the barrier of time in getting required materials. As long as learners can log on the net, the material is available.
- (v) Flexibility is guaranteed. ICT makes it possible for independent learning. Learners do not have to wait for a teacher before learning. He can access information any where, any time.

- (vi) Because there is not much of face to face interaction, course materials are interactive and learner's friendly. The language is simple and explanatory.
- (vii) ICT makes it possible for learners to have self-assessment regarding his progress since feedback mechanism is built into the programme.

Self-Assessment Exercise 13.2

- i. State **three** uses of Distance Education Technologies.
- ii. Mention **three** roles of ICT in Distance Education.

Answers to Self-Assessment Exercise 13.2

- Reaching individuals isolated by distance or geographical barriers.
 - Reaching non-traditional population of learners (e.g. adult learners, homebound individuals).
 - Providing instruction in specialized subject areas, such as advanced physics or foreign languages, for which a local teacher might not be available.
 - Bringing experts or other special individuals into the classroom from a distance (e.g., having the author of a children's book interact with a class of students who have just finished reading the book.)
- ii.
- It helps in getting course materials to the learners.
It saves the learners from carrying loads of books about since they can access materials from the net.
It makes it inexpensive for learners to get their assignment back to the teachers without travelling a long distance.
It reduces the barrier of time in getting required materials. As long as learners can log on the net, the material is available.

4.0 CONCLUSION

In this unit, you have read about Distance Education or Learning. You also read about the process of Distance Education and its benefits to skill development of individuals that could not fit into the mainstream of learning, as a result of jobs or location and how Distance Education with the use of ICT can enhance the performance of such individuals.

In the next unit, we shall examine the evaluation of the quality of ICT in schools.

5.0 SUMMARY

In this unit, you have read about

- Distance Education
- Features of Distance Education
- Roles of ICT in Distance Education
- Application of ICT in Distance Education

6.0 TUTOR-MARKED ASSIGNMENT

- i. What is Distance Education?
- ii. Mention **two** stages of the development of Distance Education and explain them in your own words.
- iii. List **five** classroom uses of Distance Education Technologies.
- iv. Mention **four** roles of ICT in Distance Education.

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**UNIT 4 EVALUATING THE QUALITY OF ICT PROGRAMMES
IN EDUCATION**

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Evaluation of the Quality of ICT Programme in Education
 - 3.2 Criteria for Evaluating Instructional Materials
 - 3.2.1 Cost
 - 3.2.2 Rationale
 - 3.2.3 Context
 - 3.2.4 Level
 - 3.2.5 Relevance To Needs
 - 3.2.6 Practicality
 - 3.2.7 Layout and Organization
 - 3.2.8 Coverage
 - 3.2.9 Range of Task
 - 3.2.10 Learner Support Materials
 - 3.2.11 Interest/Motivation
 - 3.2.12 Teacher Support Materials
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

In the last unit, you read about ICT and Distance Education. You are now acquainted with what Distance Education is, stages of its development, classroom uses of its technologies and the roles of ICT in Distance Education.

In this unit, you will read about the evaluation of the quality of ICT Programme.

2.0 OBJECTIVES

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

- define evaluation
- list the criteria of evaluating an instructional material
- impact of National IT Policy on ICT Application in Education

3.0 MAIN BODY

3.1 Evaluation of the Quality of ICT Programmes in Education

Evaluation is a day-to-day determination of activities, events, process, an object and other things around us (Urwin and McAleese, 1988). It is a process of value judgment about the worth of something (Capper, 1994; Hanna, 1993; Worthen, Borge and White, 1993).

Evaluation is very necessary if one wants to ascertain the standard or quality of a programme. It shows that all is not well. It often points out problems and weaknesses. It provides information that helps teachers to be consistent, increase the amount of student learning in terms of instruction effectiveness. Continuous evaluation of instruction enables evaluator to

- identify areas of the content that are unclear, confusing, or otherwise not helpful.

- identify areas of the content that have the highest priority for revision because they (1) are the most critical aspects, (2) are the most difficult to learn, or (3) are likely to have the greatest impact on learning.
- Providing a rational evidence in support of making specific revisions (Newby, Stepich, Lehman and Russel, 2000)

The sole aim of evaluation is to improve the situation rather than avoid opportunity to evaluate one's efforts. We shall look at the criteria for evaluating instructional materials, how ICT has fared in institutions programmes and the impact of the National IT Policy on ICT application.

3.2 Criteria for evaluating Instructional Materials

This segment is concerned about how the Instructional Materials (by this, I mean, how ICT) have fully impacted on teachers and learners. The right attitude to teach and to learn, and what hinders them from applying ICT in adequate proportion.

Wallace (1998) listed twelve possible criteria for evaluation of instructional materials. These criteria shall be adapted for the evaluation of ICT quality in education. The criteria listed are: cost, rationale, context, level, relevance to needs, facilities and practicality, layout and organization, coverage, range of tasks/activities, learner support materials, interest/motivation, and support material.

3.2.1 Cost

Expense is a criterion for evaluating materials. The materials may be good but might not have value for money. It has been established that ICT in the classroom increase efficiency and reduce wastage. Do you value the cost of materials you want to apply in the class in terms of transportation cost, space for using it, suitability of the environment and time allotted to the programme? A Literature teacher who wants to present a film on Hamlet to a school in a rural area that is not motorable should know that it would cost him more to carry a television set, a

generator and a screen. He can, instead, take a white cloth (about 2-3 yards), a laptop and a multimedia projector in his bag, travel down to the rural area and rent a generator there. It will cost him less of time, money and energy and he would achieve his aim.

3.2.2 Rationale

You have to justify your preference for a particular type of material. Why do you choose online interaction? Why do you prefer the internet to deal with particular type of students? Regular programmes are time specific and have distance barrier for those on the job. You have to decide how to reach the learners and the only option in this Information Age is the Internet. Distance learners can access information any time and any where. But, a word of caution? What type of programme do you present to the learners? Do they meet the required standard and that is why programme coordinators should ensure the quality of programme being sent to learners.

3.2.3 Context

ICT can be used to instruct or educate, inform and entertain. The context of utilization has to be ascertained. Teachers should verify what the learners use their computer to do in the class. Some learners use handheld computers to record obscene programmes and use it to disturb in the class. Teachers need to verify and specify the context of using ICT in the class. A School Proprietor bought some computers to encourage the students to be computer literate. Immediately they were set up, three students disappeared from the class. When they came back and were queried by their teachers why they left the class, they said they went to look for home video to play on the computer – misplaced priority.

3.2.4 Level

This has to be stated. The criteria used to establish the level has to be stated. When applying ICT in the class, the level has to be stated. You cannot do

programming for beginners. They need to get the rudiments of computer before you can move on to that. A person who has not been able to work on Microsoft Word cannot start working on PowerPoint presentation. The items you present to the learners should be graded – elementary, intermediate, advanced.

3.2.5 Relevance To Needs

This overlaps with level. While level looks at the appropriateness of those materials to the level of the learners being considered, this state examines the relevance of the materials. If a learner is encouraged to own a computer, is he computer literate? If he is not, the material is useless to him. If he is literate, if his computer does not have a large memory and it is not Internet compliant, it is of no use to him. If Institutions that have external programmes or distance learning programme do not have websites that students can access for information, do their registration and other relevant things, such institutions are yet to see the relevance of ICT in education.

Self-Assessment Exercise 14.1

- i. Define evaluation.
- ii. Why is it necessary to evaluate an instructional material?

Answers to Self-Assessment Exercise 14.1

- i. Evaluation is a day-to-day determination of activities, events, process, an object and other things around us. It is a process of value judgment about the worth of something.
- ii. Evaluation of instructional materials enables us to
 - identify areas of the content that are unclear, confusing, or otherwise not helpful.

- identify areas of the content that have the highest priority for revision because they (1) are the most critical aspects, (2) are the most difficult to learn, or (3) are likely to have the greatest impact on learning.
- provide a rational evidence in support of making specific revisions.

3.2.6 Practicality

This deals with utilization. How practical and easy is the ICT Programme mounted by the institution or the teacher. Can students get the right information? How easy or difficult is it for them to access information? How often do the institutions upload the right information the right information on the Web for the learners? How often do teachers contact their distance students? How often do students contact their teachers or relevant authorities? The teaching length and materials available, do they justify the content of the course?

3.2.7 Layout and Organization

These attributes overlap. A good layout and organization can make materials more 'user friendly'.

Layout incorporates features such as – clear signposting, heading and subheading.

- Clear and systematic use of convention



for education.

- Attractive and appropriate typeface,
e.g. **BOLD**, etc.
- Helpful and attractive use of illustrations (Clip Art, Word Art, Animation, etc.)

Organization examines the following:

- Whether the topics are dealt with in appropriate order using relevant materials.
- The systems of organization of the elements of course – are they divided into units and the units into sections? What is the rationale for the organization?

3.2.8 Coverage

When applying ICT in education, do they cover the relevant aspects of learning? Are they adequate, appropriate, relevant and effectively utilized? Are all the important aspects of the course covered? Are there areas omitted?

3.2.9 Range of Task Activities

When applying ICT in education, what is the range of the task? Do we want learners to be computer literate only? Do we still incorporate old technologies or have we totally discarded them? What aspect does our application cover? Is there any kind of repetitive activity? Is there any element of choice for learners on the available instructional materials?

3.2.10 Learner Support Material

Do learners have extra back-up materials such as recorded CD, software on relevant subjects related to what they are taught, application software to upgrade themselves on ICT, evaluation or text materials for remedial work? Do materials provided for learners online have answer keys to support autonomous learning?

3.2.11 Interest/Motivation

This overlaps with other contention areas. For example, materials at wrong level and badly organized will tend to demotivate learners. Intention might be misunderstood if not well presented. A tertiary institution wanted to upgrade the

ICT skills of its workers and it conducted a pre-test to ascertain the level of ICT compliant of the secretariat staff. A lot of them failed the examination. The institution then mounted a remedial course and gave the staff a deadline of three months to be ICT compliant. Most of those who failed started lobbying not to be thrown out of job instead of improving their skills. Their failure demotivate them. Rather than such ultimatum, there could be reward for good performance.

3.2.12 Teacher Support Material

For ICT to relevant in education, its benefits to teachers must be spelt out. Materials should be clearly organized to help the teacher deliver the right lecture. Teacher must be conversant with materials available to him. Teacher must identify materials that will help him deliver his lecture appropriately.

For ICT to be fully utilized in education, it has to be evaluated and be found suitable, appropriate, prepared well enough to motivate learners and can also be effectively used (Amoo, Ayodele and Egbowon, 2005).

The relevance and appropriateness are related to learners' characteristics and stated objectives. The quality of preparation will help selecting materials to be used. For example, sending prepared course materials online will be preferable to publishing it as a book and asking the students to go to designated bookshop to buy. You can do that as a backup in case a student is unable to access the material online.

If you are giving a presentation in a boardroom the kind of projection will be different from that of a large hall. You will require a bigger screen and you will equally increase the fonts of the characters.

There are some other criteria that could play significant roles in evaluation of instructional materials. Notable among these are timing, perception, institutional policy and professional bias.

Timing

This can be a vital factor in evaluating instructional materials. Since evaluation is an on-going process, an instructional material might be obsolete owing to some changes or time lag. A Tertiary Institution developed software for presenting students' results. A lecturer found out that he could not upload his result on the Institution's Website after computing the students' scores until he was given an updated version. The one with him was obsolete. There should be constant update of ICT software.

Perception

This is the process of becoming aware of objects, qualities or relationship by the way of sense organ. The interpretation of information sent to the brain is mediated by past experiences of the receiver. This accounts for the various interpretations of objects from person to person (Amoo, Ayodele and Egbowon, 2005). Perception can be a criterion in evaluating instructional materials because their value judgment or worth placed on materials will depend on the experience of the evaluator. A lot of teachers were opposed to the use of television in the teaching system because of the belief that it would throw them out of job but versatile teachers that know the worth of a television as an instructional material employ it as supportive means for effective delivery of instruction.

The pace of ICT integration in education has been a bit slow because of teachers' perception. In a study carried out by Egbowon (2008), 50 teachers were selected from two tertiary institutions in Lagos State. The study showed that 40 out of 50 lecturers had computers, 10 had laptops only while 20 had laptops and Desktop PCs. 14 out of 50 use the Internet frequently and 12 out of 50 are still ignorant of ICT in education. There is the need to speed up awareness campaign and empower the teachers on the use of ICT in education.

Institutional Policy

Institutional Policy is another factor that has to be considered in evaluating instructional materials or an instructional system. The government formulated the IT policy which is supposed to be the guiding principle of ICT but not many people are aware of the policy. Many Higher Institutions now embrace ICT for both administrative and academic matters but staff and students are slow in embracing it. The policy is supposed to be vital to the operation of Distance Education but not much is put in place for the implementation of the policy.

Professional Bias

Human beings are averse to change. Evaluation brings in change and its aim is for improvement of the system. Some people do not want to change because they feel ICT is not applicable to their profession. A man was about to present a Ph.D. Oral Examination and he prepared a PowerPoint presentation. While he was presenting his report, one of the examiners cut in and said, "Tell the presenter to present his report in ten minutes. We can't be waiting here for this presentation." The presenter had to do it orally. Teachers that were opposed to television now see it as an effective instructional material.

The National IT Policy has to be given wider publicity and the enabling environment should be created for the impact is yet to be felt in education.

Self-Assessment Exercise 14.2

- i. Name **three** other criteria that have not been listed among the major ones that can affect evaluation of instructional materials.
- ii. Why are you people not aware of the IT policy?

Answers to Self-Assessment Exercise 14.2

- i. Perception, Professional Bias and Timing.
- ii. There is no wide publicity for the policy and there is no enabling environment for its application.

4.0 CONCLUSION

You have read about evaluation of the Quality of ICT Programmes in Education. You have also read about the criteria for evaluating a material and the impact of the National Policy on IT on ICT application in education.

In the next unit, we shall look at Nigerian National Policy For Information Technology (IT).

5.0 SUMMARY

In this unit, you read about

- evaluation of ICT application in education
- criteria for evaluating an instructional materials.
- impact of National IT Policy on ICT application in education.

6.0 TUTOR-MARKED ASSIGNMENT

- i. Define evaluation.
- ii. List **six** criteria of evaluating an instructional material and explain **four** of them.

7.0 REFERENCES/FURTHER READINGS

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UNIT 5: NATIONAL INFORMATION TECHNOLOGY POLICY

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 The National Policy on Education
 - 3.1.1 Primary Education
 - 3.1.2 Secondary Education
 - 3.1.3 Mass Literacy, Adult and Non-Formal Education
 - 3.1.4 Science, Technical and Vocational Education
 - 3.1.5 Tertiary Education
 - 3.1.6 Open and Distance Education
 - 3.1.7 Special Education
 - 3.1.8 Educational Services
 - 3.1.9 Planning, Administration and Supervision of Education
 - 3.2 The National Policy on Education and Integration of ICT
 - 3.3 National Information Technology (IT) Policy
 - 3.1 Executive Summary
 - 3.4 Decisions and Observation
 - 3.5 National IT Policy, National Policy on Education and Open/Distance Learning
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the last unit, you read about the evaluation of ICT in education. You read about the criteria for evaluating instructional materials and the people awareness of information technology in education. In this unit, you will read about the National Policy on Education and the National Information Technology Policy.

2.0 OBJECTIVES

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

- explain the ICT Policy in Education
- explain the National Information Technology Policy as it relates to Education

3.0 MAIN BODY

3.1 The National Policy on Education

The National Policy on Education came into being as a result of the conviction that education is an instrument “per excellence” for effecting national development. Government decided to set out the educational goals that would be relevant to the needs of every individual in the nation. This desire resulted in the 1969 National Curriculum Conference which was attended by a cross section of Nigerians. The National Curriculum Conference led to a seminar of experts from a wide range of interest groups within Nigeria in 1973. The outcome of the seminar was a draft document that led to the final document known as the National Policy on Education, first published in 1977.

The publication has been revised thrice. The second edition was published in 1981 and in 1988, the third edition was published. Each revised edition took into cognizance the dynamics of social change and the demands on education. The fourth edition was necessitated by some policy innovations and changes, and the

need to update the third edition (1998). Some of the innovations and changes include:

- (a) The lifting of the suspension order on Open and Distance Learning Programme by Government;
- (b) Revitalization and expansion of the National Mathematical Centre (NMC);
- (c) Establishment of Teachers Registration Council (TRC)
- (d) Introduction of Information and Communication Technology (ICT) into the school system;
- (e) Prescription of French Language in the Primary and Secondary School curriculum as a second Official Language;
- (f) Prescription of minimum number of subjects to be taken by SSCE candidates;
- (g) The integration of basic education in the programme of Quaranic Schools, to ensure equal opportunity and effective implementation of UBE;
- (h) Repositioning science, technical and vocational education in the scheme of national education for optimum performance; and
- (i) General contextual change to reflect the state of professional practice in education, among others.

These are the changes incorporated in the new edition of the National Policy on Education. This unit is concerned with articles (a) and (q) which are connected with the National Information Technology Policy.

- (a) The lifting of the suspension order on Open and Distance Learning Programme by Government.
- (b) Introduction of Information and Communication Technology (ICT) into the school system.

The Open University is now in Operation and it needs Information and Communication Technology (ICT) to operate because the learners are not in the

mainstream of education. They need to access their courses on the internet since they do not have direct contact with their lectures.

Before delving into the National Information Technology Policy, we shall look at the ICT policy in the National Policy on Education on all the sectors of education.

3.1.1 Primary Education

(m) In recognition of the prominent role of Information and Communication Technology in advancing knowledge and skills necessary for effective functioning in the modern world, there is urgent need to integrate Information and Communication Technology (ICT) into education in Nigeria.

Government shall therefore provide basic infrastructure and training for the realization of this goal at the primary school level.

3.1.2 Secondary Education

(f) Government shall provide necessary infrastructure and training for the integration of the ICT in the school system in recognition of the role of ICT in advancing knowledge and skill in the Modern World.

3.1.3 Mass Literacy, Adult and Non-Formal Education

No mention of ICT

3.1.4 Science, Technical and Vocational Education

No mention of ICT

3.1.5 Tertiary Education

No mention of ICT

3.1.6 Open and Distance Education

Implied in Article 90 (p. 44)

It uses a variety of Media and Technologies to provide and/or improve access to good quality education for large numbers of learners wherever they may be.

- 93(iv) Liaise with media houses, information and communication technology providers and other relevant bodies in enhancing Open/Distance Education.

3.1.7 Special Education

- 96 (c) (iii) Special Education Equipment and Materials e.g. Standard Library, audio-visual equipment, internet facilities, etc. for the gifted and talented children.

3.1.8 Educational Services

101 (e) p.52 Last Paragraph

To achieve this policy objectives, government shall provide appropriate Information and Communication Technology (ICT) facilities to ensure that the benefits of the virtual library permeate all levels of education in Nigeria.

102(d) Government shall provide facilities and necessary infrastructure for the promotion of Information and Communication Technology (ICT) at all levels of education.

3.1.9 Planning, Admin & Supervision of Education

No clear ICT Policy

3.2 The National Policy on Education and Integration of ICT

The 4th edition of the policy was necessitated by “some policy innovations and changes...” the innovations include **introduction of Information and Communication Technology into the School System.**

Going through the Policy, ICT is mention only in respect of Primary Education (Article 19 (m) p.17), Secondary Education (30 Article 30 (f) p.24), Open and Distance Learning (implied in Article 90 p.44 and 93 (iv) p.45), Special Education (Article 96 (c) (iii) p.49), Educational Services (Article 101 (e) p.52, Article 102 (a) (d) p.54.

Much as the Government is aware of the efficacy of ICT in promoting better teaching and better learning, emphasis were not laid on the application of ICT in the following sectors:

- Mass Literacy, Adult and Non-formal Education
- Science, Technical and Vocational Education
- Tertiary Education, and
- Planning, Administration and Supervision of Education

Mass Literacy is not confined to the conventional class. It is the combination of both the conventional class and the external system. ICT will be of importance.

Science, Technical, Vocational, Tertiary education all need ICT for survival. There should be a clear-cut policy on ICT to develop the sectors along the trend of Information Age, this is yet to be done.

The dire need for technological development which was exemplified in the National Policy on Education prompted the nation to evolve an Information and Communication Technology. This led to the National Information Technology Policy.

Self-Assessment Exercise 15.1

- i. Mention **four** innovations and changes that necessitated the update of the 1998 edition of the National Policy on Education.
- ii. Identify the levels of education in the National Policy on Education where there is little emphasis on ICT.

Answers to Self-Assessment Exercise 15.1

- i. Innovation and changes in the educational system.
 - The lifting of the suspension order on Open and Distance Learning Programme by Government;
 - Revitalization and expansion of the National Mathematical Centre (NMC);
 - Establishment of Teachers Registration Council (TRC)
 - Introduction of Information and Communication Technology (ICT) into the school system;
 - Prescription of French Language in the Primary and Secondary School curriculum as a second Official Language;
- ii. ICT integration is not given the needed emphasis in
 - Mass Literacy, Adult and Non-Formal Education.
 - Science, Technical and Vocational Education.
 - Tertiary Education.
 - Planning, Administration and Supervision of Education.

3.3 National Information Technology Policy

The National Information Technology (IT) policy was conceived after Nigeria's participation in the first African Development forum on the Challenge to Africa of Globalization in the Information Age held in Addis Ababa in October 1999. A

national workshop on the National Information and Communication Infrastructure was held in Abuja in March, 2000 as a follow up.

Professional bodies including Computer Association of Nigeria (COAN), Information Technology Association of Nigeria (ITAN) and the Institute of Software Practitioners of Nigeria (ISPN) submitted draft IT policy proposals which evolved into the production of a master plan for the development of a national ICT programme “ICT 200” during the tenure of Chief Ebitumi as Honourable Minister of Science and Technology.

The President, Chief Olusegun Obasanjo, the Minister of Science and Technology, Professor Turner T. Isoun all provided the motivation and mobilization that assisted the production of the policy. A committee headed by Professor G.O. Ajayi compiled the policy.

3.3.1 Content of the Policy

The Policy titled: “Nigerian National Policy for Information Technology (IT): ‘USE IT’ is divided into sections. The first section contains the Executive Summary, Acknowledgements, definitions and Acronyms and Sector Applications.

The next section contains the chapters. The chapters are divided into sixteen parts.

- Chapter 1: Human Resource Development
- Chapter 2: Infrastructure
- Chapter 3: Governance
- Chapter 4: Research and Development
- Chapter 5: Health
- Chapter 6: Agriculture
- Chapter 7: Urban and Rural Development
- Chapter 8: Trade and Commerce
- Chapter 9: Fiscal Measures
- Chapter 10: Government and Private Sector Partnerships
- Chapter 11: Arts, Culture and Tourism

- Chapter 12: National Security and Law Enforcement
- Chapter 13: Legislation
- Chapter 14: Global Consideration
- Chapter 15: IT Popularization and Awareness
- Chapter 16: Policy Implementation

The last section comprised the Appendices:

- Appendix A: National Information Technology Development (NITDA)
- Appendix B: Details on the Legal Areas that must be addressed
- Appendix C: Outline of short-term to Medium-term implementation Strategy
- Appendix D: Budgetary Estimates
- Appendix E: List of Papers consulted
- Appendix F: Consultation with IT Experts

3.3.2 Executive Summary

The executive summary is divided into five sections namely: Preamble, Vision Statement, Mission Statement, General Objectives and Strategies. The salient points here will be highlighted.

- Preamble hinged on developing the people along the development in a rapidly change global environment.
- **Vision Statement**
To make Nigeria an IT capable country in Africa and a key player in the Information society by the Year 2005, using IT as the engine for sustainable development and global competitiveness.
- **Mission Statement**
To use IT for
 - (i) Education
 - (ii) Creation of Wealth
 - (iii) Poverty Eradication
 - (iv) Job Creation
 - (v) Global Competitiveness

GENERAL OBJECTIVES

Since this course is on Information and Communication Technology in Education, we shall highlight **only the objectives related to education.**

- i. To ensure that Information Technology resources are readily available to promote efficient national development.
- ii. To guarantee that the country benefits maximally, and contributes meaningfully by providing the global solutions to the challenges of the Information Age.
- iii. To empower Nigerians to participate in software and IT development.
- iv. To encourage local production and manufacture of IT components in a competitive manner.
- vi. To establish and develop IT infrastructure and maximize its use nationwide.
- xiv. To empower children, women and the disabled by providing special programs for the acquisition of IT skills.
- xv. To empower the youth with IT skills and prepare them for global competitiveness.
- xvi. To integrate IT into the mainstream of education and training.
- xvii. To create IT awareness and ensure universal access in order to promote IT diffusion in all sectors of our national life.
- xxv. To develop human capital with emphasis on creating and supporting a knowledge-based society.
- xxix. To build a mass pool of IT literate manpower using the NYSC, NDE and other platforms as “train the trainer” Scheme (TTT) for capacity building.
- xxx. To set up Advisory standards for education, working practices and industry.
- xxxi. To establish appropriate institutional framework to achieve the goals stated above.

STRATEGIES

- iii. Addressing open standards for further liberalization and the fiscal measures including incentives to substantially improve telephone tele-density and make IT more affordable to the citizenry.
- iv. Establishing IT Parks as incubating centres for the development of software applications at national, state and local levels.
- v. Restructuring the education system at all levels to respond effectively to the challenges and imagine the impact of the information age and in particular, the allocation of a special IT development fund to education at all levels.
- vii. Encouraging massive local and global IT skills acquisitions through training in the public and private sectors with the view to achieving a strategic medium-term milestone of at least 500,000 IT skilled personnel by the year 2004.
- ix. Establishing adequate institutional framework at the federal, state, and local government levels in order to effectively accomplish the objectives of the IT vision and mission.
- x. Establishing national IT awareness machinery at all levels of government and encouraging private sector participation in exposing Nigerians to the features and benefits of IT.
- xviii. Utilizing IT opportunities to restructure government, citizens and business interfaces for better governance, improved trade and commerce and administrative effectiveness.

3.3 Decisions and Observation

- The Government established a National Information Technology Development Agency (NITDA) to implement IT Policy, regulate, monitor, evaluate and verify progress on an on-going basis under the co-ordination of the Federal Ministry of Science and Technology.
- Its operation to be funded by a start-up grant of at least \$10 million.

- The Government established a National Information Technology Development Fund (NITDEF) under the aegis of the National Information Technology Development Agency (NITDA) and funded as follows:
 - a) Start-up grant of at least \$150 million.
 - b) 2% of the Federal Capital Budget will be allocated to the fund until the articulated vision is attained.
 - c) 3% tax on all imported finished IT products will be directly paid to the products.

Above are the decisions of the government on IT Policy but it could be observed that:

- Awareness level of the policy is low.
- Educational institutions and private organizations are not fully mobilized.
- Education was not given a priority under the policy as it was done for other sectors like Health, Agric, Urban and Rural Development, Tourism, Arts and Culture, Legislation, Governance etc.
- Except under Research and Development, the Policy is silent on education as a discipline.
- Open and Distance Learning were integrated into the 4th edition of the National Policy on Education because of its importance. IT Policy does not give any priority to this type of Education.

3.5. National IT Policy, National Policy on Education and Distance Learning

The National Policy on Education has spelt out the structure and operation of the Open and Distance Learning Education. One of the ways to pursue the goals is to **liaise with media houses, information and Communication Technology Providers and other relevant bodies in enhancing Open/Distance Education.**

Granted that those involved in Open/Distance Education are those who could not fit into the mainstream of regular classroom and that they need to access their resource materials anytime, anywhere through internet and web services, there is the need to revisit the policy to meet with the national drive and the yearnings of the prospective learners and instructors.

Self-Assessment Exercise 15.2

- i. What are the mission and vision statements of ICT?
- ii. Mention **two** observations on Government's decision on IT Policy.

Answers to Self-Assessment Exercise 15.2

i. Vision Statement

To make Nigeria an IT capable country in Africa and a key player in the Information society by the Year 2005, using IT as the engine for sustainable development and global competitiveness.

Mission Statement

To use IT for

- Education
 - Creation of Wealth
 - Poverty Eradication
 - Job Creation
 - Global Competitiveness
- ii. Observations on Government's decision on IT Policy
 - Awareness level of the policy is low.
 - Educational institutions and private organizations are not fully mobilized
 - Open and Distance Learning were integrated into the 4th edition of the National Policy on Education because of its importance. IT Policy does not give any priority to this type of Education.

4.0 CONCLUSION

In this unit, you read about the National Policy on Education and the National Information Technology Policy. You also read about the relevance of the Policy to the development of Open and Distance Education.

5.0 SUMMARY

In this unit, you have read about

- ICT Policy in Education
- The Position of Education in ICT Policy
- The National Policy on Education
- Open and Distance Learning were integrated into the 4th edition of the National Policy on Education because of its importance. IT Policy does not give any priority to this type of Education.

6.0 TUTOR-MARKED ASSIGNMENTS

- i What is the purpose of formulating a National Policy on Education?
- ii What motivated the establishment of the National Information Technology Policy?

4.0. REFERENCES/FUTHER READING

FRN (2004). National Policy on Education, Lagos: NERDC Press.

Nigerian National Policy for Information Technology (IT): “USE IT”.

MODULE 4

- Unit 1 Basic Programming I
- Unit 2 Basic Programming II
- Unit 3 ICT and Tertiary Education
- Unit 4 Networks and Communication
- Unit 5 Problems and Challenges of Application of ICT in Developing Countries
- Unit 6 Your future and ICT

UNIT 1 BASIC PROGRAMMING**CONTENT**

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Definitions
 - 3.1.1 Programme
 - 3.1.2 Programming
 - 3.1.3 Steps In Programming
 - 3.1.3.1 Clarify The Problem
 - 3.1.3.2 Design a solution
 - 3.1.3.3 Code the Programme
 - 3.1.3.4 Test the Programme
 - 3.1.3.5 Document Programme
 - 3.1.3.6 Programme Maintenance
 - 3.2 Explaining the Steps
 - 3.2.2 Specify Output Requirements
 - 3.2.3 Specify Input

- 3.2.4 Clarify the Desired Processing
- 3.2.5 Double-Check the Feasibility of Implementing the Programme
- 3.2.6 Document the Analysis
- 3.3 Programme Design
 - 3.3.1 Determine the Programme Logic, Using a Top-Down Approach
 - 3.3.1.1 Top-Down Programme Design
 - 3.3.1.2 Module
 - 3.3.1.3 Hierarchy
 - 3.3.2 Design Details, Using Pseudocode and/or Flowchart
 - 3.3.2.1 Pseudocode
 - 3.3.2.2 Programme Flowcharts
 - 3.3.2.3 Control Structure
 - 3.3.2.3.1 Sequence Control Structure
 - 3.3.2.3.2 Selection Control Structure
 - 3.3.2.3.3 Iteration, or how, Control
 - 3.3.3 Code the Programme
 - 3.3.3.1 Select the Appropriate Programming Language
 - 3.3.3.2 Follow the Syntax
 - 3.3.4 Test the Programme
 - 3.3.4.1 Perform Desk-Checking
 - 3.3.4.2 Debug the Programme
 - 3.3.4.3 Run Real-world Data
 - 3.3.5 Document and Maintain the Programme
 - 3.3.5.1 Prepare User Documentation
 - 3.3.5.2 Prepare Operator Documentation
 - 3.3.5.3 Write Programmer Documentation
 - 3.3.5.4 Maintain the Programme
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings.

1.0 INTRODUCTION

In this unit, we are going to look at programming. In systems development life cycle (SDLC), there are six basic steps. These are the preliminary investigation, systems analysis, systems design, systems development, systems implementation and systems maintenance.

You will be taken through the areas of programming that are relevant to ICT education.

2.0 OBJECTIVES

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

- define programme and programming
- clarify the programming steps
- explain programme design

3.0 MAIN BODY

3.1 Definitions

3.1.1 Programme

A programme is a list of instruction that the computer must follow in order to process a data into information (Williams and Sawyer, 2005).

A programme is a list of instructions for the computer to follow to accomplish the task of processing data into information (O'Leary and O'Leary, 2005)

3.1.2 Programming

Programming is a multistep process for the list of instructions for the computer. (William & Sawyer, 2005)

Programming, also known as software development, is a six-step procedure for creating the list of instructions for the computer to follow to process data (O’Leary & O’Leary, 2005)

3.1.3 Steps in Programming

While Williams and Sawyer (2005) identified five steps of programming, O’Leary and O’Leary (2005) listed six steps. Step 5 of Williams and Sawyer (2005) list was split into two by O’Leary and O’Leary (2005). The basic steps in programming are:

3.1.3.1 Clarify the Problems (Programme Specification)

This is the programme’s objectives, needed inputs, outputs, and processing requirements.

3.1.3.2 Design a Solution (Programme Design)

Using a modeling tool to chart the programme. Here, a solution is created using programme techniques such as top-down programme design, pseudocode, flowchart and logic structure.

3.1.3.3. Code the Programme

The programme is coded using a programming language

3.1.3.4 Test the Programme

Get rid of any logic errors or “bugs” in the programme (“debug” it).

3.1.3.5 Document Programme

An on-going process throughout the programming process includes written instruction for users. This phase focuses on formalizing the written description and process used in the programme.

3.1.3.6 Programme Maintenance

(Part of No. 5 Williams & Sawyer,2005)

Periodic review of complete programme to evaluate their accuracy, efficiency, standardization and ease of use. Changes are made to the programme's code as needed.

3.2 Explaining the Steps

3.2.1 Clarifying the Programme's Needs (Programme Specification)

There are six basic steps under programme specification. These are clarifying objectives and users, outputs, inputs, processing tasks, feasibility of implementing the programme and documenting the analysis. This is called programme definition or programmer analysis.

3.2.1 Clarifying objectives and Users

Different kinds of problems are solved everyday. It might be the Welfare of workers or how to provide resources for the change in curriculum. Thus everyday you determine your objectives.

All programs work the same way. You should write the statement of the objective you are trying to accomplish. You notice that for every unit of this course, you have some specific objectives that you have to accomplish.

You should make sure you know who the users of the programme will be. They could be people within the main stream of education or distance learning students.

3.2.2. Specify Output Requirements

It is better to specify the outputs before the inputs. You can do this by drawing a picture of your desired output. What should the information be? This may require several meetings with the designer and the users to make sure you are creating what they want. You need to list what you want to get out of the computer system before you determine what will go out of it.

3.2.3 Specify Input Requirements

Once you know the kind of output required, you can think of the input. What kind of input data is needed? In what form should it appear? What is its source?

3.2.4 Clarify the Desired Processing

Here you define the processing task that must happen for input data to be processed into output.

3.2.5 Double-check the Feasibility of Implementing the Programme

Is the programme to be created feasible within the present budget? Will it be requiring a lot more staff when created? Will it take too long time to be accomplished?

Occasionally, programmers suggest bringing existing programmes and modifying them rather than embarking on a fresh one.

3.2.6 Document the Analysis

Throughout programme classification, programmers are enjoined to document everything they do. This includes writing the objective specifications of the entire process being described.

Self-Assessment Exercise 16.1

- i. Define programme and programming'
- ii. List the steps in programming.

Answers to Self-Assessment Exercise 16.1

- i. A programme is a list of instruction that the computer must follow in order to process a data into information.

A programme is a list of instructions for the computer to follow to accomplish the task of processing data into information

Programming is a multistep process for the list of instructions for the computer.

Programming, also known as software development, is a six-step procedure for creating the list of instructions for the computer to follow to process data.

- ii. Steps in programming include:
 - Clarification of problems - Define a solution - Code the Programme
 - Test the Programme - Document the Progamme - Maintain the Programme

3.3 Programme Design

Imagine your decision is to make or custom-write, the programme, you then go ahead to design the solution specified by the systems analyst. To design a solution, you need algorithm. An **algorithm** is a formula or a set of steps for solving a particular problem. To be an algorithm, the rule or set of rules must be unambiguous and have a clear stopping point. For example, a recipe for baking cake is an algorithm. Most programmes, except some artificial intelligence applications are algorithm.

The two mini-steps of programme design are Determining the Programme Logic, Using & Top-Down Approach and Design Details, Using Pseudo Code and/ or flowcharts.

3.3.1.1 Top-down Programme Design

This identifies the top element or module of a programme and then breaks it down in hierarchical fashion to the lowest level of detail. The top-down programme designed is used to identify the programme's processing steps, or modules. The actual coding proceeds from the bottom up, using the modular approach after the program is designed.

3.3.1.2 Module

A module is a processing step of a programme. Each module is made up of a logically related programme Statements. A module is sometimes called a sub-programme or sub-routine

An example of a module can be create a new file, collect all documents on School finance, save in the new file and shut down the system. A module has these features.

- Each module must be manageable in size
- Each module should be independent and have a single function.
- The function of input and output are clearly defined in separate modules.
- Each module has a single entry point (execution of the programme module always starts at the same place) and a single exit point (control always leaves the module at the same place).
- If one module refers to or transfers control to another module, the latter module return control to the point from which it was “called” by the first module.

3.3.1 Hierarchy Chart

A hierarchy chart, or structure chart, illustrates overall purpose and the relationships among them. It works from the general down to the specific, starting with the top-level (high level) view of what the programme is to do. Each layer then refines or expands the previous one until the bottoms layer can be made into specific programming modules.

3.3.2 Design Details, Using Pseudocode and/or Flowcharts

After determining the essential logic of the program through the use of top-down programming and hierarchical charts, one can proceed to work on details. Details are shown in two ways – either they are written or drawn. i.e. use pseudocode or use flowcharts. Most projects use both.

3.3.2.1 Pseudocode

A method of design a program using normal human language statements to describe the logic processing flow. It is like an outline or summary form of the programme you will write. Sometime it is used to express the purpose of a particular programming module in somewhat general with the use of such terms as IF, THEN, or ELSE. It follows the rule of **control structure**.

3.3.2.2 Program Flowcharts

It is a chart that graphically presents the detailed series of steps (algorithm or logical flow) needed to solve a programming problem. It uses standard symbols called **ANSI symbols** (American National Standard Institute) which developed them.

3.3.2.3 Control Structure

Words like “if” and then and else are words frequently used when trying to determine the logic behind something. Control structures make use of such words.

A control structure, or logic structure, is a structure that controls the logical sequence in which the computer program instructions are executed. In structured programs design, three control structures are used to form the logic of a program: sequence, selection, and iteration (or loop)

3.2.3.1 In the *sequence control structure*, one program statement

follows another in logical order e.g. statement and statement. One box could say “Open File” the other “Read a Record.”

There are no decisions to make, no choices between ‘yes’ or ‘no’. The boxes logically follow one another in sequential order.

3.3.2.3.2 The *selection control structure* – This is known as IF-THEN-ELSE structure – represents a choice. It offers two paths to follow when a decision must be made by a program. An example of a selection structure is as follows:

If a worker’s hour exceeds 36
THEN overtime hours equal the number of hours exceeding 36
ELSE the worker has no overtime hours.

A variation of the usual selection control structure is the case control structure. This offers more than a single 'yes' or 'no' decision. This structure allows several alternatives, or "cases," to be presented. ("If case 1 occurs, THEN do thus-and-so. If case 2 occurs, THEN follow an alternative course.... "And so on). This saves the programmer the trouble of having to indicate a lot of separate IF-THEN-ELSE conditions.

3.3.2.3.3 Iteration, or loop, control structure

A process may be repeated as long as a certain condition remains true. These are two types of iteration structures. DO UNTIL and DO WHILE. DO UNTIL is more often encountered.

Example of DO UNTIL structure

Do compile students' records UNTIL there are no more records.

Example of DO WHILE structure

Do compile students records WHILE- that is, as long as – these continue to be students' records. **N.B** The difference between the two iterated structures is that if some statements are to be repeated, you must decide where to stop. You can decide to stop them at the beginning of the loop, using the DO WHILE structure or you can decide stop at the end of the loop, using the DO UNTIL structure. The DO UNTIL iteration means that the loop statements will be executed at least once, because the iteration statements are executed before the programme checks whether stop.

3.3.3 Code the Programme

Writing of a programme can begin after the design has been developed. The programme can begin after the design has been developed. The process of writing

the program is called coding. Coding is what is being thought of whenever people talk of programming. It is only a step of programming. It consists of translating the logic requirements from pseudocode or flowcharts into a programming language – the letters, numbers, and the symbols that make up the programme.

3.3.3.1 Select the Appropriate Programming Language

A **programming language** is a set of rules that tell the computer what operations to do. Examples are C, C++ and Java. These are called “high-level languages,” as we explain shortly. Not all languages are appropriate for all uses. Some have strengths in mathematical and statistical processing while others are more appropriate for database management. Thus you need to consider the purpose a program design is to serve before you make the choice of the language and what are already being used in your organization on your own field.

Follow the Syntax

For a programme to work, you have to follow the **syntax**, that is, the rules of the programming language. Programming languages have their own grammar just as human languages do. However, computers are probably a lot less forgiving if you use these rules incorrectly.

3.3.4 Test the Programme

Programme testing involves running various tests and then running real-world data to make sure the program works. The two main activities are desk-checking and debugging. These steps are called *alpha testing*.

3.3.4.1 Perform Desk-Checking

This is simply reading through, or checking, the programme to make sure it is free of errors and that the logic works. In other words, desk-checking is like

proofreading. This step should be taken before the programme is actually run on a computer.

3.3.4.2 Debug the Program

Once a program has been desk-checked, further errors or “bugs” are bound to surface. To *debug* means to defect, locate and remove all errors in a computer program. Mistakes may be syntax errors or logical errors.

Syntax errors are caused by typographical errors and incorrect use of the programming language.

Logical errors are caused by incorrect use of control structures. Programmes called *diagnostics* are used to check programs syntax and display syntax-error messages. Diagnostic programs help to identify and solve problems.

3.3.4.3 Run Real-World Data

After desk-checking and debugging, the programme may run fine. It needs to be tested with real data and this is called beta testing. It is even advisable to test the program with bad data - faulty, incomplete, or in overwhelming quantity - to see if the system can crash. Many users may be careless and ignorant for more than the programmer has anticipated.

Several trials might be needed before the programmer might be satisfied and release the program. Some bugs may persist because there are some points where the pursuit of errors might be uneconomical. This is why many users are hesitant of using the first version of a software.

3.3.5 Document and Maintain The Programme

Writing the programme documentation is the 5th step in programming. The resulting *documentation* consists of written description of what a program is and how to use it. It is not an end stage of programming. Rather, it has been (or should have been) throughout all the programming steps. It is meant for people who will be using or be involved with the program in the future. Documentation should be prepared for different kinds of readers – users, operators, and programmers.

Summary of the Programming Steps

Step	Activities
Step 1: Problem Definition	<ol style="list-style-type: none"> 1. Specify programme objectives and programme users. 2. Specify output requirements 3. Specify input requirements 4. Specify processing requirements 5. Study feasibility of implementing program 6. Document the analysis.
Step 2: Programme Design	<ol style="list-style-type: none"> 1. Determine programme logic through top-down approach and modularization, using a hierarchy chart. 2. Design details using pseudocode and/or using flowcharts, preferably on the basis of control structures. 3. Test design with structured walkthrough.
Step 3: Programme Coding	<ol style="list-style-type: none"> 1. Select the appropriate high-level programming language. 2. Code the program in the language following the syntax carefully.
Step 4: Programme Testing	<ol style="list-style-type: none"> 1. Desk-check the programme to

discover errors.

2. Run the programme and debug it (alpha testing)
3. Run the real-world data (beta testing)

Step 5: Programme Documentation and maintenance

1. Prepare users documentation
2. Write operator documentation
3. Write programmer documentation
4. Maintain the programme

3.3.5.1 Prepare User Documentation

The manual that follows any commercial software package you buy is the user documentation. Nowadays, manuals are usually on the software CD.

3.3.5.2. Prepare Operator Documentation

Computer operators are people who run large computers. These are specialists on their own but they are not programmers, they need something that will assist them to check and what is necessary when the programme malfunctions. The information needed is got from *operator documentation*.

3.3.5.3 Write Programmer Documentation

Programme may be in operation long after the programming team has been disbanded. It is often the case that a fifth programming staff leaves every year and after five years there could be a new bunch of programmers who knew nothing about the software. Programme documentation assists in training new comers and enables them to maintain the existing system.

3.3.5.4 Maintain the Programme

Maintenance includes any activity designed to keep programmes in working condition, error-free, and up to date – adjustments, replacements, repairs, measurements, tests and so on. The rapid changes in modern organization are bound to reflect in their computer systems. Maintenance is an important and documentation must be available to help programmers make adjustments in existing systems.

Self-Assessment Exercise 16.2

- i. What are the basic requirements of Programme Design?
- ii. How do you test a programme?

Answers to Self-Assessment Test 16.2

- i. Determine the Programme Logic, using a Top-down Approach
Design Details, using pseudocode and/or flowcharts
Code the Programme
Test the Programme
Document and maintain the Programme
- ii. Perform desk-checking
Debug the Programme
Run Real-world Data

4.0 CONCLUSION

In this unit, you have read about programming and the steps involved in programming. Also, you read about programme design and how to test a programme. You have learnt also how to document and maintain a programme..

In the next unit we shall continue with programming with emphasis on generations of programming language and the type of programming language used today.

5.0 SUMMARY

In this unit, you read about

- Programme and Programming
- Programme Design
- Steps in Programming
- Documentation and maintenance of Programme.

6.0 TUTOR-MARKED ASSIGNMENT

1. Define programme and programming.
2. Explain the steps to be taken in programming.
3. Describe how a programme is tested.

7.0 REFERENCES/FURTHER READINGS

O'Leary, T. J. and O'Leary, L. I. (2005). Computing Essentials 2005 Complete Edition. Boston: McGraw Hill Technology Education.

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UNIT 2 BASIC PROGRAMMING II**CONTENT**

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1.0 INTRODUCTION

In the last unit, you were introduced to programming. You read about the steps involved in programming and programme design. You also read about how to test a programme.

In this unit, you will read about the generations of programming language and the type of programme language used today.

2.0 OBJECTIVES

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

- list the generations of programming
- give a brief history of programming
- describe the application of programming

3.0 MAIN BODY

3.1 Generation of Programming Languages

Programming Language is a set of rules that tell the computer what operations to do. Programmers use these languages to create other kinds of software. There are many programming languages with colourful names like SNOBOL, HEARSY, DOCTOR, ACTORS, EMERALD, JOVIAL. Each is suited to solving particular kinds of problems. What they all have in common is reduction to digital form – a 1 or 0, electricity on or off – because that is all that computer can work with.

There are **five** levels or generations of programming languages ranging from low level to high level. These are:

Lowest Level:	(1)	Machine Language
	(2)	Assembly Language
High Level:	(3)	Procedural Languages and object oriented languages
Very High Level:	(4)	Problem-oriented languages
Highest Level:	(5)	Natural Languages

Programming Languages are said to be low when they are closer to the languages of the computer and high level when they are closer to the language people use.

- The births of the generations are as follows:
- 1st Generation, 1945 – Machine Language
- 2nd Generation, mid 1950s – Assembly Language
- 3rd Generation, mid 1950s early 1960s – high level languages (procedural languages & object oriented) Examples are FORTRAN, COBOL, BASIC, C, AND C++
- 4th Generation, early 1970s – very high languages – very high level languages (problem – oriented languages): SQL, Intellect, NOMAD, FOCUS
- 5th Generation, early 1980s – natural language

Let us consider the five generations.

3.1.1. First Generation: Machine Language

This is the basic language of the Computer, representing data as Is and Os. Each CPU model has its own machine language. Machine language programs vary from computer to computer, that is they are machine- dependent. The binary digits correspond to on and off electrical states of the computer which are not convenient for people to read and use. A sign of relief came with the next generation of programming languages – assembly languages.

3.1.2 Second Generation: Assembly Language

This is a low-level language programming language that allows a computer user to write a programme using abbreviations or more easily remembered words instead of numbers. E.g. “MP” to represent MULTIPLY and “STO” to represent STORE. A programmer can write instruction in assembly language more quickly than in machine language. It is still not an easy language to learn and it is so tedious to use that mistakes are frequent. It has the same drawback as machine language. It varies from computer to computer – it is machine dependent.

A language translator has to be introduced because a computer execute programmes only in machine language. A translator or a converter is needed if the programme is written in any other language.

A language translator is a type of system software that translator a programme written in a second -, third-, or higher- generation language into machine language.

There are three types of language translators. They include assemblers, compilers and interpreters.

An assembler or assembler programme, is a programme that translates the assembly – language programme into machine language.

3.1.3 Third Generation: High-Level or Procedural Languages

A **high-level** or **procedural/objective- oriented, language** resembles some human language such as English. For example, COBOL, which is used for business applications. A procedural language allows users to write in a familiar notation, rather than numbers of abbreviations. Most are not machine dependence like machine and assembly languages. Familiar languages this sort include FORTRAN, COBOL, BASIC, Pascal, and C. For it to work on a computer, it needs a language translator to translate it into machine language. Two types of translators may be used – a **compiler** or an **interpreter**.

3.1.3.1 Compiler – execute later

This is a language translator programme that converts the entire programme of a high-level language into machine language before the computer executes the programme. The programming instructions are called the source code.

The advantage here is that the object code can be saved and thus can be executed later. Examples of procedural language using computers are COBOL, FORTRAN, Pascal, and C.

3.1.3.2 Interpreter – execute immediately

An **interpreter** is a language – translator programme that converts each procedural language statement into machine language and executes it **immediately**, statement by statement. Interpreter work runs more slowly than

compiled work. No object is saved but code can be tested line by line. BASIC is a procedural language using an interpreter.

The advantage of a compiler language is that, once you obtain the object code, the program executes faster. The advantage of an interpreter language is that programs are easier to develop. Some of the most procedural languages are Visual BASIC, C, and C++.

3.1.4 Fourth Generation: High Level or Problem-Oriented Languages

Third-generation languages tell the computer how to perform a task. The fourth-generation languages, in contrast, tell the computer *what* to do.

Very high level, or problem-oriented, languages, also called fourth-generation languages (4GLs), are much more user-oriented and allow users to develop programmes with fewer commands compared with procedural languages, although they require more computing power. These languages are called problem-oriented because they are designed to solve specific problems, whereas procedural languages are more general – purpose languages.

Three types of problem – oriented languages are report generators, query languages, and application generators.

3.1.4.1. Report generators

A report generator, also called a report writer, is a programme that is designed for end-users that produces a report. The report may be a printout or a display. It may equally show all or part of a database file. Format can be specified as advance columns, headings, and so on – and the report generator will then produce data in that format. An example is RPG III

3.1.4.2 Query Languages

It is an easy-to-use language for retrieving data from database management system. This may be expressed in the form of a sentence or near-English command. It may equally be obtained from choices on a menu. Examples are SQL (for “Structured Query Language”) and Intellect, used with IBM mainframe, you can make an English-Language request such as “Tell me the number of employees in the sales department”.

3.1.4.3 Application generators

An application generator is a programmer’s tools consisting of modules that have been programmed to accomplish various tasks. It has the advantage of generating application programs from description of the problem rather than by traditional programming, which needs specification of how the data should be processed.

Application generators are used by programmers to create parts of other programmes e.g. the software is used to construct on screen menus of input and output screen format. NOMAD and FIOCUS, include application generators.

3.1.5 Fifth Generation: Natural Languages

These are of two types. The first type comprises ordinary human languages. English, Spanish and so on. The second type comprises programming languages that are human language to give people a more natural connection with computers.

Natural languages allow questions or command to be framed in a more conversational way or in an alternative form. They are part of field study known as Artificial Intelligence (AI). This is a group of related technologies that attempt to develop learning, reasoning, communicating, seeing and hearing.

3.2 The Programming Language of the Contemporary Period

Examples of some of the third-generation, or high-level, languages used today.

3.2.1. FORTRAN: The language of mathematics and the first High-Level Language

Developed from 1954-1956 by John Backus and others at IBM, FORTRAN (for FORMULAR TRANSLATOR) was the first high-level language. It was originally designed to express mathematical formula and it is still the most widely used language for mathematical scientific and engineering problems. It is also used for complex business applications, such as forecasting and modeling but it can not handle a large volume of input/output operations or file processing. It is not used for typical business problems. It has both its advantages and disadvantages.

- Advantages
 - Fortran can handle complex mathematical and logical expressions
 - What is developed on one type of computer can often be easily modified to work as other types
- Disadvantages
 - Fortran does not handle input/output operations to storage devices as efficiently as some other high-level languages.
 - Has only a limited ability to express and process non-metric data
 - Not as easy to read and understand as some other high-level languages.

3.2.2 COBOL: The language of business

Developed under the auspices of the U.S. Department of defense, with Grace Murray Haper as a major contributor, and formally adopted in 1960, COBOL

("Common Business – Oriented Language) is the most frequently used business programming language for large computers. It is extremely readable e.g.

MULTIPLY HOURLY-RATE BY HOURS-WORED GIVING GROSS-PAY.
Writing a COBOL programme resembles writing an outline of a research. It is divided into four divisions – Identification, Environment, Data and Procedure. The divisions are divided into section which are divided into paragraphs and divided into sections. The Identification Division identifies the name of the programme and the author (programmer) and perhaps some other comments. The Environment Division describes the computer on which the program will be compiled executed. The Data Division describes what data will be processed while the Procedure Div. describes the actual processing procedure. It has both advantages and disadvantages.

- Advantages

- Cobol is machine-independent
- Its English-like statement, are easy two understand, even for a non-programmer.
- Cobol can handle many files, records and fields.
- It can easily handle input/output operations.

Disadvantages

- Though it is so readable, it is wordy. Thus, even simple programs are lengthy, and program productivity is slowed.
- Cannot handle mathematical processing as well as FORTRAN
-

3.2.3 BASIC: The Easy Language

Developed by John Kemeny and Thomas Kwortz in 1964 for use in training their students at Dartmouth College. By the late 1960s, it was widely used in academics settings on all kinds of computers, from mainframe to PCs.

BASIC (Beginner's All-purpose Symbolic Instruction Code) used to be the most popular micro-computer programme language and considered the easiest to learn. Though available in computer form, the interpreter form is more popular with first-time and casual users. This is because it is interactive, the user and computer can communicate during the writing and running of the programme.

There is no one version of BASIC. The advantages and disadvantages are as follows:

- Advantage
 - It is easy to use
- Disadvantages
 - Its processing speed is slow, although other computer versions are faster than interpreter versions.
 - There is no one version of BASIC, although in 1987 ANSI adopted a new standard that eliminated portability problems – problems with running if on different on different computers.

3.2.4 PASCAL: The Simple Language

Pascal was named after the 17th Century Mathematicians Blaise Pascal. He developed in 1970 by Nicklaus Wirth – an alternative to BASIC as a language for teaching and is relatively easy to learn. Utilization of structured programming differentiates it from BASIC. Pascal offers the following advantages and disadvantages.

- Advantages
 - Pascal is easy to learn
 - It has extensive capabilities for graphic programming
 - It is excellent for scientific use

- Disadvantage
 - Pascal has limited input/output programming capabilities which limits its business applications.

3.2.5. C: For Portability and Scientific Use

C succeeds B, which was the successor of BCPL which was the successor of CPL(Computer Programming Language), an early programming that was not implemented. It was developed in the early 1970s by Dennis Ritchie at Bell Laboratories. C is a general-purpose, compiled language developed for micro-computers and it is portable among many computers. It is used for writing applications including word processing, spreadsheet, games, robotics and graphic programs.

Advantages and disadvantages of C

- Advantages
 - C works well with micro computers
 - It has a high degree of portability – can run without change on a variety of computers
 - It is fast and efficient
 - It enables the programmer to manipulate individual bits in main memory.
 - It requires less memory than other programming languages
- Disadvantages
 - C is considered difficult to learn
 - Its conciseness makes the codes difficult to follow
 - It is not suited to applications that require a lot of report formatting and data file manipulation.

3.2.6. LISP: For Artificial Intelligence Programmes

LISP(LIST Processor) is a third-generation language used principally to construct artificial intelligence. Developed at the Massdusettes Institute of Technology in 1958 by Mathematician John McCarthy. It is used to write expert system and

- Disadvantages
 - has limited input/output programming capabilities which limits its business applications.

natural language programmes. Expert systems are programmes that are enriched in knowledge by a human expert and these can walk you through a problem and solve it.

Self-Assessment Exercise 17.1

- i. Into how many generations are programme languages divided? List them.
- ii. List the advantages and disadvantages of FORTRAN.

Answers To Self-Assessment Exercise 17.1

- i. 5 generations.
 - 1st Generation – Machine Language
 - 2nd Generation – Assembly Language
 - 3rd Generation – High Level or Procedural Language
 - 4th Generation – High-Level or Problem-oriented Language
 - 5th Generation - Natural Languages
- ii. Advantages
 - Can handle complex mathematical and logical expressions

- Developed on one type of computer can often be easily modified to work as other types.
- Disadvantages
 - does not handle input/output operations to storage devices as efficiently as some other high-level languages.
 - Has only a limited ability to express and process non-metric data
 - Not as easy to read and understand as some other high-level languages.

3.3 Object-Oriented and Visual Programming

Computer Pioneers were formerly concerned with procedure-oriented programmes which forced programmers to follow a pre-determined data. Two developments that have made thing easier are object oriented programming and visual programming.

3.3.1 Object Oriented Programming: Block by Block

This is an improved version of third generation Language. It saves a lot time. It is a kind of recycling technique.

- In object-oriented programming (OOP), data and the instructions for processing data are combined into a self sufficient “object” that can be used in other programmes.
- An object is a self-contained module consisting of preassembled programming code. The module contains both a chunk of data and the processing instructions that may be performed on that data.

When an object data is to be processed – sending the “message”

A particular set of instruction is activated only when a corresponding “message” is sent. A message is an alert sent to the object when an operation involving that object needs to be performed.

How Object data is processed – the “Method”

The message identifies the operation but the performance is embedded within the processing instructions that are part of the object. This is called method.

Once a block of program code is written, it can be reused in many other programs. You do not need to start from the scratch with OOP.

OOP takes longer to learn than trade programming. It means training oneself to a new way of thinking. An object can be used repeatedly in different application and by different programmes thereby speeding up development time and lowering costs.

3.3.2 Three Important Concepts of OOP

OOP has three important concepts namely: encapsulation, inheritance and polymorphism.

3.3.2.1 Encapsulation

This means that an object contains (encapsulates) both data and the relevant processing instructions. Once an object is created, it can be reused in other programmes. An object’s uses can be extended through class and inheritance.

3.3.2.2 Inheritance

Created objects are used as foundations for similar objects that have same behaviour and characteristics. Object derived from or related to one another form a

class. Each class contains specific instructions (methods) that are unique to it. For example, if you are adding a new computer to a computer system, you need to enter only what makes it different from other computers.

3.3.2.3 Polymorphism

Presence of “many shapes”. It means that a message produces different result based on the object sent to it. An example is C++ created by Bjarne Stroustrup. C++ can write standard code in C without object oriented code.

Java is an object-oriented language. It was developed by Sun Microsystems in 1995. It is used to write compact programme that can be downloaded over the Internet and immediately executed on many kinds of computers. It is similar to

C++ but simplified to eliminate language features that cause common programming errors. Small Java application is called *applets* and can be downloaded from a web server and run on your computer by a Java-compatible web browser, such as Netscape Navigator or Microsoft Internet Explorer. Java applets make websites more interactive and attractive, adding features such as animation and calculators.

3.3.3 Visual Programming: The Example of Visual BASIC

Visual programming is a method of creating programmes in which the programmer makes connections between objects by drawing, painting, and clicking on diagrams and icons and by interaction with flow charts. The programmer can create programmes by clicking on icons that represent common programme routines.

An example is visual BASIC, a Window-based, object-oriented and office and applications by (1) Creating Command buttons, text boxes, windows, and toolbars which (2) then may be linked to small BASIC programmes that perform certain actions.

3.4 Markup and Script Languages

This is a kind of coding or “tags” inserted into text that embeds details about the structure and appearance of the text. It has codes indicating layout and styling (such as boldface, italics, paragraphs, insertion of graphics, and so on) within a text file – for example HTML. The name “mark up” is derived from the traditional publishing practice of “marking up” a manuscript, that is, adding printer’s instructions in the margins of a paper manuscript.

In web terms, a *script* is a short list of self-executing commands embedded in a web page that perform a specific function or routine. Scripts are similar to the macros used in Microsoft Word or the batch files used in the early days of DOS, both of which performed functions ranging from generating text to displaying the date and time. The following are examples of mark up scripting languages.

3.4.1 HTML: For creating 2-D Web Documents and Links

HTML (Hypertext Mark-up Language) is a mark-up language that allows people to create onscreen documents for the internet that can easily be hinted by words and pictures to other documents: One main feature is the ability to insert hypertext links into a document. This enables you to display another web document supply by clicking on link area on your screen.

3.4.2 VRML: For Creating 3-D Web Pages

Created by Mark Pesce and Tony Pansi at Silicon Graphics in 1994. “VRML” rhymes with “thermal”. VRML (Virtual Reality Modelling Language) is a type of programming language used to create three-dimensional web pages including animation. Many existing modeling and CAD tools now offer VRML support, and new VRML- centred software tools are now in the market. An example of VRML scene could be a virtual room where the viewer can use controls to move around inside the room (or move the room useful) as though he or she were walking through it in real space.

You need a special VRML browser to view VRML files in a addition to internet connection - a web browser. It is what interprets VRML commands and let the user interact with the virtual world.

3.4.3 XML: For making the Web Work Better

HTML is noted for its simplicity and ease of use but lacks the software muscle to handle the business world. A never mark-up language XML (extensible Markup Language) is for creating special purpose markup languages. It is to facilitate the sharing of structured text and information across the internet.

It allows you to create any tags you wish and then describe those tags in a meta language known as DTD (document Type Definition)

Whereas HTML makes it easy for humans to read websites, XML makes it easy for machine to ready websites by enabling web developers to add more “tags” to a web page.

3.4.4 Java Script: For Dynamic Web Pages

Java Scripts (ECMA Script) is an object – oriented scripting language originally developed by Netscape communications under the name “Livescript” but renamed to “JavaScript” and giving a syntax closer to Sun Microsystem’s Java language. One major use of Java Script is to write little functions that are embedded in HTML pages and interact with the browser to perform certain tasks not possible in static HTML alone, such as opening a new window and changing images as the mouse cursor moves over them.

3.4.5 Active X: For Creating Interactive Web Pages

Active X is a set of controls, or reusable components, that enable programs or content of almost any type to be embedded within a web page. Developed by Microsoft as an alternative to Java for creating interactivity on Web Pages. The chief characteristic of Active X is that it features reusable components, which may be plugged seamlessly into another applications.

3.4.6 Perl For CGI Scripts

Perl (Practical Extraction and Report Language) is the dominant scripting language used to develop CGI scripts in the context of web development. CGI (Common Gateway Interface) is a standard for passing information between a server and an application as part of the World Wide Web’s HTTP protocol. Almost anytime users are asked to put information on a website, a CGI script is at work.

3.5 Rational For Programming Languages in Information and Communication Technology In Education

Basic knowledge of programming is very vital to every students who wants to progress in computer-based learning. Program gives you a list of instructions that your computer must follow to process your data into information and programming is a multistep process for creating that list of instruction.

If your data is not processed, there will be no information and if there is no information, there is nothing to base your decision on. For learning to be meaningful, there must be adequate information. The basic knowledge of programming is vital.

Self-Assessment Exercise 17.2

List **four** mark-up languages and their uses.

Answers to Self-Assessment Exercise 17.2

HTML: For creating 2-D Web Documents and Links
VRML: For creating 3-D Web Pages
XML: For making the Web Work Better
JavaScript: For Dynamic Web Page

4.0. CONCLUSION

In this unit, you have read about basic programming and the steps involved. You have also read about the history and generations of programming and its application.

In the next unit, we shall discuss ICT and Tertiary Education.

5.0 SUMMARY

In this unit, you read about

- Listing the generations of programming
- Describing the application of programming

6.0 TUTOR – MARKED ASSIGNMENT

- i) Define the following:
 - (a) Programme
 - (b) programming
 - (c) HTML
 - (d) Java Script
- ii) List the steps in Programming
- iii) Describe the 'selection control structure'.

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UNIT 3 ICT AND TERTIARY EDUCATION**CONTENT**

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Emergency of ICT in Tertiary Education
 - 3.2 Application of ICT in Tertiary Education
 - 3.2.1 Teaching
 - 3.2.2 Capacity Building
 - 3.2.3 Institution's Website
 - 3.2.4 Harnessing Funds
 - 3.2.5 Challenges of ICT in Tertiary Education

Conclusion

Summary

Tutor-Marked Assignment

References/Further Readings

1.0 INTRODUCTION

In the last unit, you read about basic programming. You also read about different generations of programming, the history of programming and application of programming.

In this unit, you will read about ICT in Tertiary education and the areas of application. You will also read about the problems, prospects and challenges of ICT in tertiary Institutions.

2.0 OBJECTIVES

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

- describe the roles of ICT in Tertiary Education
- identify area of application of ICT in Tertiary Institutions

- describe the problems, prospects and challenges of ICT in Tertiary Institutions.

3.0 MAIN BODY

3.1 Emergence of ICT in Tertiary Education

Tertiary institutions all over the world are complex organizations that replicate and integrate much of the activities in the larger society. They have the capacity to carry out teaching, training and research; and this mandate is enshrined in a complex process with numerous activities which include teaching, training, administration, examination and evaluation.

Data and information generated by human race have risen to a proportion that manual manipulation cannot give accurate result. Delivery of educational services, proper record keeping, administrative and managerial services can no longer survive the traditional methods. The problems of information explosion, increase in school enrolment at all levels, shortage of competent and qualified personnel, storage and retrieval of data, high price or resource materials have compelled all institutions, especially tertiary institutions, to evolve means of tackling the problems (Egbowon and Nwaboku, 2009)

The last two decades witnessed the advent of Information and Communication Technologies (ICT) and this has offered the tertiary institutions the opportunity of achieving better co-ordination which are resulted in reduction of administrative stress and expansion of the scope of attention for teaching, learning and training. Many writers have elicited the implicit advantages of the new technologies and how they could be harnessed for optimal application and integration. (Ajayi 2000, Nwaboku, 2006, HMIE,2007) In the same vein, some International Organizations like UNESCO, ILO, have identified ICTs as a means of bridging educational and economic gaps between the north and south as evidenced in the pace of

developments in South East Asia and the Pacific (ADB, 1990, UNESCO-PROAP, 1991).

Information and Communication Technology basically uses the Computer System and other related materials to support learning and teaching processes. It is involved in Computer Communications and Information accessibility of internet-based services such as electronic mail and the World-Wide-Web.

It allows large information-based packages to be cheaply and easily distributed and thus make educators to be more focused on the use of technology to improve teaching and learning.

3.2 Application of ICT in Tertiary Education

Tertiary Institutions hold the ace in terms of getting the pace in educational development of a nation. Most of the policies formulated for education come from the workshops which involved the cream of experts and professionals from the Tertiary Institutions. It has been established that Information and Communication Technologies (CT/s) offer a wide scale of tools which lead to the change of teaching process from one closed and rigid, oriented on teacher, to an inciting and interactive process centred on learners (Dumitresue, Oleteanu, Gorphni and Gorghni, 2006). Let us look at areas where ICT can be applied in Tertiary Institution.

3.2.1 Teaching

Tertiary Institution can apply ICT in teaching. Computers can be made available to the teachers and students at affordable price and the institution can also provide Internet facilities. This will enable the teachers to have up-to-date materials to update their work and to present quality materials to students.

In the era of dearth of printed materials like books, journals or where the price of subscription is high, teacher's access to the Internet can help in accessing current journals on-line for instructional delivery.

ICT can reduce the distance barriers between teachers and learners. Teachers can reach their students through e-mails and they can hand in assignments to students without being physically at his office.

ICT can be applied in Tertiary Institution for collaborative teaching. A teacher can collaborate with another teacher in another far away institution and have his live in his class. This enriches teaching.

Tertiary Institutions Operating Distance Education can also harness the benefit of ICT by posting the course materials on the institution's website for the learners to harness for learning.

Where there is shortage of qualified lecturers for some specialized courses or a lecturer on ground want to go on sabbatical, such could record his lectures on CD and this could be made available to the students or the lectures could be uploaded on the Institution's website for the students to access.

3.2.2 Capacity Building

Tertiary Institutions can harness the development in ICT for capacity building. By capacity building, we mean, upgrading the skills of staff to meet the required level of competence of use of ICT materials. This is an all round development. Academic Staff could be trained on how to deliver their lectures with new technologies by leaving the chalk and talk method to a more interactive presentation like PowerPoint with adequate graphic illustrations. Also, they could be taught new ways of computing results thereby having better ways of storing and retrieving data relating to students.

On the part of the students, they could be taught how to register on-line, access information relating to their studies from both their lecturers and on the Internet, having access to their personal data – status as students, school fees, academic progress, etc.

Secretarial staff can become competent in the use of computers in order to keep abreast with new trends of Information Age, training on how to use specified computer software packages over a period of time.

Tertiary Institution can develop software that could be used for capacity building in-house or purchase same from manufacturers. Lagos State University, Lagos, Nigeria develops all her software packages.

Self-Assessment Exercise 18.1

- i. State at least **two** benefits of ICT to the Tertiary Institutions in the last two decades.
- ii. How can Tertiary Institutions harness the benefits of ICT for capacity building?

Answers To Self-Assessment Exercise 18.1

- i. Your answer should include
 - better coordinated activities which has resulted in reduction of stress and expansion of the scope of attention for teaching, learning and training.
 - Internet facilities have given teachers and students access to materials that could keep them abreast of current development in technology.
- ii. Tertiary Institutions can harness the development in ICT for capacity building by
 - Training the teachers new methods of instructional delivery or presentation instead of the chalk and talk method.
 - Registration on-line to avoid wastage of human hour and fraud.

- Building websites where both staff and students can assess necessary information about the institution.
- Development of software that could be used for capacity building.

3.2.3 Institution's Website

Tertiary Institutions can develop their websites. A website is an information location. This will enable the institution to transact activities ranging from students' registration, financial transactions, examinations and records, staff audits, on-line job applications, personal contacts, etc. The operation of a website will enable institutions do save both time and money and even manage human resources better.

3.2.4 Harnessing Funds

Tertiary Institutions can use ICT to improve their financial positions which can impact on the funding of programmes in the institutions. Instead of the payment to the Bursary, student could be asked to pay to the banks using special pin numbers and some designated banks. This will reduce fraudulent practices and generate funds.

The Lagos State University introduced e-payment into the system and students were issued computer generated Bursary Number for presentation at the designated banks for the institution's e-payment. Without the payment and correct number, students could neither register nor access their results. All the financial leakages were as a result plugged and the issues of funding problems were solved.

3.2.5 Communication Network

Another area which the Tertiary Institutions can harness in ICT is the Computer communication system. Tertiary Institutions can network their systems and can transmit information from one campus or department to the other. They should be able to utilize both the Internet and Extranet services.

3.3. Challenges of ICT in Tertiary Education

As stated earlier, human beings are averse to change. Most Tertiary Institutions that try to integrate ICT into their systems have met with some resistance. There are some of the staff who are not prepared to change. There are some who are changing gradually while there are some who can no longer operate without the computer system.

Those that have taken up ICTs as the new way of work cannot imagine what the old ways were any more and they can hardly function without computers and the internet.

Students in Tertiary Institutions also have their challenges where ICT is introduced into the system. Lagos State University (LASU) has gone into implementing ICT, and the institution operating system has two categories of students - those that take the full advantages of ICT facilities and register on time without hitch and those that have problems relating to e-payment and registration. The latter find it difficult to register and they depend on others to do the work for them. This slows down the pace of work in the system.

Tertiary institutions that embrace ICT in handling examination materials find it easier and quicker to compile their results as results are handled electronically. This is not without some hitches. Human errors still occur, for example, change of course code which may lead to rejection or omission of students' registration if not adjusted.

One advantage of ICT in Tertiary education is that it gives equal access to all students whether regular or part time.

The major challenge is in the area of capacity building. How often does an institution mount training for its work-force and how prepared are the workers or employees to take the advantage of the training for them to be able to apply it appropriately?

Self-Assessment Exercise 18.2

What are some of the challenges of ICT in Tertiary Institutions?

Answers To Self-Assessment Exercise 18.2

- Resistance from staff
- Inadequate training to carry along both staff and students
- Better co-ordination of activities by those who embrace ICT.
- Equal access to materials.

4.0. CONCLUSION

ICT in Tertiary Institutions allow equal access to information. It enables institutions to minimize waste. ICT can be applied in teaching and for Capacity building. Institution's Website and Communication Network where both staff and students have access to current and relevant information will put the institution on a high pedestal. There are some challenges when applying ICT in Tertiary Institutions. These include inability of some people to embrace new technology consistence in capacity building and the pace of integration of ICT in Tertiary Institution.

5.0 SUMMARY

- In this unit, you have read about :
- ICT and Tertiary Education
- Role of ICT in Tertiary Education
- Application of ICT in Tertiary Education

6.0 TUTOR-MARKE ASSIGNMENT

- i) Mention **three** roles of ICT in Tertiary Education
- ii) Mention and explain **three** areas where ICT can be applied in Tertiary Education
- iii) Identify one problems, prospects and challenges of ICT in Tertiary Institutions

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UNIT 4 NETWORKS AND COMMUNICATIONS**CONTENT**

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1 From the Analog To Digital Age
 - 3.1.1. Classroom Implication
 - 3.2 Practical uses of Communications
 - 3.2.1 Videoconferencing and Videophones: Video/Voice Communication
 - 3.2.2 Workgroup Computing and Groupware
 - 3.2.3 Telecommuting and Virtual Offices
 - 3.2.4 Home Networks
 - 3.2.5 Smart Television: DTV, HDTV and SDTV
 - 3.3 Communications Media and Transfer Rate
 - 3.3.1 Wired Communications Media: Wires and Cables
 - 3.3.2 The Electromagnetic Spectrum, the Radio-Frequency (RF) Spectrum, and Bandwidth
 - 3.3.3 Wireless Communication Media: Transmitting Data through the Air.
 - 3.3.3.1 Infrared Transmission
 - 3.3.3.2 Broadcast Radio
 - 3.3.3.3 Microwave Radio
 - 3.3.3.4 Communication Satellites
 - 3.3.4 Compression and Decompression: Putting more Data In Less Space.
 - 3.4 Transmission Mode: Asynchronous and Synchronous
 - 3.4.1 Asynchronous Transmission
 - 3.4.2 Synchronous Transmission
 - 3.5 The Rule of Data Transmission
 - 3.6 Networks

3.6.1 The Benefits of Networks

3.6.2 Types of Networks: WANs, MANs and LANs

3.6.2.1 Wide Area Network (WAN)

3.6.2.2 Metropolitan Area Network (MAN)

3.6.2.3 Local Area Network (LAN)

3.7 Internets, Extranets and Firewalls: Private Internet Networks

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Readings.

1.0 INTRODUCTION

In last unit, you read about ICT in Tertiary Education. You also read about the areas of application of ICT in Tertiary Institutions. The prospects, problems and challenges of ICT in Tertiary Institutions were highlighted for your appreciation.

In this unit, we shall go further to describe the development in ICT as regards network and communications.

2.0 OBJECTIVES

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

- Identify the roles of networks and communication in education.
- Describe the development in networks and communication
- Identify the characteristics of the next generation wire and wireless communications.
- Identify concerns regarding censorship of internet information.

3.0 MAIN BODY

Pre 1950s witnessed computing devices processed data into information, and communications devices communicated information over distances. Both computing and communications developed independently but in there is a new song, a revolution.

This has brought about **digital emergence** – a gradual merger between computing and communications evolving into a new information environment, in which the same information is exchange among many kinds of equipment, using the language of computers (Williams and Sawyer, 2005). You are not expected to go into the details of network and communication but you will learn how some of them affect education.

3.1 From the Analog to Digital Age

Analog means continuously varying in strength and/or quality – fluctuating, evolving, or continual changing.

Digital describes and systems based on discontinuous data or events; in the case of computer, it refers to communications signal or information represented in a two-state (binary) way using electronic or electro magnetic signals. Each O and I signal represents a bit.

Everything around man, sound, light, temperature, photographs, etc have been in analog. They are therefore continuous. All measuring instruments like thermometer, speedometer, etc. are analog because they can measure the variations or continuous fluctuation. Electrical transmission of telephone, radio, television and cable TV signals has also been analog.

The computer however uses the binary system which consists of only two digits, (0 and 1). The advantage is that computers can only distinguish between these two values – 0 and 1 or off and on.

There is no representation of in-between values like the 0.25. All data must as a result be digitally encoded in order to keep abreast of the twenty-first century development.

If all known equipment carry analog signals and only computer carries digital signals, why should there be a cry for a change? Reasons adduced by authors point to the fact that digital signals are easier to store and manipulate electronically. It could also be said that since the computer is the engine room of Information and Communication Technology (ICT) other equipment have to conform to the signals of computer.

3.1.1 Classroom Implication

Of what importance are analog and digital transmissions to the classroom teacher or an instructional designer or a programmer? Education applies or utilizes electronic materials as instructional materials in the class. Instructions are packaged and transmitted electronically via networks or cue used for individualized instructions. The fusion of computing and communications has brought about digitalization. A computer is the engine room for powering Information and Communication Technology. This Information Age where all information or communication process is computer-based behoves every stakeholders in education, the teacher, curriculum developers, educational managers to go digital.

3.2 Practical Uses of Communications

There is explosion of the utilization of wireless networking hardware. There is therefore an increase in the number of people communicating through the computer. The businessmen, travelers, students, teachers, political associates, etc. The power of communications connections or connectivity which gives us an

instant, and round the-clock information from all over the globe is responsible for the explosion. Let us consider some of the forms of connectivity.

3.2.1 Videoconferencing and Videophones: Video/Voice Communication

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

This device allows face-to-face interaction. Williams and Sawyer (2005) gave the example of Daniel Minz, who used this device, e-mails and digital photograph device, to maintain interaction with his 17 month old daughter, Noa and avoided the 'stranger treatment' many parents have with their children.

There are two types of video conferencing. These are point to point and multipoint.

- **Point-to-Point:** A point-to-point videoconferencing system is a two-person system. Each person has a video camera, a microphone, and a computer with speakers and monitor. While they talk to each other, their voices are delivered over the speakers and their images appear on each other's monitor.
- **Multipoint:** Multipoint videoconferencing allows three or more participants in difficult locations, each equipped with video camera, microphone and speakers to interact with one another.

Anyone with a properly configured PC and a connection to the internet can do videoconferencing. One can acquire a microcomputer with a video camera, called a PC camera or Webcam (A webcam is a video camera attached to a computer to

record live moving images that can be posted on a website in a real time) and network interface card, which allows you to see the people you are communicating with in the internet. (A network interface card (NIC) allows the transmission of data over a cable network, which connects various computers and other devices such as printers. Software programmes for videoconferencing include CUSeeMe and Clock to Meet Express.

One major setback in video conferencing and videophones is the inability of PLOTS (Plain Old Telephone Service) equipment based on standard copper wire, to transmit or receive images very rapidly. For smooth transmission the expensive high-speed communications lines that will be free of conveying jerky and distorted images will be required.

In the classroom situation, a teacher can collaborate with his colleague in a difficult location and bring him live into his classroom. A teacher who might be unavoidable absent from the institution can arrange a videoconference where available with his students and still pits across necessary information exceeded in his course.

3.2.2 Workgroup Computing and Groupware

Computers were first handled at workplace for personal productivity like typewriters. Companies began the linkage of computers together on a network to share expensive piece of hardware such as a laser printer. Employees found that networks allowed them to share files and databases. Networking of common software allowed users to buy equipment from different manufacturers – e.g. a mix of computers from both Sun Microsystems and Hawlett Packard. Sharing resources which led to workgroup computing.

Workgroup computing, also called collaborative computing, allows teams of coworkers, often at different sites, use networks of micro computers to share information and cooperate on projects. Workgroup computing is made possible by **groupware**, software that allows two or more people on a network to work on the same information at the same time.

Groupware is another medium by which learning can be enhanced in the classroom. A teacher may collaborate with his colleague or resource persons in the business or health sector and tap into the program of the organization through computer networks. It enhance linkages outside the organization.

3.2.3 Telecommuting and Virtual Offices

Computers and communications tools have led to telecommuting and virtual offices.

Telecommuting: Working at home or on the road while in telecommunication with the office is called telecommuting or telework. The advantages or benefits of telework include the reduction of traffic congestion, energy consumption and air pollution. Employers have lower commuting rate and workplace – wardrobe costs and choices about how they handled their time. Employers believed it is flexible and telecommutes may experience fewer distraction at home than the office and can work flexible hours. It may equally reduce absenteeism and improve teamwork. Costs of office space, parking, insurance, and other overhead are reduced.

Isolation of employees is a major drawback. Employees feel working outside the office may hinder their career advancement. Such arrangement blur the line between office and home, strain family life and even may present problem of measuring employee's productivity. With teamwork becoming a workplace

requirement, managers may bring about telecommuters keeping up with the pace of change. Security breaches by hackers or equipment thieves can also be a bane.

Nevertheless, education sectors can still harness the benefit to keep the experts on the job. The flexibility of time could be harness to keep the expert online with learners who will benefit from their wealth of experience. Research students could keep online with their supervisors or experts on their fields to enrich their research work.

Virtual Offices: The virtual office is an often non permanent and mobile office run with computer and communication technology. Employees work from their homes, cars, and other new work sites. Pocket papers, portable computers, fax machine, and various phones and network services and used to conduct business. Such an office exists more in virtual space than physical space. The virtual office is meant for more than a computer, a telephone, a modem, and/or fax machine. Communication with the outer world is through a post office box, a voice mail system, a web page, or an e-mail address. A virtual web service such as office space can be hired to transact business anywhere.

This could be applied to the educational system. Distance Learners could harness the benefit of mobility of virtual office to work in their homes or outside their normal business offices. Researchers could also avail themselves the opportunity of patronizing cybercafé which sometimes might be congested and reduce your privacy.

3.2.4 Home Networks

Computers linked by telephone lines, cable or wireless systems are established component of information technology. Many homes or buildings are built with “network enabled”.

These homes or small offices are equipped with a local area network (LAN), which allows all the personal computers under the same roof to share peripherals (such as a printer, or a fax machine) and a single modem and an internet service. The next development is supposed to be the networking of home appliances, linking stereo, light, heating systems, phones and TV sets. When accomplished one could walk into his house and give a voice command to turn on the lights or bring up music. For example, home networks could be turned to educational use. It could help an individual link up educational websites either as a researcher, regular students or distance learning students.

3.2.5 Smart Television: DTV, HDTV and SDTV

Experts differentiate between interactive TV, personalized TV, and internet TV.

- Interactive TV is popular in Europe and allows interaction with the show you are watching, so that you can request information about a product or play along with a game show.
- Personalized TV consists of hard-drive. It is equipped with personal video recorders (PVRs) such as TiVo and Replay TV, which allows you to record shows you can also pause, rewind, and replay live TV programmes
- The Internet TV, such as the MSN TV service, allows you to read internet text and web pages on your television set.

All the three categories of TV could be applied in the classroom. The interactive TV could be used for instructional purposes in the class especially in a science or social studies class. The personalized TV could serve better in individualized learning. It allows storage of information for future use. It is also flexible. The Internet Television could be of assistance to learners and teachers where computer network is not available. It could be used by an individual or for a whole class.

In future these types of television, personal, interactive and internet TV – will fall into a single one under the umbrella name of “digital television”.

- **Digital Television (DTD)**
uses digital signal, or scenes of Os and Is. It is much clearer and less prone to interference than analog TV. It uses digital cameras, digital transmission, and digital receivers.
- **High-Definition Television (HDTV)**
A form of digital TV. It works with digital broadcasting signals and has a wider screen and higher resolution than standard television. It has an aspect ratio of 16 to 9 as opposed to analog TV’s 4 to 3. It has 10 times more pixels on a screen - 1,920 x 1,080 pixels or more. It could have up to 1,080 lines on screen, compared with 525 – line resolution for analog.
- Standard-definition television (SDTV). HDTV takes a lot of bandwidth that broadcaster could use for standard-definition television (SDTV). It has a lower resolution, a minimum of 480 vertical lines and a picture quality similar to that required to watch DVD movies. It enables broadcasters to transmit more information within the HDTV bandwidth. Broadcasters can **multicast** their products, transmitting up to five SDTV programs simultaneously (Analog broadcasts only one programme at a time).

Digital Television (DTV) has sound qualities and it also allows the broadcast of several programmes simultaneously. This benefit can be harnessed for educational broadcast.

3.3 Communications Media and Transfer Rate

Communications Media carry signals over a communications path, the route between two or more media devices. One is concerned with the speed, or data transfer rate at which transmission occurs, which depends on media and the type

of signal. This is of importance in education because of the location of the learners and the teachers.

3.3.1 **Wired Communications Media: Wires and Cables**

There are three types of wired communications media. These are twisted-pair wire (conventional telephone lines), coaxial cable, and fibre cable.

Twisted-pair wire consists of two strands of insulated copper wire, twisted around each other. The twisted-pair configuration (compared to straight wire) somewhat reduces interference (called “crosstalk”) from electric field. It is relatively slow, carrying data at the rate of 1-128 megabyte per second and does not protect well against electrical interference. It can be upgraded.

This type of wire might not be a viable option for transmission of messages. For educational transmission, it is not advisable for use. It can be upgraded.

Coaxial Cable: commonly called “co-ax”, consists of insulated copper wire wrapped in a solid or braided metal shield and then in an external plastic cover. This is widely used for cable television and cable internet connections. The extra insulation gave it an advantage over the twisted-pair wiring at existing noise. It carries data at faster rate (up to 200 megabytes per second). Coaxial cables are bonded together.

The faster rate of transmission is an advantage that can be harnessed for internet connections for classroom use.

Fibre-optic cable consists of dozen or hundreds of thin strands of glass or plastic that transmit pulsating beams of light rather than electricity. The strands are as thin as human hair and can transmit up to about 2 billions per second (2 gigabytes); each “on” pulse represents 1 bit. When bundled together, fibre optic strands in a

cable 0.12 inch thick can support a quarter – to a half-million voice conversations at the same time. It is not affected by random electromagnetic interference in the environment. Thus it has much lower error rate than normal telephone wire cable. It is lighter and more durable than twisted pair wire and co-ax cables but more expensive. It cannot easily be wire tapped and that makes transmission more secure.

The importance of this to education is that it gives communications provider the option of getting durable and effective materials for transmitting educational programmes. Also, internet which is the backbone of online transmission uses wired communications media.

3.3.2 The Electromagnetic Spectrum, the Radio-Frequency (RF) Spectrum, and Bandwidth

Wired media transmission often proves inefficient and impossible. Thus it is better to use wireless transmission. One needs to understand wireless communication which depends on transmission signals and the electromagnetic spectrum.

The **electromagnetic spectrum of radiation** is basis for all telecommunication signals carried by both wired and wireless media and part of it is the **radio-frequency** (RF) spectrum, field of electrical energy and magnetic energy that carry most communication signals.

Electromagnetic waves vary according to frequency. The radio-frequency spectrum ranges from lower frequency waves (used for garage doors (40 megabytes), through the medium frequencies (for certain cellphones (824-849), air traffic control monitors (960-1,215 megabytes) to deep-space radio communication (2,290-2,300 megabytes), frequencies at the very end of the

spectrum take the forms of infrared rays, visible light, ultra-violet light, X-rays, and gamma rays.

The **bandwidth** is the range, or band, of frequencies that a transmission medium can carry in a given period of time. The wider a medium's bandwidth, the more frequencies it uses to transmit data and thus the faster the transmission.

Broad band connections are characterized by very high speed. The wider a medium bandwidth, the more frequencies it can use to transmit data and thus the faster the transmission.

Broad Connections are characterized by very high speed. For example, the connections that carries the newest digital phone signals range from 144 kilobits (14,400 bits) per second to 2 megabits (2 million bits) per second.

The knowledge of transmission frequencies is necessary so that one would know the type of equipment to utilize for the transmission of educational programmes depending on the location of learners.

3.3.3 Wireless Communication Media: Transmitting Data Through The Air.

There are four types namely: Infrared transmission, broadcast radio, microwave radio, and communications satellite.

3.3.3.1 Infrared transmission

This sends data signal using infrared light waves at a frequency to low ((1-4 megabits per second) for human eyes to receive and interpret. This can be found in laptop computers, digital cameras, and printers as well as wireless mike. TV

remote-control units use infrared transmission. The disadvantages are that the **line-of-light** must not be obstructed between transmitter and receiver. It is also confined to a short range.

3.3.3.2 Broadcast Radio

AM or FM radio station uses broadcast radio. This is a wireless transmission medium that sends data over long distances up to 2 megabits per second between regions states or countries. A transmitter is required to send messages and a receiver to receive them but sometime both sending and receiving functions are combines in a **transceiver**.

In the lower frequencies of radio spectrum, several radio bands are reserved not only for conventional AM/FM radio but also for broadcast television, cellphones, private radio-band mobile services (such as police, fire etc)

3.3.3.3 Microwave Radio

This transmits voice and data at 45 megabits per second through the atmosphere as super-high frequency radio waves called microwaves. It vibrates at 1 gigahertz (1 billion hertz) per second or higher.

These frequencies are used not only to operate microwave but also to transmit messages between ground-based stations and satellite communications systems. Like infrared waves, there must be no obstructions between the transmitter and the receiver as earlier stated. The stations are placed within the distance of 25-30 miles of each other. Most telephone system today use microwave transmission.

3.3.3.4 Communications Satellites

To avoid microwaves earth stations limitations, communication companies have added microwaves sky station known as communications satellites. These are microwave relay station in orbits of the earth transmitting as signal from a ground station to a satellite (uplinking) and from a satellite to a ground station (down linking). The process will be slow if more than one satellite is required to get the message delivered. There are three satellite zones in the space. The highest zone is known as geostationary earth orbit (GEO), the medium is called the **medium-earth orbit (MEO)** and the lowest is called the low earth orbit (LEO).

The knowledge of the communication media is necessary for any institution that might want to set up a communication network for its information dissemination.

3.3.4 Compression and Decompression: Putting more Data in Less Space

A vast stream of text, audio and visual information threatens to overwhelm us. The file of a two-hour movie will require at least 360 disk changes during a single show. A broadcast that fits into one analog television would require 45 channels if sent in digital language. These are needed to compress the data to fit into less space and to also increase the speed. A mathematical process called **compression** is employed.

Compression, or digital-data compression is a method of removing repetitive elements from a file so that the file requires less storage space and therefore less time to transmit.

Before using a data, it is decompressed, that is, the repeated patterns are restored. These methods are sometimes referred to as **codec** (for **compression/decompression**) techniques.

The two principal methods of compressing data are called lossless and losing. **Lossless** uses mathematical techniques to replace repetitive pattern of bits with a kind of coded summary while **lossy** techniques permanently discard some data during compression. Lossless compression schemes are used for text and numeric data files while lossy compression schemes are used with graphics and video files.

The compression standards – JPEG and MPEG. JPEG is the compressing standard for still images. JPEG stands for “Joint Photographic Experts Group” of International Standard Organization. MPEG is the compressing standard for moving images. People working with video are interested in storing or transmitting an enormous amount of usual information in economical form. There are three MPEG standards for compressing information - MPEG-1, MPEG-2 and MPEG-4

Compression of information is necessary in education so that a teacher could have enough materials for his classroom use. The knowledge of standard MPEG affords the teacher of the type of equipment – in terms of capacity-to purchase for instructional dissemination.

3.4. Transmission Mode: Asynchronous and Synchronous

3.4.1 Asynchronous Transmission

This method is used with most microcomputers. It is also called the start – stop transmission. In asynchronous transmission, data is sent 1 byte (or character) at a time. Each string of bits making up the byte is bracketed, or marked off, with special control bits. The “start” bit represents the beginning of a character, and a “stop” bit represents its end. Only 1 byte is transferred at a time, the method is relatively slow. It is not used when a great amount of data is involved. It has the advantage of data transmission at the convenience of the sender.

3.4.2 Synchronous Transmission

Instead of using start and stop bits, **synchronous transmission** sends data in blocks. Start and stop bit patterns, called **synch bytes**, are transmitted at the beginning and end of the blocks. These patterns synchronize internal clocks in the sending and receiving devices so that they are in time with each other. This method is not often used with microcomputers because it is more complicated and expensive than asynchronous transmission. It is appropriate for computer system that needs to transmit great quantity of data quickly.

This has a very important implication for education. The teaching of a large number of students, offering diverse courses, within specified time demands that the institution should be able to determine the mode of transmission of materials to the learners.

3.5 Protocols: The Rule of Data Transmission

A protocol or communications protocol is a set of conventions governing the exchange of data between hardware and/or software in communications network. This enables other computer within the network to properly route its data to the main address. Sending and receiving devices must follow the same set of protocols. Protocol is built into every hardware. It specifies the type of electrical connections used, the timing of messages, and error-detection techniques.

In the past, not all subscribers and developers subscribed to the same protocol and this hindered the incompatibility of equipment. In recent years more developers agreed to subscribe to a standard of protocols called Open System Interconnection (OSI). This is an International Standard that defines seven layers of protocols for worldwide computer communications. The seven layers are arranged in descending order of magnitude.

Protocols

7 Application

Purpose for communicating:
e-mail, file transfer, client/server.

6 Presentation

Rules for data conversion.

5 Session

Start, stops, and governs
transmission order.

4 Transport

Ensures delivery of
complete message.

3 Network

Routes data to
different networks

2 Data Link

Transmits data from
node to node.

1 Physical

passes bits unto connecting medium

Protocol helps in regulating the connection and operation of computer communications.

Self-Assessment Exercise 19.1

- i. List the classroom implication of the transfer from analog to digital.
- ii. Mention **two** practical uses of communications.
- iii. Differentiate between synchronous and asynchronous transmission.

Answers to Self-Assessment Exercise 19.1

- i. Teachers apply or utilize electronic materials for instructions in the classroom. Instructions are packaged and transmitted electronically. The fusion of computing and communications has brought about digitalization. Computer is the engine room for powering Information and Communication Technology. It is therefore incumbent on all classrooms teachers to go digital if they want to remain relevant in the educational system.

- ii. The communications system could be used in many practical ways, For example:

Videoconferencing: This is also called teleconferencing. This combines the television video sounds and computer networks (including the Internet) to enable people at different locations see, hear and talk with one another.

Telecommuting : This is working at home or on the road while in telecommunication with the office. This reduces traffic congestion, energy consumption and air pollution. It is flexible.

- iii. *Asynchronous* transmission is also called the start-stop transmission. Data is sent 1 byte (or character) at a time. The ‘start’ bit represents a beginning while the ‘stop’ bit represents its end. The method is relatively slow.

Synchronous transmission sends data in blocks. Start and stop bit patterns called *synch byte*, are transmitted at the beginning and end of the blocks.

These patterns synchronize internal clocks in the sending and receiving devices so that they are in tune with each other. It is more complicated and expensive. It is appropriate for transmitting great quantity of data quickly.

3.6 Networks

All communications media, whether wired, wireless or both can be used singly or in mix-and-match fashion to form networks.

A **network**, or communications network, is a system of interconnected computers, telephones, or other communications devices that can communicate with one another and share applications and data. This “tying together” in so many ways is changing the world we live in.

3.6.1 The Benefits of Networks

There are a lot of benefits that can be derived from the use of networks.

- **Sharing of peripheral devices:** Peripheral devices such as laser printers, disk drives, and scanners can be expensive. To justify their purchase and maximize their use, the best thing is to network them.
- **Sharing of programs.** The same software can be purchased and used by employees in the system instead of buying a separate programme for the employees.
- **Better communications.** Electronic mail (e-mail) is the greatest feature of networks. Everyone on network can easily keep others posted.
- **Security information.** Formerly, whenever an employee who had a piece of information on his/her desktop is dismissed, or there is a flood or fire disaster, such information would be lost. Today, such data would be backed up or duplicated on a network storage device shared by others.

- **Access to databases:** Networks enable users to tap into numerous databases, whether company databases or public available online through the internet.

3.6.2 Types of Networks: WANs, MANs and LANs

3.6.2.1. Wide Area Network (WAN)

This is a communications network that covers a wide geographical area, such as a country or the world.

3.6.2.2 Metropolitan Area Network (MAN)

This is a communications network covering a city or a suburb.

3.6.2.3 Local Area Network (LAN)

This connects computers and devices in a limited geographic area, such as one office, one building, or a group of building close together (e.g. a college campus)

There is at least a **host computer that** controls the network. The other devices are called the **node**. A **node** is any device that is attached to a network e.g. a microcomputer, terminal, storage device, or printer.

Networks may be connected together – LANs to MANs. And MANs to WANs. **Backbones** are high-speed networks that connect LANs and MANs to the internet.

3.7 Internet, Extranets and Firewalls: Private Internet Networks

Some banners enterprises discovered that using the World Wide Web saved them a lot of money by allowing their customers to click through the web pages to trace parcels instead of using agents. It was a short step to the same technology inside companies in internal networks called intranet.

Intranet-for internal use only

This is an organization private network that uses the infrastructure and standard of the internet and the web. It enables employees to have quicker access to internal information and to share knowledge that can make them do their jobs better. Information include: e-mail address, telephone numbers, products, information, sales data, etc. within the organization.

Extranet – for Certain Outsiders

These offers security and control access. **Extranets** are private intranets that connect not only internal personnel but also selected suppliers and other strategic parties.

Firewalls – to keep out unauthorized users

Security is essential to both intranets and extranets. Sensitive company data must be kept private.

A **firewall** is a system of hardware and software that blocks unauthorized users inside and outside the organization from entering the intranet.

It monitors all internets and other network activity looking for suspicious data and preventing unauthorized access. It consists of two parts, a choke and a gate.

The **choke** forces all the data packets flowing between the internet and the intranet to pass through a gate. The **gate** regulates the flow between the two networks – identifies authorized uses, searches for viruses and implant other security measures.

Self-Assessment Exercise 19.2

- i. Explain the following terms: network, protocol, JPEG and MPEG

- ii. Mention two types of networks and explain each of them.

Answers to Self-Assessment Exercise 19.2

- i. *Protocol* is a set of conventions governing the exchange of data between hardware and software in communications network. This enables other computer within the network to properly route its data to the main address.

JPEG is the compressing standard for still images. It stands for Joint Photographic Experts Group.

MPEG is the compressing standard for moving images. There are three types MPEG-1, MPEG-2, MPEG-4.

- ii. Wide Area Network (WAN): This is a communications network that covers a wide geographical area, such as a country or the world.

Local Area Network (LAN): This connects computers and devices in a limited geographic area, such as one office, one building, or a group of building close together (e.g. a college campus)

There is at least a **host computer that** controls the network. The other devices are called the **node**. A **node** is any device that is attached to a network e.g. a microcomputer, terminal, storage device, or printer.

4.0 CONCLUSION

Network and Communications are very important to Information and Communication Technology (ICT) in education. It enables you to know the various computing devices. You also read about various types of networking and how unauthorized access could be blocked.

In the next unit, you will read about the problems and challenges of application of ICT in developing countries.

5.0 SUMMARY

In this unit you read about:

- Networking - types of networks
- Transition form Analog to Digital
- Practical uses of Communications
- Transmission of Information
- Security of Networking

6.0 TUTOR – MARKED ASSIGNMENT

- i. Differentiate between digital and analog
- ii. Explain the process of video conferencing
- iii. Differentiate between synchronous and asynchronous transmission
- iv. What is the work of firewall? Why is it necessary to install it?

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**UNIT 5 PROBLEMS AND CHALLENGES OF APPLICATION
OF ICT IN DEVELOPED COUNTRIES**

CONTENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Body
 - 3.1. Factors affecting the application of ICT in Education in Developing Countries
 - 3.1.1 Policy and Planning
 - 3.1.2 Roles and Responsibilities
 - 3.1.3 Infrastructure and Resources
 - 3.1.4 Management of Learners and Access to Digital Content
 - 3.1.5 Confidence and Competence of Teaching Staff
 - 3.1.6 Technical Support
 - 3.1.7 Power Supply
 - 3.2 Challenges of ICT Application in Developed Countries
 - 3.2.1 Ignorance and Apathy
 - 3.2.2 Lack of Political Will For Implementation of ICT Policy
 - 3.2.3 Categories of Users of ICT
 - 3.2.4 Maintenance of Equipment
 - 3.3. Prospects of Application of ICT in Developing Countries
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor – Marked Assignment
- 7.0 References/ Further Readings

1.0 INTRODUCTION

In the last unit, you read about Network and Communications and why they are very important to Information and Communication Technology (ICT) in education. The unit also provides you the opportunity to know the various computing devices. You also read about various types of networking and how unauthorized access could be blocked.

In this unit, you will read about the problems, prospects and challenges facing the application of ICT in Developing Countries.

2.0 OBJECTIVES

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

- identify problems facing the application of ICT in Developing Countries
- list some prospects of ICT Application in developing countries
- enumerate the challenges of ICT in Developing Countries

3.0 MAIN BODY

3.1 Factors Affecting the Application of Information and Communication Technology (ICT) in Education in Developing Countries.

Information and Communication Technology (ICT) has transformed the ways by which people are informed, kept people up-to-date with world events and in areas of personal interest, it encourages them learn. There is much reliance on images, video animation and sound for acquisition of information and learning. This phenomenon is accelerated by access to the internet which has made it easier than the pre-ICT era. However, there are some teething problems that affect the application of Information and Communication Technology (ICT) in teaching and learning in developing countries. These factors include policy and planning, roles and responsibilities, infrastructure and resources, management of learners and

access to digital content, confidence and competence of teaching staff, technical support and power supply.

3.1.1. Policy and Planning

There is no clearer-cut policy for ICT in most developing countries. How many people are aware National Information Technology Policy? Are copies circulated? Do the relevant Ministries sensitize the citizenry about the efficacy of the policy?

The Ministries of Science and Technology, and Education have not provided the enablement for ICT to thrive. There is no effective relationship between education authorities and schools to provide ICT services. The supportive staff are not available in institution to play significant roles in schools, colleges and centres.

There is no sufficient online learning and teaching materials from national bodies to enhance ICT application.

For adequate ICT policy and planning, provision should be made for the development of learners' and teachers' ICT skills; monitoring of students' progress, e-learning and acquisition of ICT equipment and software.

3.1.2 Roles and Responsibilities

There are no clear-cut roles about implementing ICT policy. No plan for the deployment of equipment that would meet the needs of the learners and the teaching staff. Education authorities do not put in place quality assurance arrangement that will monitor and improve the use of ICT in learning and teaching.

For ICT to thrive in schools, there must be assigned roles for classroom teachers and ministry officials. Classroom teachers or head teachers should provide leadership in effective use of ICT for learning and teaching.

The Inspectorate Division of Scotland carried out a survey on improving Scottish education: ICT in learning and Teaching (2007). It was discovered that the head teacher's role included leadership for effective use of ICT for learning and teaching. This role was creditably performed.

The bane of developing countries is that no one is assigned any clear-cut role in ICT application in schools.

3.1.3 Infrastructure and Resources

Infrastructures are not put in place to enhance effective application of ICT. In Tertiary Institutions where implementation of ICT programme is coming up gradually, the concentration is not much on capacity building but rather on reducing the administrative bottleneck as regards students' registration, compilation of result, payment of school fees and other related activities. There is no adequate infrastructure and resources that will enable learners and teachers to improve on their ICT skills. Teachers and students, in large numbers, still hold on to old system of teaching learning. Many do not know how to surf the net for information.

In developing countries, the level and quality of resources are still below standard. There is no proper budgeting and monitoring of resources. Equally there is no provision of adequate infrastructure.

3.1.4 Management of Learners and Access to Digital Content

There are a wide range of services that can be used to manage learner's access to and use of ICT. These include access to e-mail, shared folders for learning and teaching materials, network based file storage, to mention a few. In most cases,

students' access to these services is restricted because of the numbers of equipment available to learners.

There are cases where learners specializing in computer Education had no contact with computer hardware before graduating. A pathetic incident happened in a University where a Professor coordinating M. Ed. Computer Education insisted that he would not conduct the Semester examination for the students until he could ascertain their level of competence in computer literacy.

Learners and teachers should have access to the computer and there should be sufficient server space. There should equally be awareness of the teaching staff of the benefits individual accounts could bring to teaching and learning process. Learners should have access to online materials where they can showcase their best work.

3.1.5 Confidence and Competence of Teaching Staff

Teaching staff are supposed to be confident in their use of ICT because they are supposed to have computers both at home and in school. The situation is not so in many schools. Computer is still expensive in developing countries. Many schools do not have computers. Where they are available, say the Primary and Secondary Schools, they are either kept in the Headteachers' offices with restricted use. In Tertiary Institutions they are either at the Dean's or Departmental Office. Only recently Tertiary Institutions now embark on networking their campuses to allow teachers and students access to the Internet.

While staff of some Tertiary Institutions are encouraged to procure Laptops or Desktop for personal and official use through special loans, a lot of teachers remain ignorant about how to access information from the Internet.

3.1.6 Technical Support

Technical support for schools using ICT in developing country is still very low, this is a result of the scarce financial resources, high cost of computers and lack of maintenance. It is somehow difficult to implement ICT. There is no dedicated technicians working solely in centres where ICT materials are available in some cases. Even private cybercafé operators have to fold up most often because they depend solely on companies supplying the hardware and software. Repairs always take long time to be effected. In most case, there are no effective systems for reporting technical issues in places that operate ICT.

3.1.7 Power Supply

ICT depend solely on electrical generation. Unfortunately in most developing countries, the cost of generating electricity is high and the supply is not regular. There is high dependence on generating set and the cost of maintenance is high. This affects the implementation of ICT in education.

Self-Assessment Exercise 20.1

Identify five factors that militate against effective application of ICT in developing countries.

Answers to Self-Assessment Exercise 20.1

Some of the factors militating against effective application of ICT in developing countries are

- Policy and planning
- Roles and responsibilities
- Infrastructures and resources
- Management of learners and access to digital content

- Confidence and competence of teaching staff
- Power supply.

3.2 Challenges of ICT Application in Developing Countries

It is an undisputable fact that Information and Communication Technology is the bedrock for national survival and development in a rapidly changing environment. There are challenges to the application of ICT in developing countries. These challenges range from people's apathy and ignorance to lack of political will for follow-up.

3.2.1 Ignorance and Apathy

Ignorance, people say, is a disease. Some people are ignorant of the efficacy of ICT application in schools. Just as some teachers initially kicked against the inclusion of television as an instructional material which they thought would kick them out of job, some people do not see the importance of embracing ICT. However, versatile teachers see television as a good companion in making their classes interactive.

Computer manufacturers are aware of these ignorance and apathy and that is why computers are made to be learner's friendly. Ignorance and apathy is still responsible for people not to part with their old ways but those who could harness the benefits of ICT can hardly function without computers and the internet any more.

3.2.2. Lack of Political Will for Implementation of ICT Policy

One of the major challenges of ICT application in developing countries is the lack of political will to enforce the policy. There is no structure put in place for training, monitoring and maintenance of equipment.

There is no regular training to update the skills of those on the job, recruit and train fresh employees on ICT skills and monitoring the effectiveness of the training and application of the skills. There should be infrastructure on ground and adequate provision should be made for maintenance of equipment.

3.2.3 Categories of Users of ICT

Egbowon and Nwaboku (2009) identified five categories of users of ICT in terms of proficiency of use and skills. These are the novice, advanced beginners, competent, proficient and experts.

ICT users in developing countries fall into these five categories and a greater number of them fall into the lower categories and they are not ready to avail themselves of the opportunities in computer use. Those who are not computer literate especially some of those who had some training on manual operation are not favourable disposed to training on ICT. They see it as a time wasting device.

3.3.3 Maintenance of Equipment

There is a frequent breakdown of equipment due to virus attack. The cost of maintaining a computer is very high. Many researchers have lost valuable materials as a result of breakdown of their computers. The cost of computer ware, printing link, paper and accessories are still very prohibitive especially when they are applied in functions like photography, publishing and graphic designs as required in teaching.

3.2.4 Curriculum Review

There is the need for the curriculum review of all tiers of education to reflect and accommodate ICT application. You cannot put new wine in an old skin. This

means there should be commensurate training to go along with the curriculum review that will usher in full implementation of ICT in education.

The existing curriculum is still emphasizing the use of the old non-digital media. There should be a greater move towards embracing open learning system with internet as a medium of focus.

3.3 Prospect of Application of ICT in Developing Countries

ICT has turned the world into a global village. Each age is an age of change and people are willing to change with the times, giving up the old and taking what is new. It is time to change and go digital. There are a lot of prospects that could be derived from applying ICT in education. Some of these include:

- Improvement of learners' motivation
- Broadening and widening of learners' understanding and skills
- Maintenance of learners' interest and engagement
- Ensuring that learners experience across the curriculum a range of approaches as a result of collaboration.
- Management of learning experience.
- Access to information.
- Overcome physical disability, and
- Promotion of active learning and authentic assessment.

Self-Assessment Exercise 20.2

- i. What are the challenges facing the application of ICT in developing Countries?
- ii. List five prospects of application of ICT in the developing countries.

Answers to Self-Assessment Exercise 20.2

i. Maintenance of Equipment

- Ignorance and apathy
- Lack of political will for the implementation of ICT Policy
- Categories of users of ICT
- Maintenance of Equipment

ii. Some of the prospects of ICT in Developing Countries include

- Broadening and widening of learners' understanding and skills
- Maintenance of learners' interest and engagement
- Ensuring that learners experience across the curriculum a range of approaches as a result of collaboration.
- Management of learning experience.
- Access to information.
- Overcome physical disability, and

4.0 CONCLUSION

In this unit, you read about the problems, challenges and prospect of application of ICT in developing countries. You read about numerous factors that affect the application of ICT in developing countries. Some of these factors include policy and planning, roles and responsibilities, infrastructure and resources, management of learners' access to digital content teachers' confidence and technical support. You also read about challenges of ICT application in developing countries which include ignorance and apathy, lack of political will for implementation, categories of users and maintenance of equipment. Curriculum review is also seen as a big challenge. Lastly, you read about the prospect of ICT application in developing countries which include among others improvement of learners' awareness, access to information and a host of other reasons.

5.0 SUMMARY

In this unit, you read about:

- Problems facing the application of ICT in developing countries.
- Prospect of ICT application in developing countries
- Challenges of ICT application in developing countries

6.0 TUTOR - MARKED ASSIGNMENT

- i) List **three** problems facing ICT application in Developing Countries.
- ii) Mention any **three** challenges of ICT application in developing countries.
- iii) Identify **four** challenges of ICT application in developing countries.

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UNIT 6: YOUR FUTURE AND ICT

CONTENT

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- 2.0 Objectives
- 3.0 Main Body
 - 3.1 Emerging Global Telecommunications
 - 3.1.1 Models of Telecommunications
 - 3.1.2 The Potential Effects of the Switch-Network Model:
Napster and Rise of File Sharing
 - 3.2 Information and Education
 - 3.3 Health, Medicine and Science
 - 3.3.1 Healthcare and Medicine
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 - 3.5 Jobs and Career
 - 3.5.1 Ways to Fund Employers
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 - 3.7.1 Cynicism
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 - 3.8 How To be A Winner
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- 3.9 You and Information and Communication Technology
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignments
- 7.0 References/Further Readings

CONTENT

1.0 INTRODUCTION

In the last unit, you read about the problems and challenges of ICT in developing countries. Factors like policy and planning, management of learners and access to digital contents were identified as some of the factors militating against the application of ICT in developing countries and the challenges included ignorance and apathy, lack of political wills and maintenance of equipment.

In this unit, you will read about what Information and Communications Technology holds in store for you and the society. I hope you will enjoy reading this section.

2.0. OBJECTIVES

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

- discuss the emerging global telecommunications and explain the impact of ICT on information and education
- describe the effect of ICT on health, medicine and science
- describe government's impact on electronic democracy
- write a note on the impacts of ICT on jobs and career

- explain why it is important to have individual strategies to be a ‘winner’ in Information Age
- discuss ways people may react to new technology
- describe how to stay current with your career

3.0 MAIN BODY

3.1 Emerging Global Telecommunications

Communications was based on transportation in the beginning. The Roman Empire had road networks, European powers had the navies and United States and Canada built Trans-continental roads. Transportation evolved into electronic exchange of information. In 1876, the telephone emerged as a competitor to the telegraph. Thirteen years later, in 1889 electromagnetic radio waves transmission of the English Channel. The amplifying vacuum tube invented in 1906 gave birth to commercial. In 1925, England witnessed the birth of television. July 21, 1931 also witnessed the first TV shows, broadcast from New York.

With the overwhelming spread of TV sets in the 1950s and 1960s, Marshall McLuhan posed the notion of the world becoming a “global village”. This refers to the “shrinking of the world society because of the ability to communicate,” His assumption came up as a result of the global reach of the mass media such as television. People all over the world have viewed similar shows and have used his word as a common point of reference.

Recent technology has become more portable giving individual greater access to information and communications that now makes the world even more closely knit. Cellphones, pagers and portable computers with communications links that were not in existence over two decades ago are now commonplace materials.

With computer and communication technology going digital, computer, communications, consumer electronics, entertainment, and mass media industries are undergoing a technological convergence.

3.1.1 Models of Telecommunications

Two kinds of arrangements have emerged for the organization of telecommunications. These are “tree and branch” versus “switched network”.

In the tree and branch model, a centralized information provider sends out messages through many channels to thousands of consumers. This is common in mass media such as radio and TV broadcasting. It is also a model envisaged by some cable and entertainment companies that are looking out to provide movies and other services from a centralized library or a core of “content provider”.

The switched-network model telecommunication will make consumers of information (‘content’) possible providers of information. This model as found in the telephone systems, and in most of the computer networks, including the Internet will change the world.

3.1.2 The Potential Effect of the Switch-Network Model: Napster and the Rise of File Sharing

Napster is file-sharing software which tapped from the participatory potentials of the switched-network model. It enabled users to download songs residing in MP3 format on the hard drives of other music lovers. It was used to pirate copyrighted music released by music companies on CD. Most Napster users got their downloaded music free from their fans and not from the record company servers, thus the economics of music distribution was changed. It was an easy attack on copyright because it had a centralized file-sharing network. Music services took up the challenge and had it become a subscribed service and no longer a free service.

The switch-network model has come to stay and could well change the basic economics not only that of the music business but also of, perhaps the on-line book-publishing business (Williams & Sawyer, 2005).

The emerging global development in telecommunications will have its future shortcoming. Not only will access to information become a commonplace but also the protection of intellectual copyright will face a serious challenge. Piracy will be on the increase and it will be difficult to track down the culprits. Already the advanced free fraud (419) is taking its toll on all sectors – education, politics, economy and ICTs, etc.

3.2 Information and Education

It is becoming impossible to get the right end of information. It is a big challenge. Since the Library of congress cannot make available all records online to citizens and companies as a result, some records are classified documents to which access is restricted. Government records, patents, contracts and other legal documents even geographical maps photographical from satellites are not to be on display for security reasons.

Another challenge is getting information that makes sense. The online, therefore, needs a versatile librarian. Most computer users are of the opinion that with access to the web, a lot less is needed from the library. Williams and Sawyer (2005) stressed that the library is well organized and standardized whereas what is on the web is often an overwhelming, un-standardized and chaotic information.

Since computer use is gradually becoming the major source for funding and processing information. Many college courses will require the use of e-mail and many already have their own dedicated web pages. In developed countries of the world college students spend an average of 5.6 hours a week on the internet. It is

not so in developing countries where shortage of equipment and technical manpower to effect proper maintenance and utilization of the resources.

One revolution of computer and Information and Communication Technology is the advent of its use as a tool for distance learning, or “Cyber classes”. There is also the explosion of internet resources. Institutions of higher learning and individuals now take the advantage of internet resources to enroll for online courses. Those who did not have the opportunity to attend the normal class can now harness the benefits of online system (internet) to enroll for courses and upgrade themselves. The flexibility of time has made it possible for those who would have been deprived of upgrading themselves to do so.

3.3 Health, Medicine and Science

William and Sawyer (2005) reported the case of a Bleeding Sailor performing a self surgery via e-mail as contained in San Francisco Chronicle of November 19, 1998 A1, A10. The sailor, Victor Yazykor, through the aid of his solar-powered laptop computer contacted a Boston-based Dr. Daniel Carlin from South Atlantic concerning his friend that needed urgent surgery. With a step-by-step instruction via the e-mail, he was able to operate on his own arm.

3.3.1 Health and Medicine

The case of Yazykor is an example of **telemedicine** – medical care delivery via telecommunications. It is now possible for physicians in local area without access to radiologists to use “teleradiology” to exchange digital images such as X-ray via telephone-linked networks with expert physicians in metropolitan areas. Telemedicine is moving to an exciting new level, as the use of digital camera and sound in effect moves patients to doctors rather than the reverse (Williams & Sawyer, 2005)

Computer technology is equally changing the tools of medicine. Medical Information like X-ray, lab test, blood pressure can now be digitalized. Epidemiologists are also using the web to improve public health in developing nations.

Physicians, patients and health consumers are going online. Online health information can sometimes be misleading and dangerous. However, consumers go online to seek information from experts and those who suffer similar ailments like them. It is advised that online health be sourced with caution.

3.3.2 Science

Scientists are regular users of information and Communication Technology. There is the idea of “Collaboratory”, an internet-based collaborative laboratory, in which researchers all over the world can work easily together even at a distance. An example is the space Physics and Aeronomy Research Collaboratory, based at the University of Michigan at Ann Arbor. This arrangement allows space physicists to band together to measure the earth’s ionosphere from instruments on four satellites and Massachusetts, Norway, Puerto Rico and Peru; a super computer processes the information, and the result can be transmitted at once to scientists in many places.

Non-scientists equally should be concerned about environmental issues like the global warming and guideline on social tourism we are all equally affected. Information on these changes is available on the World Wide Web.

3.4. Government and Electronic Democracy

Internet is becoming a tool in the hands of government and its agencies, and government has used the Internet to streamline its commercial activities that have been in the hands of some individuals.

Government is also concerned with teaching and learning. This is why it goes online in educational issues. The internet is used for database on education-enrolment, placement, payment of fees, and release of students' examination results. Some governments have also adopted the use of internet for tax collection and for passing the bills.

The internet is used for opinion polls, voting and monitoring of voters' registration. We now have e-government and e-payment and this is also a reason why you should work hard to become computer literate.

Self-Assessment Exercise 21.1

- i. List some of the emerging issues in global telecommunications
- ii. Give some vivid examples where ICT has great impact in man's life

Answers to Self-Assessment 21.1

- i. Portability of Technology
Greater Access to information
Switched-network model telecommunications
- ii. Health, Medicine and Science
Government and Electronic Democracy
Jobs and Career

3.5 Jobs and Career

At anytime of the day, you can get a job-search advice, tips on interviewing and resume writing, and posting of employment opportunities all over the world. You can direct your web browser to a portal such as www.google.com,

www.yahoo.com. to obtain a popular list of websites. In the menu, you can click on Business and Economy, then employment work, and then career and Job, then Jobs. This will bring up a list of sites that offer career advice, resume writing etc.

3.5.1 Ways For You to Find Employers

You will find companies seeking for people with technical background. You will be expected to fill some forms on-line. Most websites are free for job seekers. When you open the website, you may find English Language Teachers' needed in China. You might be required to present your Curriculum Vitae.

3.5.2 Ways for Employers to Find You

Posting your resume on line for prospective employers is good, attractive and cost less. You have to be careful because there are some disadvantages – your current employer may stumble on your resume, you have no control over whatever you broadcast on the cyberspace. Below are some website for posting job listings.

America Job Bank: www.ajob.div.us

Career Builder: [www.career](http://www.careerbuilder.com) builder.com

College Grade; Job Hunter: www.collegegrad.com

Jobs on line: www.jobsonline.com (Williams and Sawyer, 2005)

If you have a technical background, it is worth posting your resume with an electronic jobs registry. Online recruitment is popular with companies because it prescreens applicants for at least basic computer skills.

3.6. Changing Times

Each age is an age of change and people are willing to change with the times, giving up the old and taking what is new. There are some who will or who cannot

change. Industries should be aware that they must adapt to changing technology or be left behind. For example, banks have found that ATM is a viable option to retail banking, so they make it available to customers to ease bank congestion. They equally allow customers access to their funds in a more flexible way. To be a winner, you must design your own strategy to keep abreast of global development.

3.7 Technology and People

The reaction of people to the development in technology may be cynical, naïve, frustrating or proactive. People have different ways of coping with the development in technology, for example, the use of television in the classroom.

3.7.1. Cynicisms

A Cynic would see any development as time-wasting. He does not see the reason why the manager should understand and work on spreadsheet. Rather, he should delegate it to another person and face his managerial work. Cynics may express their doubts openly, especially if they are top managers.

3.7.2 Naiveté

Many naïve people are not familiar with a navigator and its functions. They may see computer as an all-purpose machine capable of handling any job.

3.7.3 Frustration

The frustrated person may be quite boring and find taking time out to learn computer as a time wasting device. Some are frustrated because they find manuals difficult to understand.

3.7.4 Proactivity

Proactivity means be positive in outlook. Proactive people do not give up learning something afresh. They explore new ways of improving on their skills.

3.8. How to be a Winner

3.8.1 Stay Current

You have to be current with the development in technology to be a winner. You can harness the benefit of computer education to keep abreast the digital age. Participate electronically with special interest groups on the Internet.

3.8.2 Maintain Your Computer Competency

Stay ahead of technology. Books, journals and trade associations are best sources of information. If you wish to subscribe to a magazine that deals extensively with computer technology, you can go ahead. Most of the magazines have online version on the web.

3.9 You and Information and Communication Technology

You have seen the arrays of opportunity being opened up by ICT, it is yours to grab them and improve on them. Computer technology – Internet, wireless revolution, networking – have turned the world to a global village. Bulky materials are now miniaturized and they are now very portable. Distance is no longer a barrier. Collaborative work is there for you. Get in touch online with experts on your field and improve your skills. Apply the knowledge of ICT to all aspects of your life. You will soon get there. Do not give up.

Self-Assessment Exercise 21.2

- i. Mention the groups of people that have negative views about ICT.
- ii. How can you win the battle?

Answers to Self-Assessment Exercise 21.2

- i. The cynics
The naïve
The frustrated
- ii. Stay current
Maintain your computer competence.

4.0 CONCLUSION

You have read this unit on the current development in ICT. You now understand what the future holds for those who are ready to learn. Avail yourself the opportunity to keep abreast with the new development and stay current.

5.0 SUMMARY

In this unit, you have read about :

- The impact of ICT on education
- Effects of ICT on medicine, and health and science
- Impacts of ICT on jobs
- Ways people may react to new technology and how to
- Stay current in one's career

6.0 TUTOR-MARKED ASSIGNMENT

- i) Explain the models of telecommunications
- ii) State the input of technological development on health, medicine and science
- iii) Explain people reactions to technology

7.0 REFERENCES/ FURTHER READINGS

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